Regional Low-Carbon Transition & Development Planning in China: *Theory and Practices*

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Contents

1. **Background**

2. **Methodology/Toolkit Development**

3. **Case Study**

4. **Experience & Next Step**

China's Low-carbon Development Planning:
Political and Economic Background

- **Building institutions for ecological civilization** (2013): The 3rd Plenary Session of 18th CPC Central Committee

- **The Belt and Road Initiative** (2013): Greater South-South cooperation, emphasize on energy and coping with climate change

- **The economic "New Normal"** (2014): on-going industrialization and urbanization

- **Political commitment** (2017-18): guiding the international cooperation on climate change, finding sustainable solutions worldwide, and pushing to build a fair, reasonable, cooperative, and win-win global climate governance system

China's Low-carbon Development Planning: *Policy*

- ● National Policy：
  - ➤ Mandatory Targets – NDC(The Paris Agreement) Driven: Carbon Intensity reduction in 2030 by 60-65% compared with the level of 2005; non fossil energy share and forest stock increase targets
  - ➤ Pilot program for Low-carbon development in 6 provinces and 81 cities (January, 2017);
  - ➤ 7 ETS pilots and National ETS (December, 2017)
  - ➤ New context: Eco-Civilization development

- ● Policy instruments
  - ➤ Comprehensive policies adopted
  - ➤ Planning plays an important role in China
  - ➤ Market-based instruments crucial in the future

LC Development Planning: Challenges

- **Challenges**
  - Not enough legal support
  - Data and statistical system imperfection
  - Lack of evidence-based, quantitative methodology and guideline
  - Planning conflicts

- **Approaches:**
  - Long-term and short-term
  - Action coordination among different sectors / stakeholders
  - Objectives, roadmaps and policies
  - Managing the transitional and dynamic system

Regional Low-carbon Development Planning Framework: *Int'l Experience*

- **Prerequisite: Reasonable targets + clear political will**
- **Government agencies take the lead**
- **Integrated policies with actions**
- **Stakeholders' participation and coordination mechanisms**
- **Key: Low-carbon technologies and financing**

Procedures to Develop a Low-carbon Action Plan

Make Inventory of CO_2 Emissions

⬇

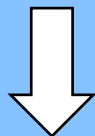Review Results of Relevant Emission Reduction Policies Sector by Sector

⬇

Integrate Existing Policies and Identify Their Emission Reduction Potentials

⬇

Set Overall Emission Reduction Targets and Sector-based Targets, and Set Low-carbon Visions
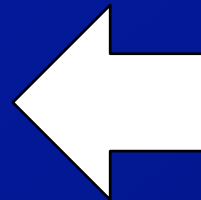
Make CO_2 Emission Reduction Action Plans

Make Climate Change Adaptation Plans

⬇

Identify Economic Development Opportunities and Make Strategic Low-carbon Development Plan

⬅

Policy Toolkit

Pilot by Government Agencies

Policy Integration

Stakeholders' Participation

Low-carbon Technologies

Low-carbon Financing

Other Tools

Contents

Main points of the toolkit

- **Data Base**: data collection, investigation, evaluation, structuralized and standardized; 7 fields, 244 types of emission source, 100 items of tech and policy

- **Modelling**: Top-down + Bottom-up

- **Institutional negotiation**: stakeholder involvement

- **Best practice**: capacity development, scenario analysis, case study at national, provincial, city, and sectoral levels

Regional Low-carbon Planning Toolkit: *R&D*

- Joint Research and Development (2010)
  - Under the framework of China-US Eco-partnership
  - Collaboration among:
    - Institutes of Science and Development, Chinese Academy of Sciences (CASISD)
    - Global Environmental Institute (GEI)
    - Center for Climate Strategies (CCS)
    - Others
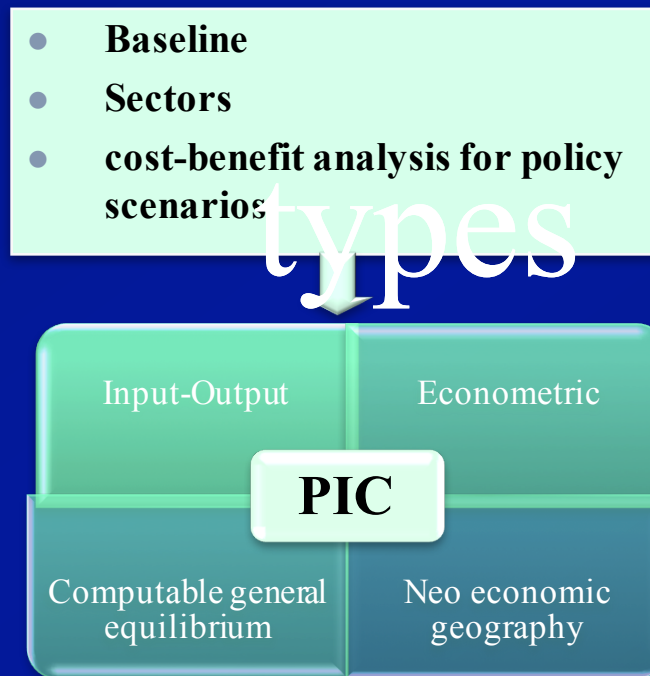 - The intellectual property is shared by all parties.
- Progress
  - Finish the development of China's Regional Low-carbon Planning Toolkit in 2013, and revise continuously
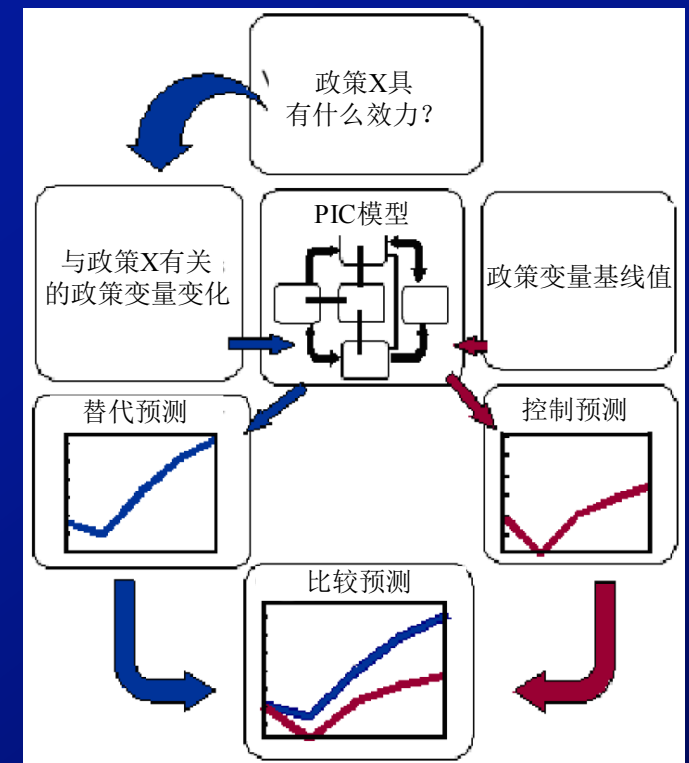
模型开发与政策模拟
Modelling Development and Policy Simulation

- **Policy Insight and package of China model**: *PIC+PAC*, top down & bottom up, jointly develop by the CASIPM, GEI, CCS and REMI under the China-US Eco-Partnership
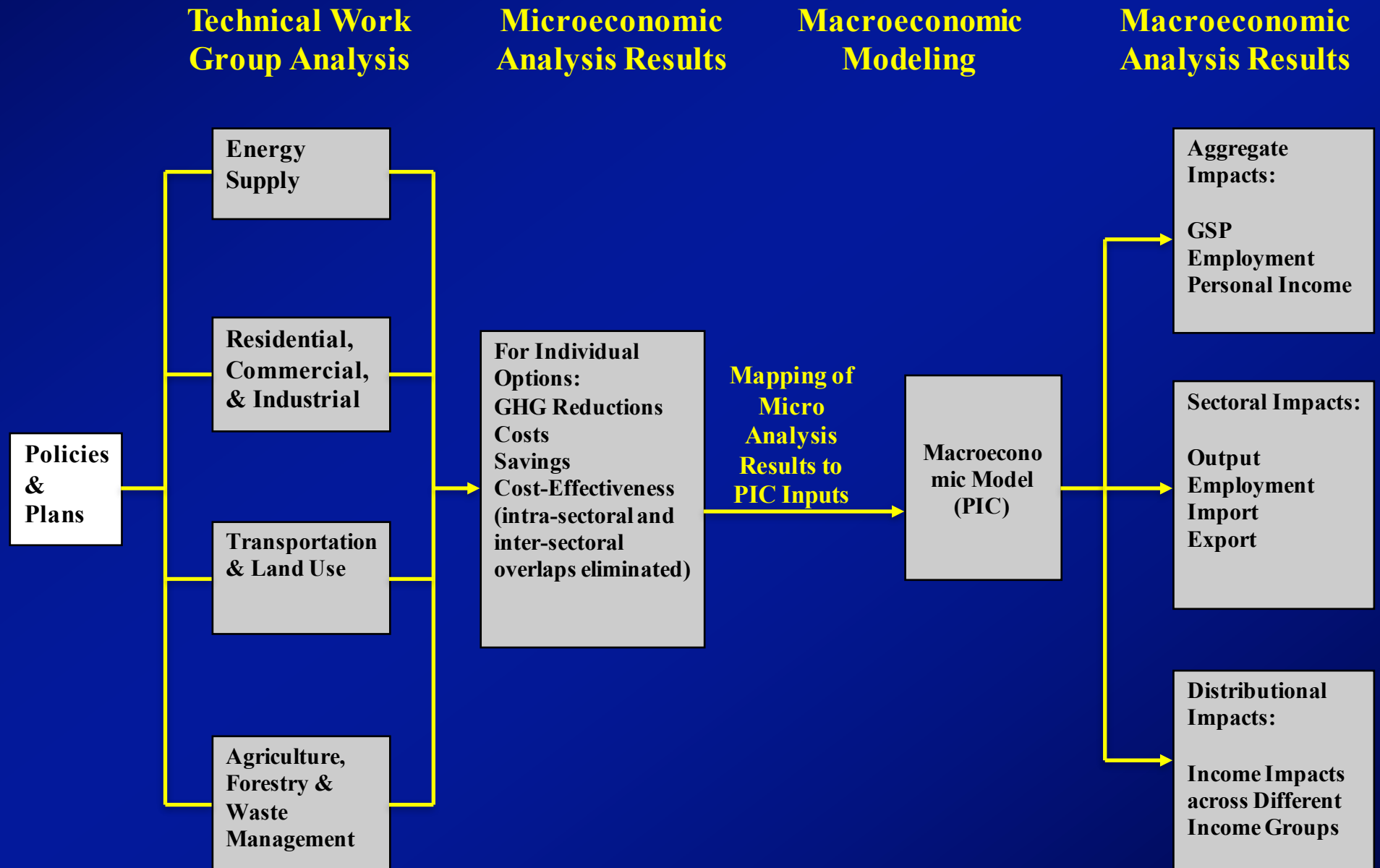
➤ Difficulty: rapid growth and structural changes, uncertainty management

➤ Sectors and provincial emission accounts: 32 regions, 58 sectors

- **Baseline**
- **Sectors**
- **cost-benefit analysis for policy scenarios** types

Input-Output	Econometric
PIC	
Computable general equilibrium	Neo economic geography

➤ **Population, employment, economic growth, Energy & emissions, sustainability, costs …**

政策X具有什么效力？

PIC模型

与政策X有关的政策变量变化

政策变量基线值

替代预测

控制预测

比较预测

Linkages of Micro and Macro Analysis

Technical Work Group Analysis

Microeconomic Analysis Results

Macroeconomic Modeling

Macroeconomic Analysis Results

Policies & Plans

Energy Supply

Residential, Commercial, & Industrial

Transportation & Land Use

Agriculture, Forestry & Waste Management

For Individual Options:
GHG Reductions
Costs
Savings
Cost-Effectiveness
(intra-sectoral and inter-sectoral overlaps eliminated)

Mapping of Micro Analysis Results to PIC Inputs

Macroeconomic Model (PIC)

Aggregate Impacts:

GSP
Employment
Personal Income

Sectoral Impacts:

Output
Employment
Import
Export

Distributional Impacts:

Income Impacts across Different Income Groups

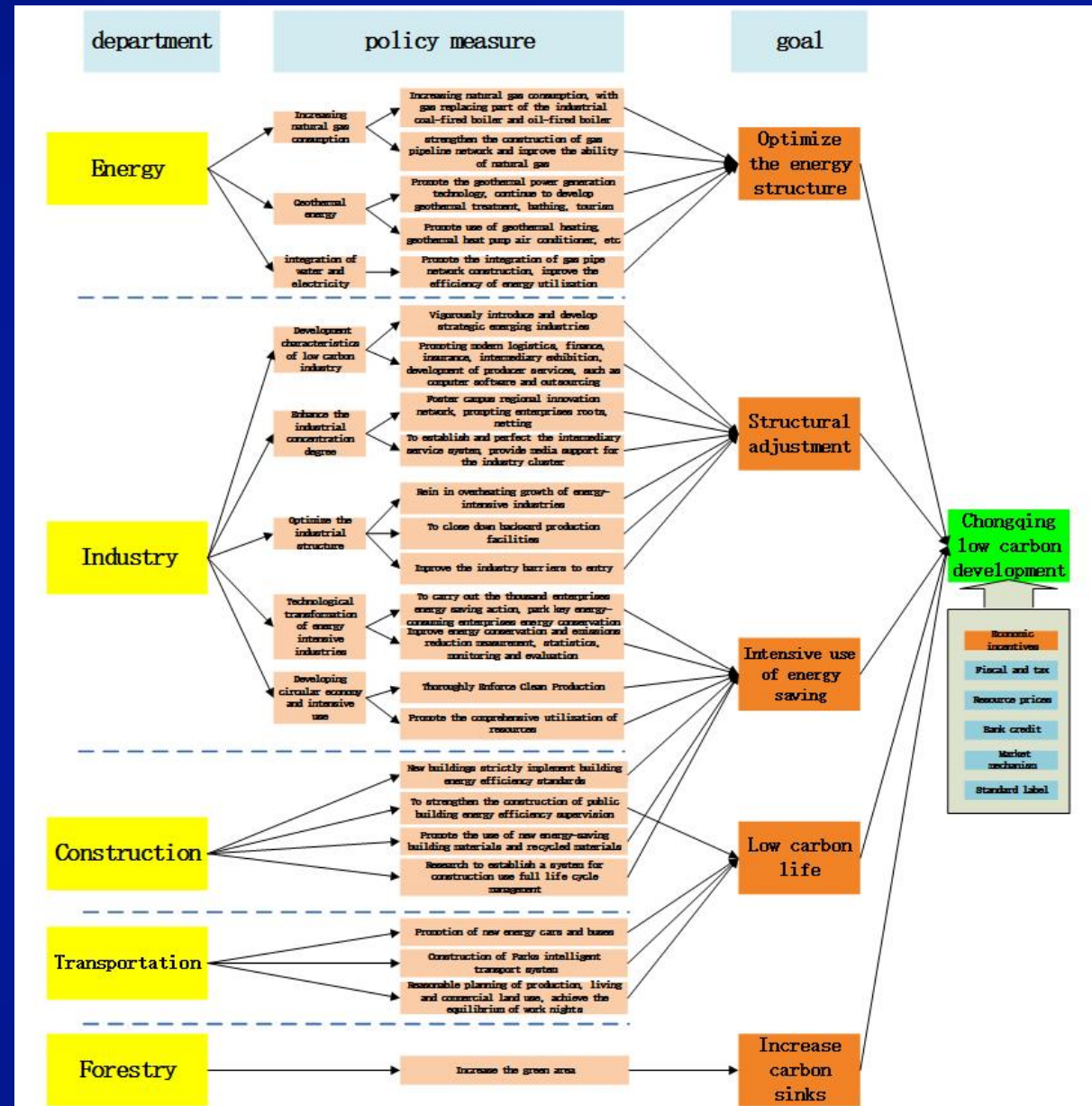# Regional low-carbon planning toolkit:
Data base

- 7 sectors, 26 industries, 244 types of emission sources (based on products), including:
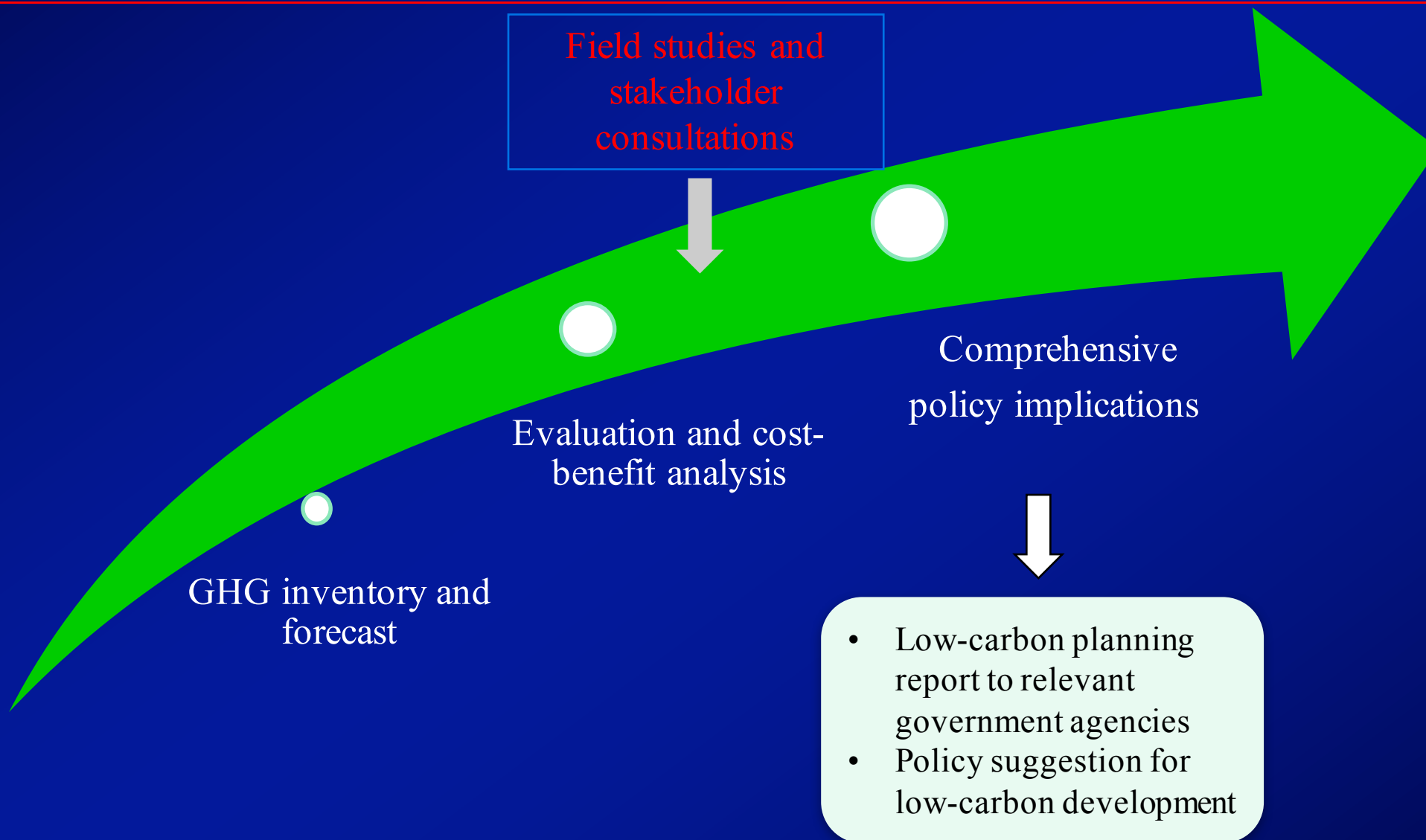
  - Energy: 7 industries, 61 emission sources
  - Industry: 5 industries, 19 emission sources
  - Building: 2 industries, 27 emission sources
  - Transportation: 4 industries, 13 emission sources
  - Agriculture: 5 industries, 31 emission sources
  - Forestry: 1 industry, 11 emission sources
  - Waste management: 2 industries, 26 emission sources

The low carbon development policy library

- Through questionnaire investigation and expert consultation, about 40 policies are screened from about 300 policies of various industries as the key object to analysis.

- Policies can be divided into structural adjustment, technology progress, and fine management .

- Now 92% policies has been completed by quantitative analysis.

Procedures of Regional Low-carbon Planning

Field studies and stakeholder consultations

Comprehensive policy implications

Evaluation and cost-benefit analysis

GHG inventory and forecast

- Low-carbon planning report to relevant government agencies
- Policy suggestion for low-carbon development

Low-carbon Policies Analysis System (PAC):
bottom-up

Function	Process	Step	Outcome
Make sure the emission source and the industry which emission lager GHG	Complementing the GHG emission inventory	• Depart the GHG emission of a region into all the industries • Make sure the definition of the bounds of each industry • Working out the initial inventory • Choosing the accounting method • Develop the tool using for accounting based on the inventory	• Using the bottom-up and up-bottom method to calculate the emission of the region • The inventory contains seven sectors, including energy sector, industry sector, Transportation sector, Building Sector and so on; • The inventory contains 23 industries and 244 typical emission source
Forecast the emission of the region in the future under the BAU scene	The forecast of the baseline	• Making sure the target to account • Making sure the year used as the base year and the year used for target year • Develop the forecasting model • Searching and collecting the data useful • Check the result and make the result reasonable	• The emission under the baseline of region in the future, which is from year 2011 to 205 • The emission of each sector in the region in the future under the baseline • The energy consumption in the future under the baseline
Calculate the emission change under the new policy, as well as the cost of implementing these policies	The analysis of the policy	• Gathering the policies and classifying • Making the Policy base • Develop and modify the model used for account the emission decreased and cost of each policy • Check the result and make the result reasonable	• Quantify the policy on one place and on one or some industries about low carbon, including the policies published in region, national, and international • Together quantifying 327 policies, including policies on Scale, Economy, Technology, Management

China's LC policy analysis system (**Policy Package of China. PAC**)

Quantitative Analysis of Climate Action Plans

Guidance Principals

1. General principals
2. Sector-based principals
3. Policy Selection: data source, calculation tools & methodology, assumptions and variables
4. Integration

Results of Analysis

1. Emission reduction amount
2. Energy (energy efficiency and carbon intensity)
3. Resources (water, land, waste)
4. Implementation cost
5. Cost-benefit of policies
……

Categories of Impact

1. Workers
2. Enterprises
3. Households
4. Communities
……

Regional Low-carbon Planning Toolkit: *Application*

- **Application and Promotion in Low-carbon Pilot Cities/Provinces (2013-2018)**
  - **Industrial Park**
    - 39 low-carbon industrial parks in Chongqing
    - Shenzhen International Low Carbon City
  - **Sectoral Road Map**
    - Energy, Industry, Building, Transportation, Agriculture, Forestry, and Waste management
  - **Province and City Low-carbon Planning**
    - West China: Chongqing, Chengdu, Guiyang
    - East China: Guangdong, Shenzhen
    - Middle China: Hubei, Xiangtan, Liuzhou
  - **National Low-carbon Policy and Peak analysis**
  - **International expanding**
    - The Belt and Road regions

Regional Low-carbon Planning Toolkit:
capacity development

- **Capacity Building and Promotion**

  - Training: there are 5 training courses on the planning toolkit to be carried out during 2013-2018.

  - Participants: including local government officials, climate change scholars, business practitioners, etc. More than 200 people have been trained up to now.

  - The GEI had more training activities.

Introduction to Regional Low-carbon Planning Toolkit: *software copyrights*

● **Achievements, 5 items of software copyrights.**

1. Greenhouse gas emission inventories and emission forecasting tools in China's energy sector V1.0 (2016: 1472776)

2. Greenhouse gas emission inventories and emission forecasting tools in China's industrial sector V1.0 (2016: 1472783)

3. Greenhouse gas emission inventory and emission forecasting tool for China's agriculture and forestry sector V1.0 (2016: 1472726)

4. Greenhouse gas emission inventory and emission forecasting tool for China's waste management sector V1.0 (2016: 1472714)

5. China's sub sector greenhouse gas emission inventory and emission forecast summary tool V1.0 (2016: 1472721)

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Empirical study on green and low carbon policy assessment

- **Sectors level**：**Research on green and low carbon transition roadmap for key industries and sectors**

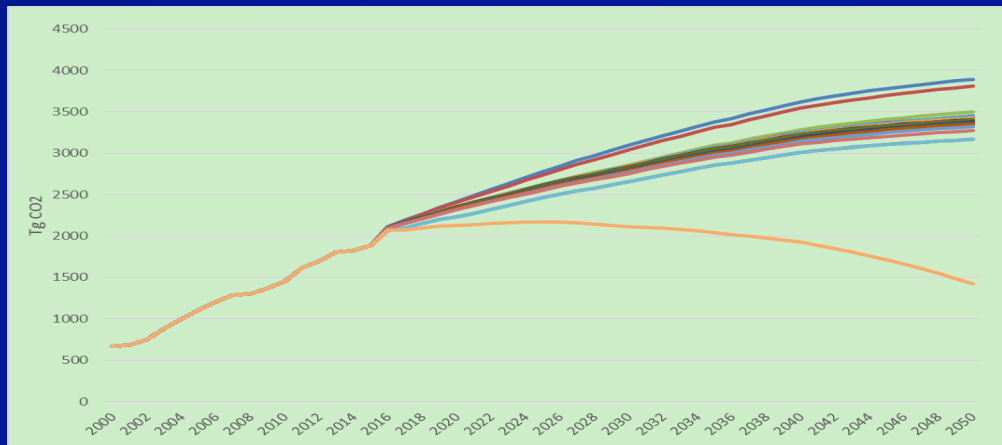- **Provinces and Cities level**：**GHGs reduction evaluation and cost-benefit analysis of policies of low-carbon pilot provinces and cities**

- **National level**：**The simulation and policy mix analysis of China's carbon emission peak**

- **Additional applications:**
  - **Financing project planning**
  - **Chongqing low carbon transition planning (key sectors and projects layout)**
  - **Shenzhen International Low-carbon City planning assessment (key projects selection and layout proposal)**

Empirical Study on green low carbon policy assessment: *sectors*

- **Sectors level**：**Research on green and low carbon transition roadmap for key industries and sectors**

Energy, Industry, Building, Transportation
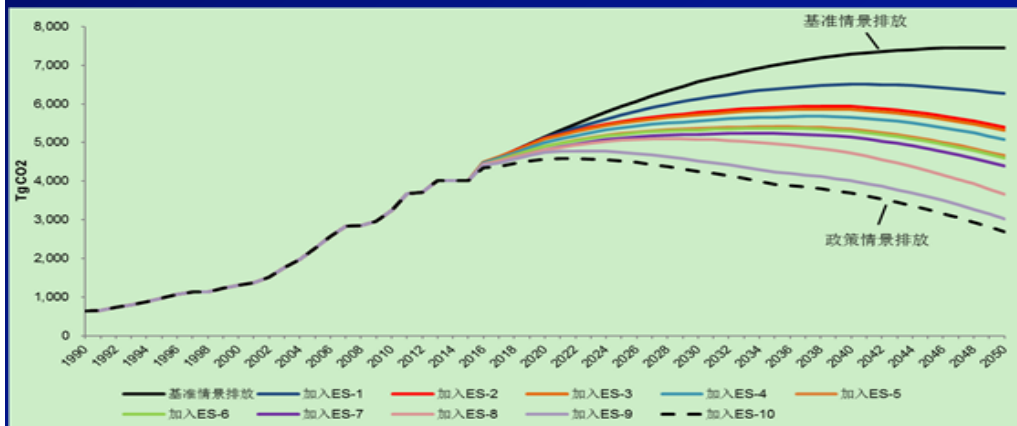
CO2 emissions from China's power and thermal supply sector under different scenarios
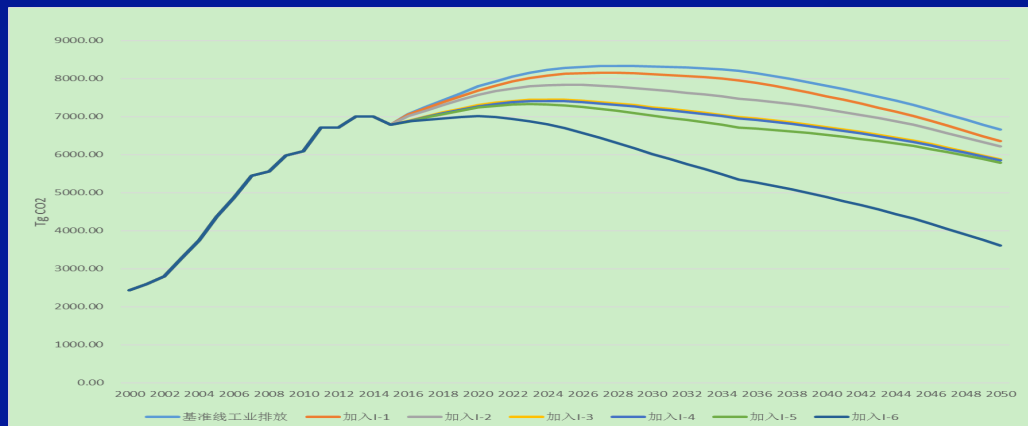
CO2 emissions from China's industrial sector under different scenarios

CO2 emissions from Chinese building sector under different scenarios
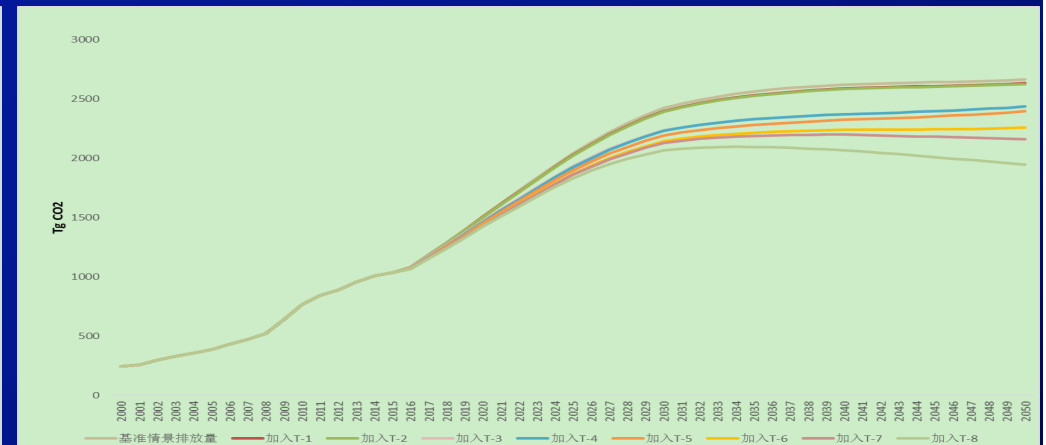
CO2 emissions from China's transportation sector under different scenarios

Empirical Study on green low carbon policy assessment: *local level*

- **Provinces and Cities level：Take the lead in carrying out GHG reduction evaluation and cost-benefit analysis of policies of low-carbon pilot provinces and cities**

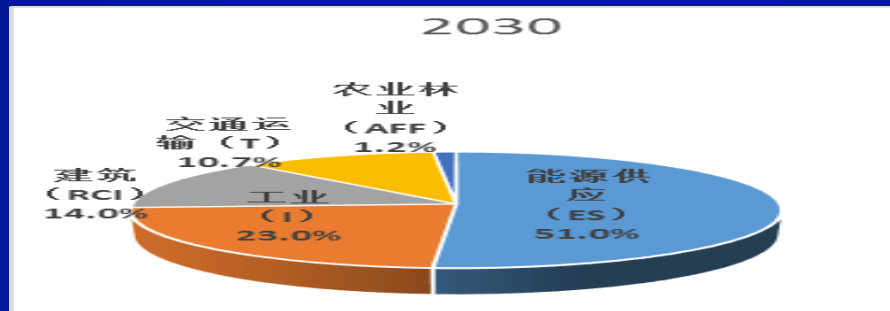**First batch: East (Guangdong, Shenzhen), Middle (Hubei), West (Chongqing)**

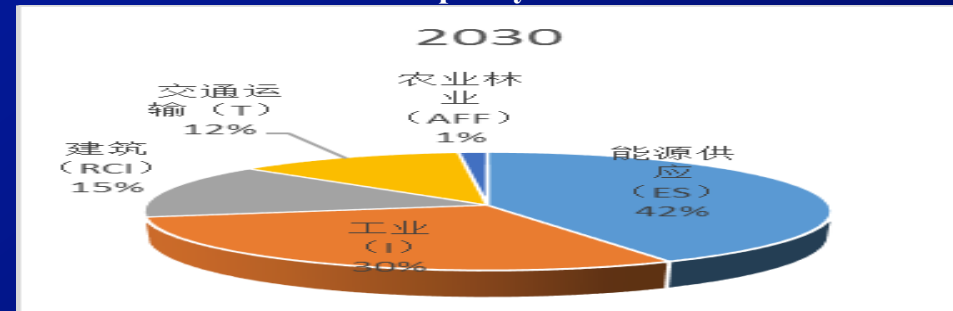**Second batch: Xiangtan, Liuzhou, Chengdu, Guiyang**
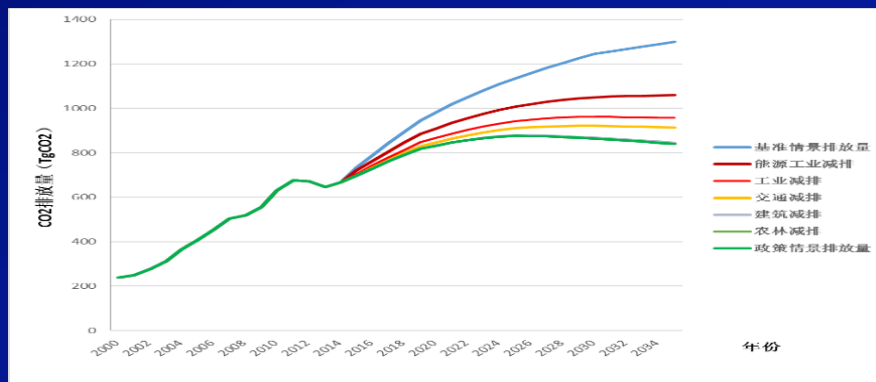
2000-2035 Guangdong GHG emissions of BAU and policy scenarios
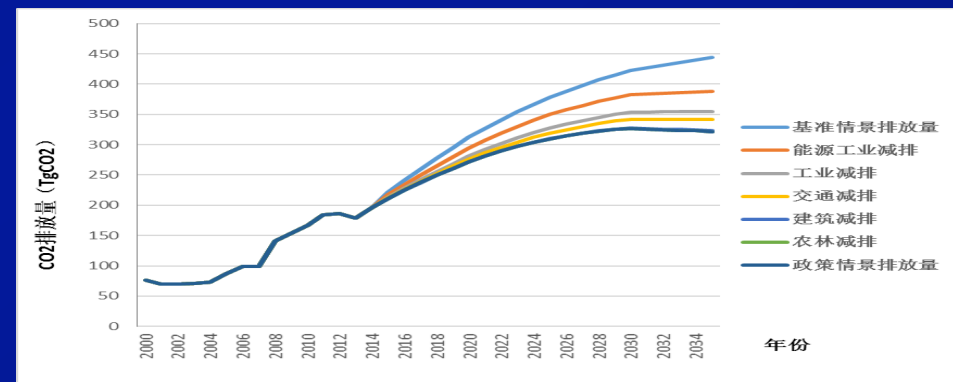
**2000-2035 Chongqing GHG emissions of BAU and policy scenarios**

**The contribution ratio of various sectors in Guangdong in 2030**

The contribution ratio of various sectors in Chongqing in 2030

# Empirical Study on green & low carbon policy assessment: *national level*

National level: An empirical study based on the low carbon pilots in the East, the Middle and the West regions, we simulated and analyzed the mixed low-carbon policies of China's carbon emission peak, evaluated the existing low carbon policies and the expected effect in the future, and proposed the suggestions on the adjustment of the low carbon policies at the national and regional level in 13th Five-Year.
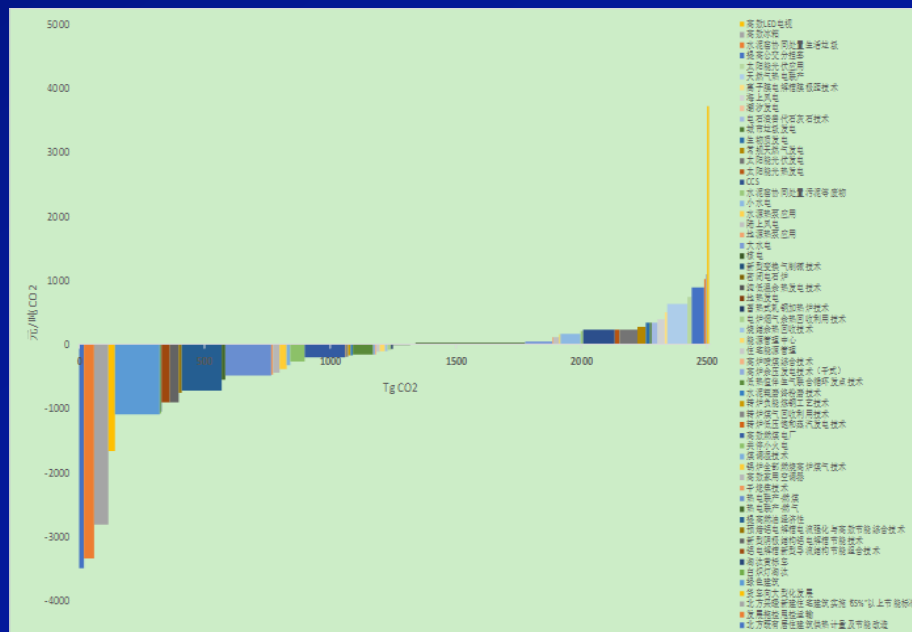
**Marginal abatement cost curve for China in 2030**
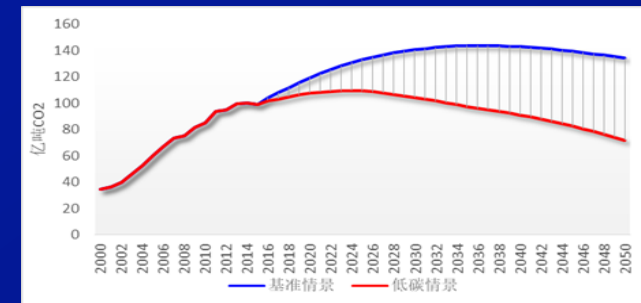
The trend of GHG emissions in China (2000-2050)
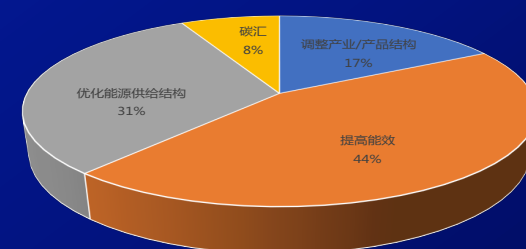
GHG reduction contribution of four types of technology and policy options in 2030

Outcomes and Effects at both national and province/city levels

- We made the **implementation scheme of the low-carbon pilot of Chongqing**, which has been applicated by Chongqing development and Reform Commission. (2014)

- On the basis of the analysis results, the **"climate change response" in the "13th Five-Year Plan"** was drafted and submitted to the NDRC's climate division and planning department, which directly supported the making of the climate change part in the "13th Five-Year" plan. (2016)
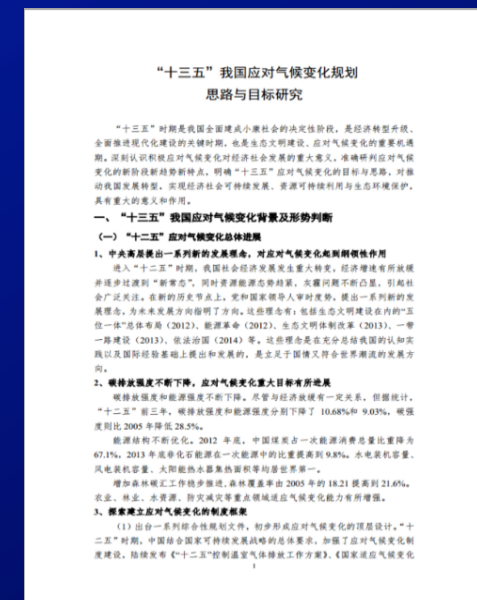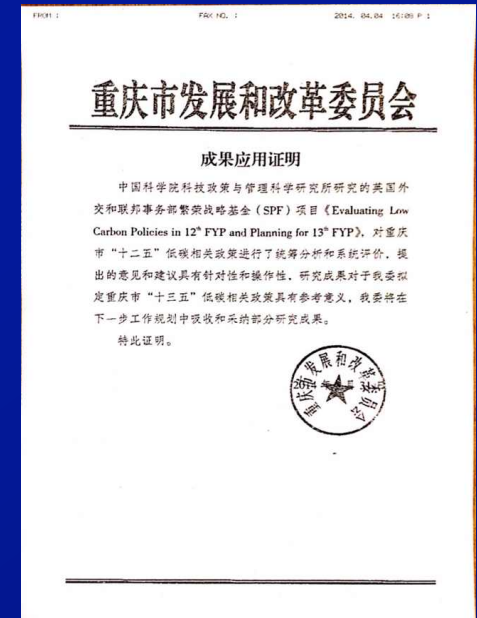
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Experience and Next Step

- **Legal role** of LC development planning
- **The toolkit of planning should reflect the integration of green and low carbon practice, model system development and policy supporting system for co-benefit**
- **Establishment of the planning guideline, quantitative policy base and framework**
- **Model forums for comparison and cooperation**
- **Suitable for developing countries, and support the carbon emission peak prediction, the made of emission reduction roadmap, low carbon technology and policy optimization, and the planning and analysis function of the financing project library, both at the regional level and national level.**
- **The proposed policy recommendations have a solid foundation of model analysis, which can provide operational proposals and financed project planning for the local industry, with great potential for application.**

Thanks for your attention!

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