



Environmental Energy Technologies Division Lawrence Berkeley National Laboratory

# Evaluating China's pilot low-carbon city initiative: national goals and local plans

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# Cities and Low Carbon Development

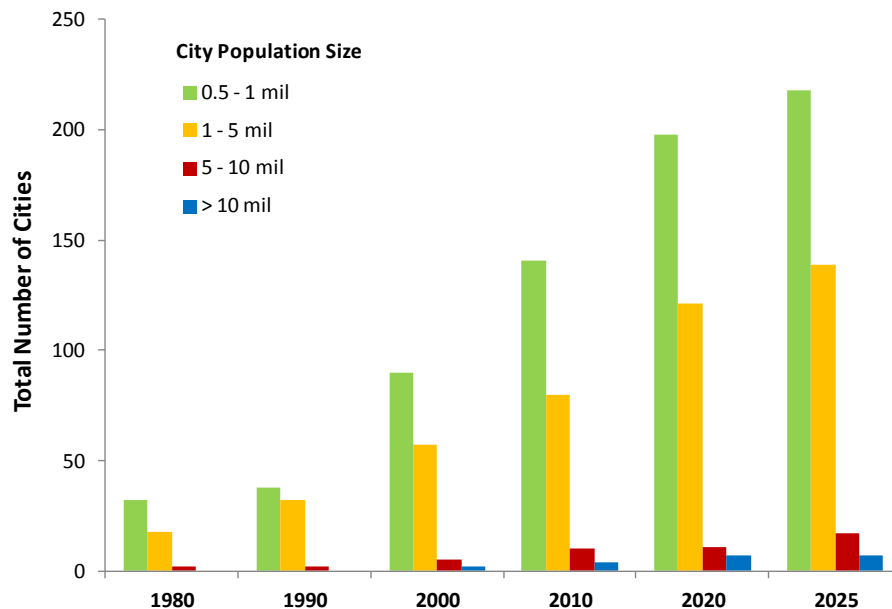
Cities today...

- ...cover **2%** of the earth's surface
- ...contain **50%** of the world's population
- ...consume **75%** of global energy
- ...produce **80%** of greenhouse gas emissions



# Cities in China

- China's urbanization rate surpassed 50% in 2011
- 210 million new urbanites were added between 2000-2010, and *another* 250 million are expected by 2025



Source: UN World Urbanization Prospects 2011



- Cities – and the development of low carbon cities – will be crucial to achieving China's energy and CO<sub>2</sub> emissions reduction targets
  - By 2015: reduce energy per unit of GDP by 16%, CO<sub>2</sub> per unit of GDP by 17%
  - By 2020: reduce CO<sub>2</sub> per unit of GDP by 40-45% relative to 2010 levels

# Initiatives on Low Carbon Eco-cities in China



- **Eco-garden City** (Ministry of House and Urban and Rural Development, since 1992)
  - By end of 2010, **184** cities have been named “National Garden City”
- **Eco-city** (Ministry of Environmental Protection, since 2003)
  - By July of 2011, **38** cities have been named “Ecological City (County)”
- **Low Carbon City** (National Development and Reform Commission, since 2010)
  - 5 low-carbon pilot provinces and 8 pilot cities
  - By February 2011, **133** cities have set targets for “low-carbon cities ”
- **Low Carbon Eco- City** (Ministry of House and Urban and Rural Development, since January 2011)



# What is a “Low-Carbon/Eco” City?



currently lack of:

- specific definition
- consistent indicator system
- guidelines on design and implement a low carbon plan
- policies/measures and its impact
- tools

# China Energy Group's Research and Development on Low Carbon Eco-cities



1 Guidebook on low carbon development for local governments in China

1 Booklet with key 23 policies for local governments

1 Low carbon city indicatory system

3 Tools to support low carbon development

- Great
- Urban-RAM
- Low Carbon benchmarking and decision making tool

1 Low carbon eco-city indicator system

1 Evaluation tool for low carbon eco-cities

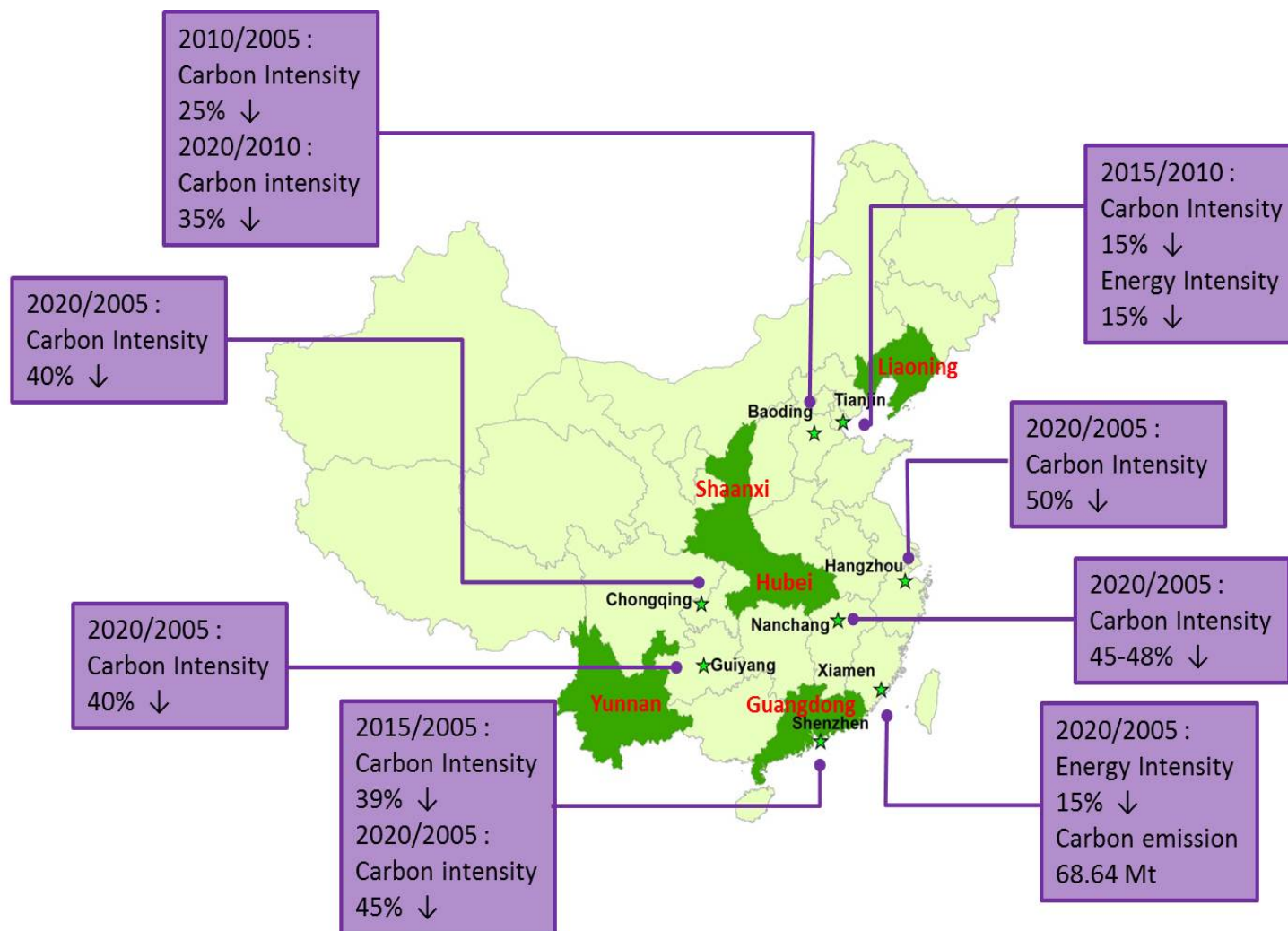
3 Reports on international best practices on low carbon eco-cities as well as evaluation of China's development status

# Evaluating China's pilot low carbon cities



- Purpose of study:
  - Review the progress and challenges facing the 8 pilot low carbon cities
  - Based on international experiences and best practices in low carbon city development, identify gaps between pilot cities' proposed low carbon action plans

# NDRC's Low Carbon Pilot Program: 5 Provinces, 8 Cities





# Diverse socioeconomic conditions underscore differing priorities in development as low carbon cities

City	Population	Per capita GDP (RMB)	Primary sector Share of GDP	Secondary sector Share of GDP	Tertiary sector Share of GDP	Urbanization
Tianjin	12.9	72,994	2%	53%	45%	79.6%
Baoding	11.2	18,462	15%	52%	33%	38.9% <b>Low urbanization</b>
Hangzhou	8.7	68,398	4%	48%	49%	73.3%
Chongqing	28.8	27,596	32%	69%	28%	53.0%
Nanchang	5.0	47,174	6%	56%	38%	65.7%
Guiyang	4.3	25,941	5%	41%	54%	70.2%
Xiamen	3.5	71,808	1%	51%	48%	52.7%
Shenzhen	10.4	95,000	0.1%	48%	52%	100%

↓  
Vastly different population sizes and per capita GDP

↓  
Different roles of primary industry = different stages of industrialization

# All pilots have carbon – but not energy – targets; Most have sectoral targets for industry, but not buildings

Target	Tianjin	Baoding	Hangzhou	Chongqing	Nanchang	Guiyang	Xiamen	Shenzhen
Overall targets								
Carbon intensity								
Carbon emissions								
Energy intensity								
Non-fossil fuel share	Very few energy targets							
Energy saving								
Industrial targets								
Industry emissions								
High-tech industry value added share						Focus on industrial structural change, not efficiency		
Service sector value added share								
Cultural and creative industry value added share								
Low carbon industry value added share								
Building targets								
Building emissions	Very few building targets, with limited scope							
Green buildings share								

**Focus on industrial structural change, not efficiency**

# Targets have similar focus, limited diversity

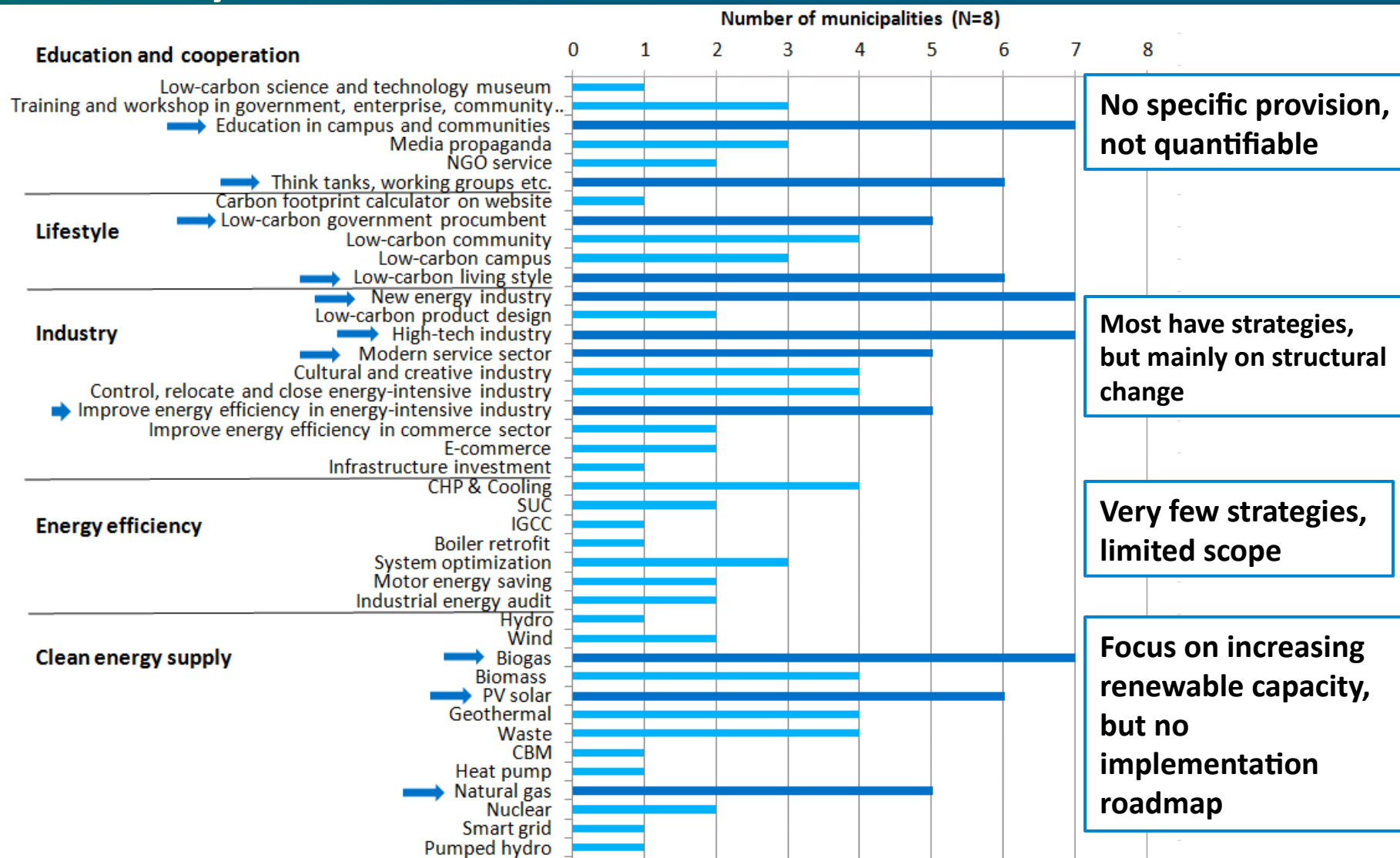
Target	Tianjin	Baoding	Hangzhou	Chongqing	Nanchang	Guiyang	Xiamen	Shenzhen
<b>Transport targets</b>								
Transport emissions								
Public transport share								
Bus ownership rate								
Electric bus share								
Metro length								
Bicycle lane length								
The number of new energy cars								
The number of free bicycles								
<b>Ecological targets</b>								
Forest coverage rate								
Wetland coverage rate								
Number of natural reserves								
Water saving								
Pollution control								
Per capita public green area								
<b>Other targets</b>								
R & D investment in low carbon technologies								
Information dissemination								

Most targets focus on public transport

Only 2 cities with targets for all 3 demand sectors

Targets beyond traditional demand sectors

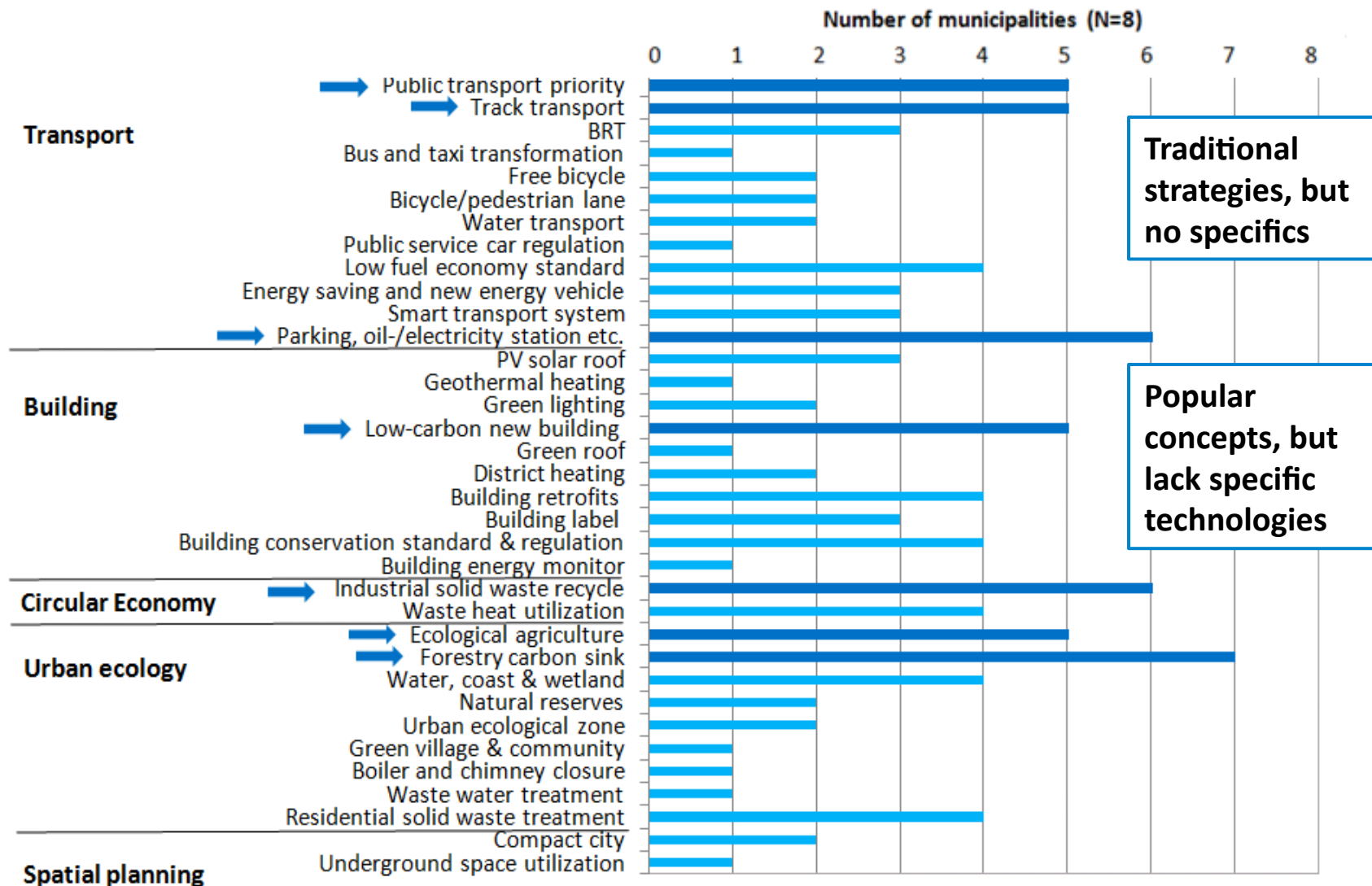
# Strategies are piecemeal and follow traditional approaches, will likely limit effectiveness



Dark blue bars and blue arrows indicate the most popular measures included in more than 4 low carbon city plans.



# Very broad scope in proposed strategies, and lack explicit targets, programs or implementation mechanisms



# Many measures, but few specific details (timeline, resource, staff, responsibilities, etc...)

Measure	Tianjin	Baoding	Hangzhou	Chongqing	Nanchang	Guiyang	Xiamen	Shenzhen
<b>Administrative</b>								
Advisory group	×	×	×	×	×	×	×	×
Performance evaluation system	×	×	×		×			×
GHG emission statistics, verification and management	×	×	×	×	×			
Energy audit and label	×		×	×	×			
Low-carbon industrial park enterprise requirements							×	
<b>Planning and Legal Framework</b>								
Special planning	×	×	×	×	×	×	×	×
Regulation				×				×
Preferential policies (land, fiscal, procurement policies)			×	×	×			×
<b>Financial and Tax-Based</b>								
Low-carbon fund	×			×	×			
Financial incentives			×					
Financial funding	×		×	×	×			
Consumption tax						×		
Energy price	×							

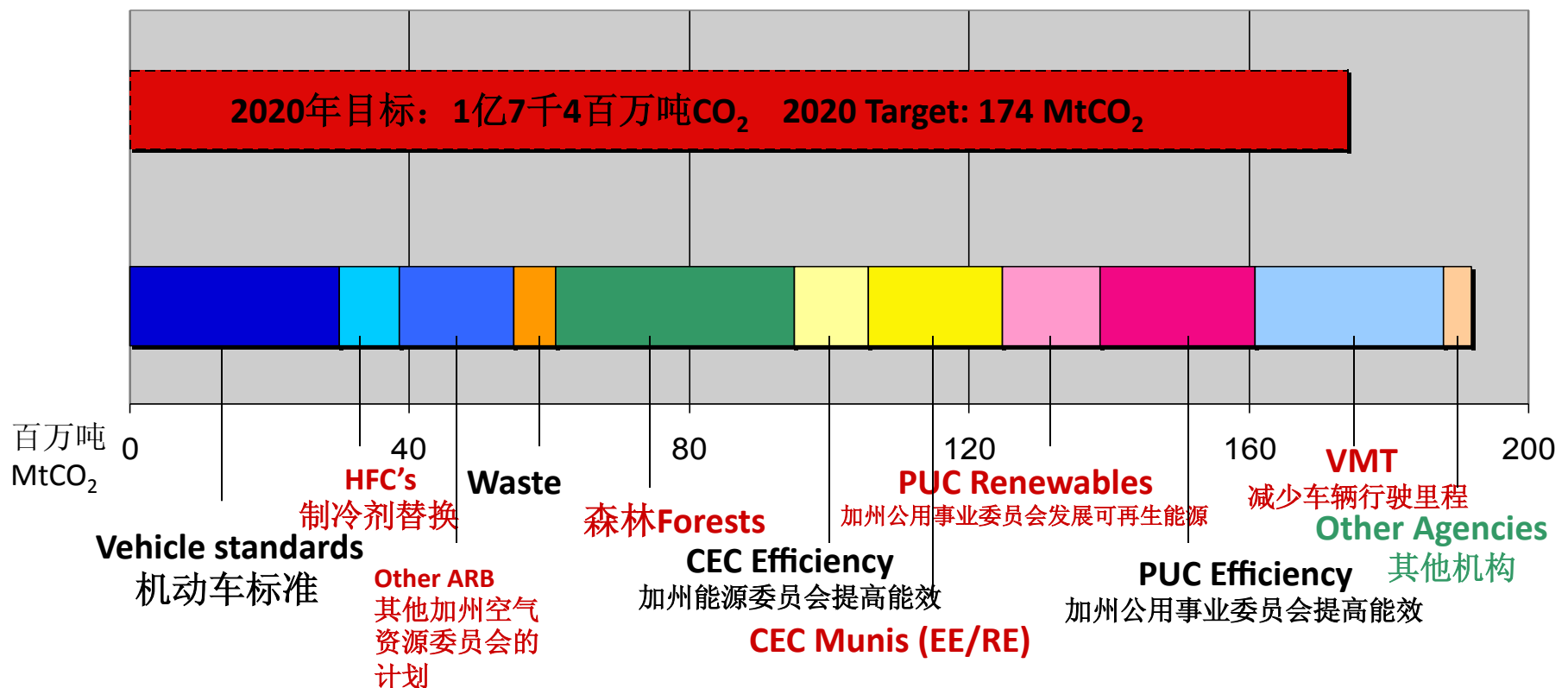
**Essential to low carbon city, but few implementation details**

# Lack of diversity in other types of measures

Measure	Tianjin	Baoding	Hangzhou	Chongqing	Nanchang	Guiyang	Xiamen	Shenzhen
<b>Market</b>								
Clean Development Mechanism				×	×		×	
Energy and carbon trading market	×		×	×		×	×	×
Industry and technology trading center								×
<b>Scientific research</b>								
Low carbon research center	×	×		×	×			
Low carbon service center					×			×
Talent introduction			×	×	×			
<b>Other</b>								
Information disclosure	×		×	×	×			
International collaboration	×	×	×	×	×	×	×	×
Public awareness and promotion	×	×	×	×			×	

**Very similar market and scientific research measures, no diversified or systematic approach**

## California Reduction Opportunities





# Strategies CEC will Implement over the First Two Years



## Energy Commission Climate Change Emission Reductions

(Mt CO2 Equivalent)

2010

2020

Building Energy Efficiency Standards in Place 建筑能效标准到位	1	2
Appliance Energy Efficiency Standards in Place 家电能效标准到位	3	5
Fuel-Efficient Replacement Tires & Inflation Program 高效能轮胎替换和充气项目	1.5	1.5
Building Energy Efficiency Standards in Progress	TBD	TBD
Appliance Energy Efficiency Standards in Progress	TBD	TBD
Cement Manufacturing 水泥制造	<1	<1
Municipal Utility Energy Efficiency Programs/ Demand Response 市政公共事业能效项目/需求响应	1	5.9
Municipal Utility Renewable Portfolio Standard 市政公共事业可再生能源组合标准	<1	3.2
Municipal Utility Combined Heat and Power 市政公共事业热电联产	0	<1
Municipal Utility Electricity Sector Carbon Policy 市政公共事业电力部门碳政策	3	9
Alternative Fuels: Non-Petroleum Fuels 可代替燃料: 非石油燃料	TBD	TBD
Total 总计	9.5	26.6

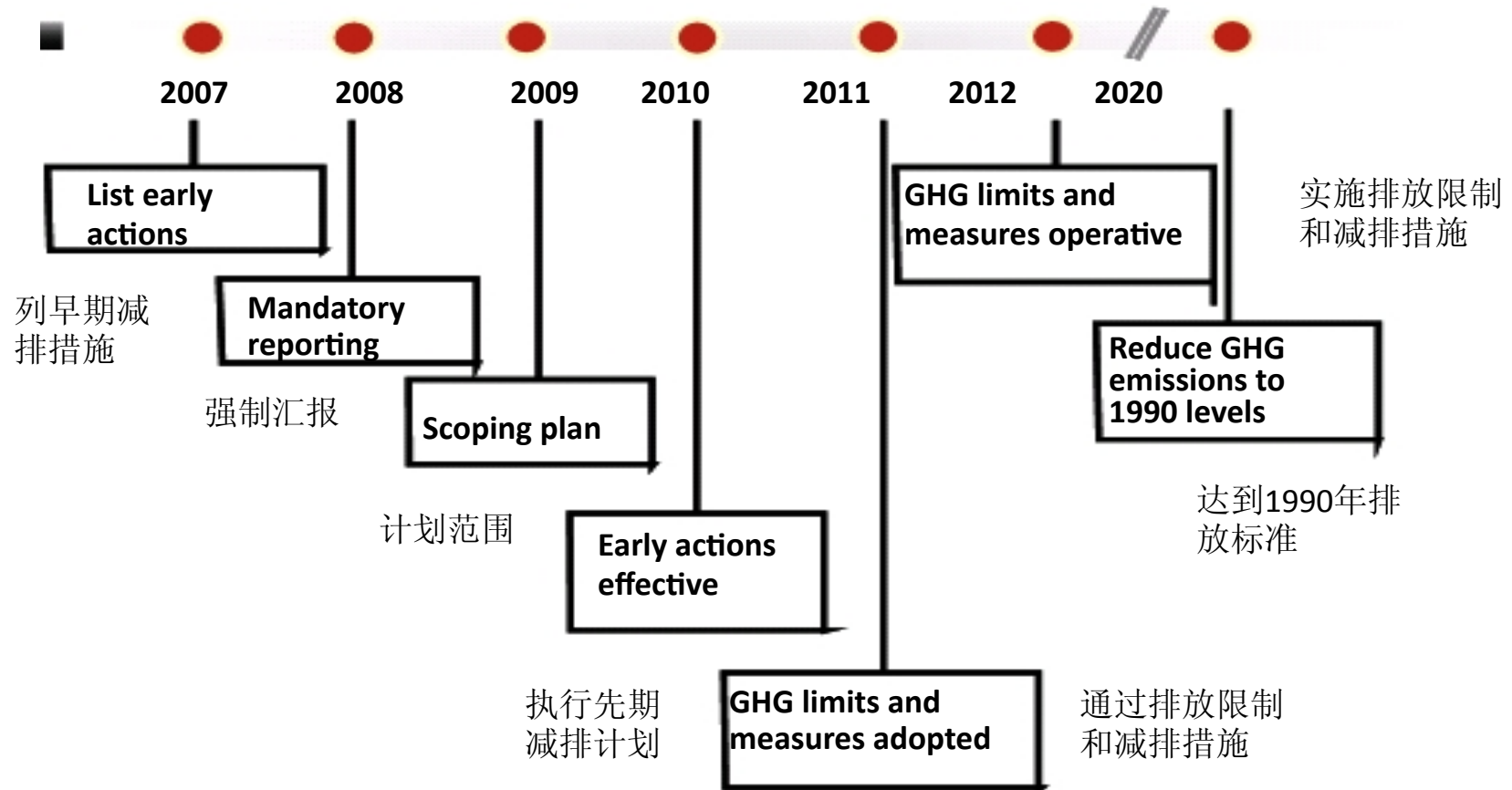
Munis (EE/RE)

• 市政公共事业的能效项目和可再生能源组合标准

Source: Climate Action Team Report to Governor Schwarzenegger and the Legislature, March 2006.

www.climatechange.ca.gov 来源: 气候变化行动组向施瓦辛格州长和州议会提交的报告, 2006年3月

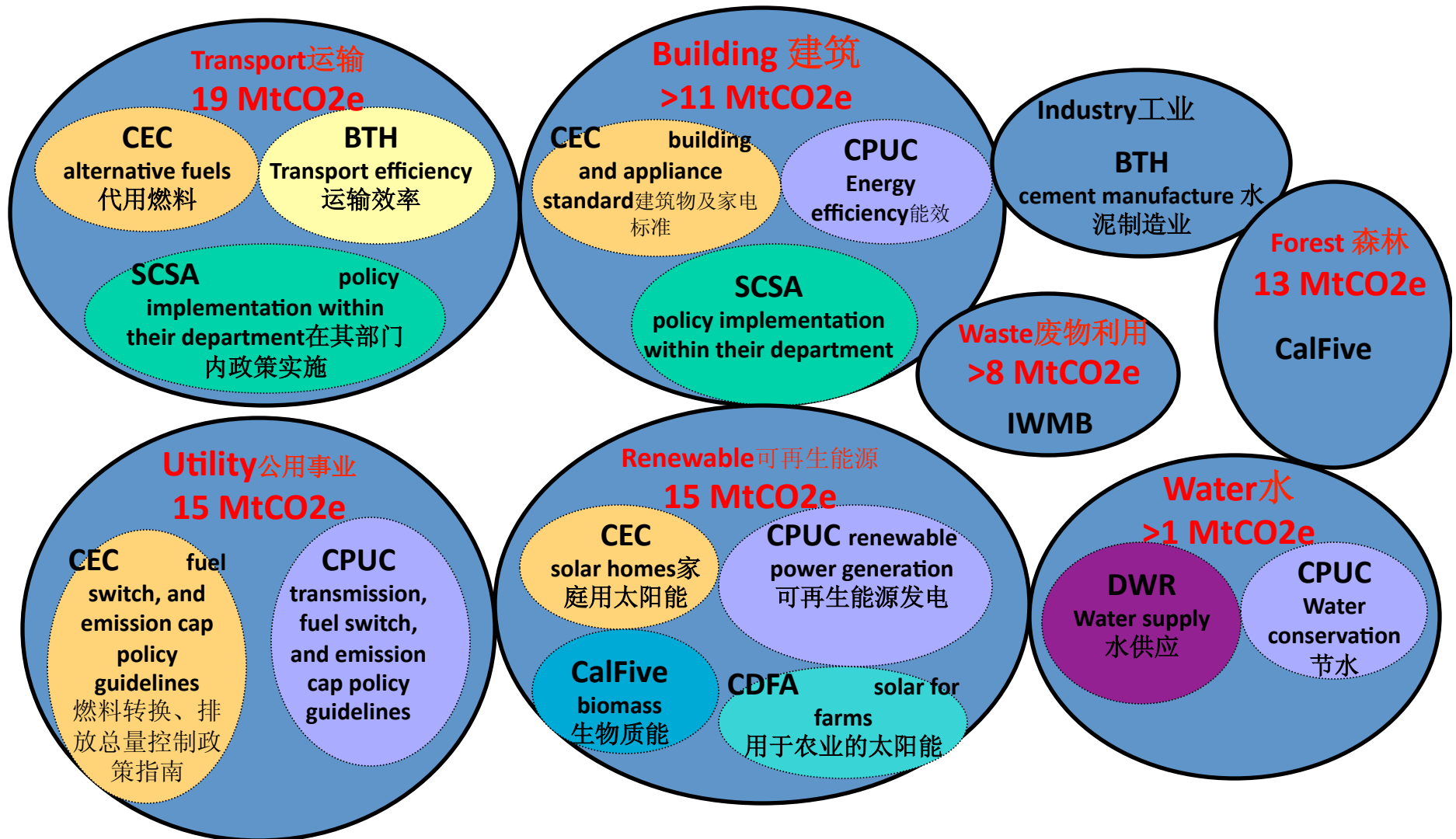
# Comprehensive Multiyear Program Established by AB 32



Source: Proposed Early Actions To Mitigate Climate Change In California, ARB under CalEPA

来源：加州针对减缓气候变化的早期减排措施

# CAT Early Action Measures Organizations and Responsibilities



Source: Climate Action Team Proposed Early Actions To Mitigate Climate Change In California, CalEPA

# Implementation of the Policy Mechanisms: Portland Example



- Implementation should be guided by **time tables, responsible parties, assignment of budget and staff** in government and enterprises.

## Example of Policies and Implementation Plan in Buildings Sector, from Portland's Climate

**Overall City Target:** Reduce CO<sub>2</sub> emissions by 40% between 1990 and 2030.

**Long-term Target:** Reduce CO<sub>2</sub> emissions by 80% between 1990 and 2050.

### Goals for Sector 1. Buildings and Energy

Goal 1. **Reduce the total energy use** of all buildings built before 2010 **by 25%**.

Goal 2. Achieve **zero net greenhouse gas emissions** in all **new buildings** and homes.

Goal 3. Produce 10 % of the total energy used within Multnomah County from on-site renewable sources and clean district energy systems.

Goal 4. Ensure that new buildings and major remodels can adapt to the changing climate.

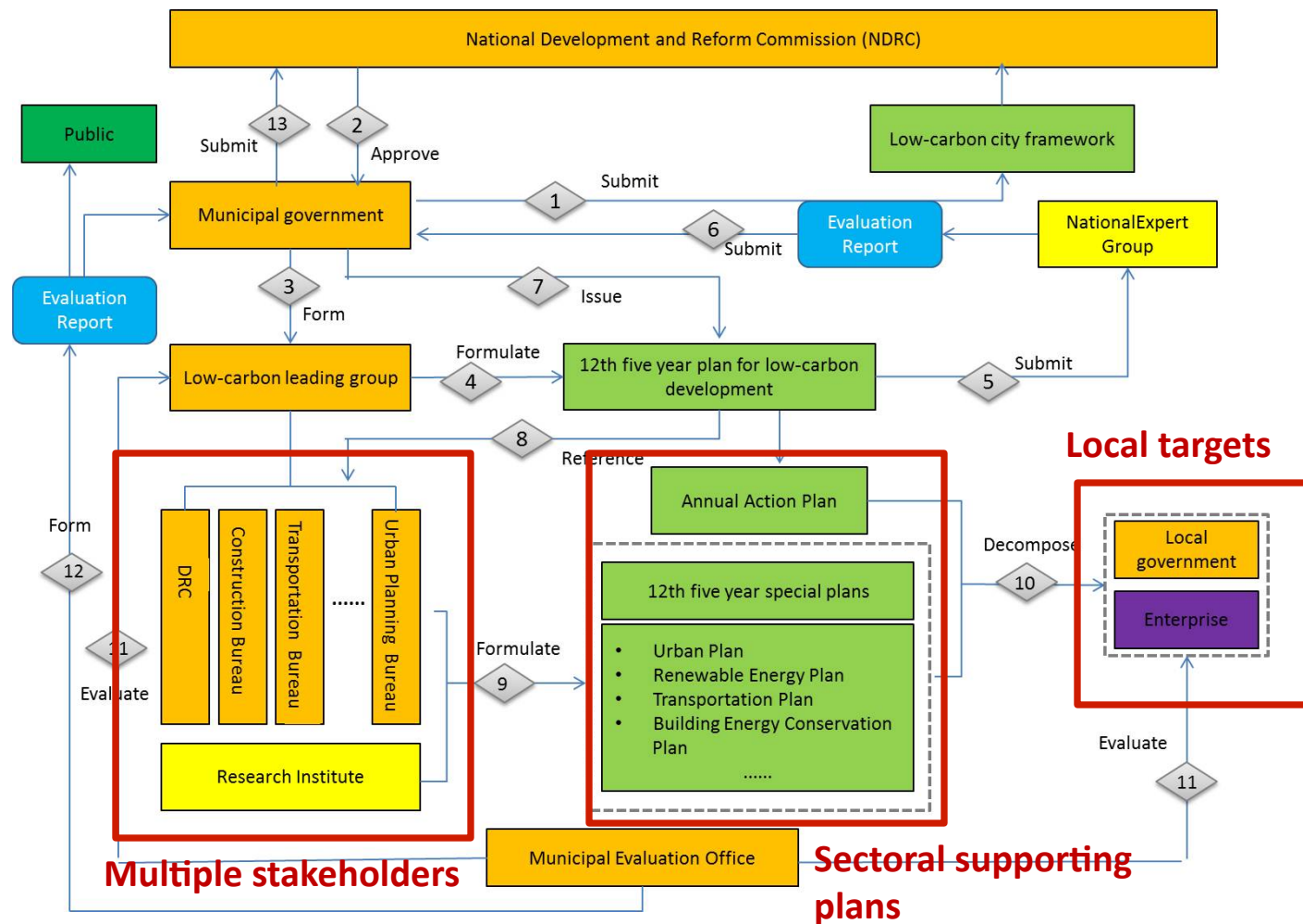
### Actions to take by 2012, on Goal 1, Sector 1.

1. Establish an **investment fund** of at least \$50 million to provide low-cost financing to residents and businesses;
2. **Require energy performance ratings** for all homes;
3. Require energy **performance benchmarking** for all commercial and multi-family buildings;
4. Provide other resources and **incentives** for carbon-reducing actions;
5. Work with partner organizations to improve operation and maintenance practices in all commercial buildings.
6. Establish a City business **tax credit** for installing **solar panels and eco-roofs** (green roofs) together.



# Hangzhou unique in comprehensive planning process with detailed, sectoral supporting plans and decomposed targets to lower levels of government

## Case study: Hangzhou's low carbon city development planning process



Low carbon development programs took off quickly in China in last few years, but challenges have emerged:

- **Absence of explicit definitions** for low carbon city and **multitude of parallel programs** have created **complexity, confusion and overlaps** in development of low carbon cities
- **Linkage between carbon and energy** not realized, most cities focus only on reducing carbon intensity
- Few cities have developed **implementation plans**
- **Lack of public information** on progress of low carbon development, status of implementation plans
- **Lack of capacity and understanding** on low carbon development → Adoption of **many measures but no prioritization** or strategic roadmap

# Lessons Learned and Recommendations

- For low carbon city plans to be effectively implemented, there needs to be:
  - Both **carbon emissions and energy consumption targets** as well as **sector-based targets** for better implementation and program evaluation
  - Roadmaps of the low carbon city plans need to be formulated and **sector-based targets** should be **decomposed** from the overall targets to enable better implementation, performance evaluation and policy adjustment.
  - **Supportive policies, market-based mechanisms** and a roadmap needed to carry out low carbon city plans
  - **Third-party surveillance and evaluation** of implementation at different levels of government, along with **public disclosure and information dissemination**

Thank you!



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