



# Low Carbon Cities in China

AN INTEGRATED STRATEGY TO ASSIST CHINA'S CITIES IN ACHIEVING  
AN EARLY CARBON EMISSIONS PEAK

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# 绿色创新发展中心

**iGDP** Innovative Green Development Program

Innovative Green Development Program's (iGDP) mission is to advance robust policy and actions to address green growth challenges at the subnational level. We create [analytical tools](#), share [professional knowledge](#), and facilitate [multidisciplinary dialogues](#) that foster integrated solutions for regions, cities and communities.

iGDP also serves as the secretariat of the Green Low Carbon Development Think Tank Partnership (GDTP). GDTP is an informal platform of China's leading low-carbon research institutes and renowned energy and environmental experts and economists.

iGDP was launched with funding and operational support from Energy Foundation China.

## Areas:

- Energy and Emission Modeling
- Regional Low Carbon Development Planning
- Carbon Pricing
- Green Fiscal and Tax Policies
- U.S.-China Climate Change Collaboration

## Key City Projects:

- A Policy Mapping and Cases Database for Local Green Cities
- iGDP Seminars is a Multidisciplinary Forum on low carbon actions
- A low carbon development Planning and Ranking Tools set

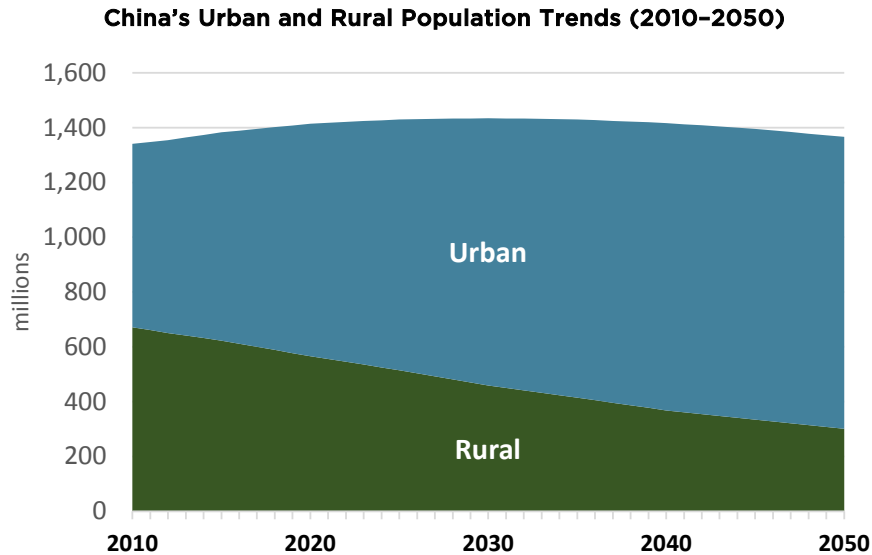
# China's National Climate Change Commitments

- GHG emission peak around 2030
- Carbon Intensity decrease 60-65% till 2030 at 2005 level
- Non-Fossil Fuel Share Increase to 20% by 2030
- Carbon Market Launch at 2017



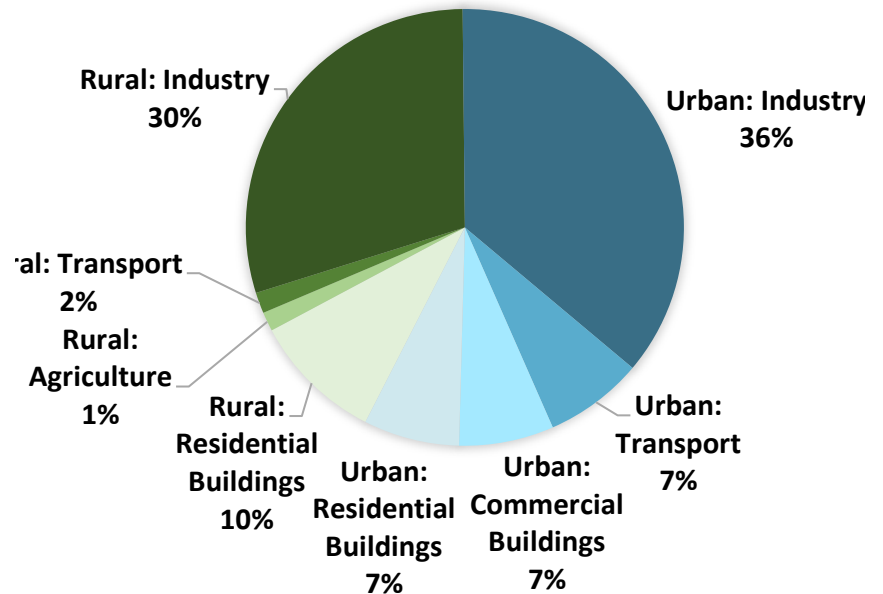
# The Role of Cities to Achieve China's Climate Change Targets

Urban emission increase dramatically



Source: National Bureau of Statistics (NBS), 2012. China Statistical Yearbook.

Industry Emissions contributes most



Source: Lawrence Berkley National Lab, 2015

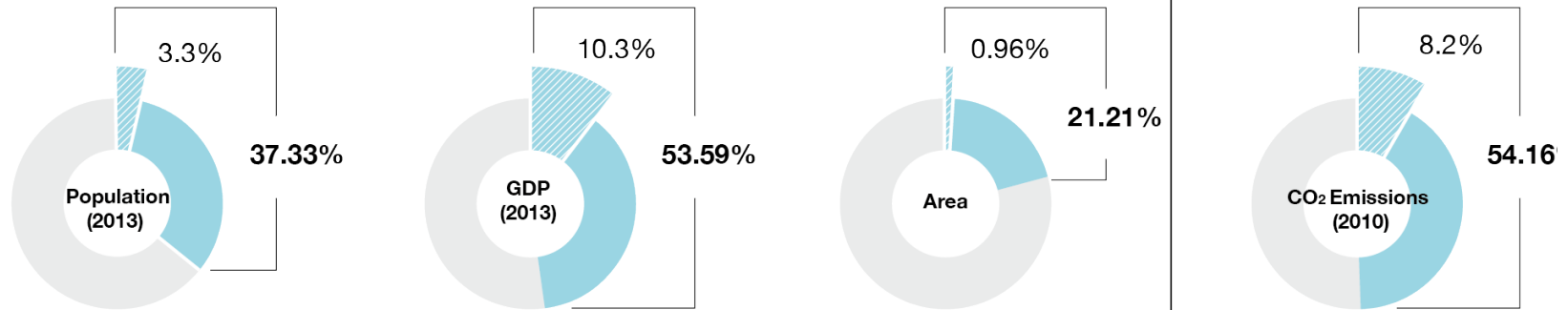
# China's Low Carbon Pilots in a Snapshot


China's 42 low carbon pilots covered approximately 37 percent of the population, 54 percent of GDP, 21 percent of total land area, and 54 percent of carbon emissions in 2013. APCC cities, which are part of the low carbon pilots, accounted for 3.3 percent of the population, 10.3 percent of GDP, and 8.2 percent of carbon emissions in 2013.




China's National Development and Reform Commission issued two executive orders in July 2010 and November 2012, identifying altogether 42 low carbon pilots. The executive orders require these pilots to develop a low carbon development action plan and a greenhouse gas (GHG) emissions inventory. The pilots must also establish a policy framework to promote carbon mitigation and clean economic growth.

## Basic Information of Low Carbon Pilots



 42 Low Carbon Pilots  
(%, of total China)

 APC Cities  
(%, of total China)

*Data sources: 2013 Annual Statistical Report of the above cities  
Data sources for GHG emissions from (National Climate Strategy Center, 2013)  
Carbon emission data does' not include Yan'an.*

# Difference in Urbanisation Rate of 42 Low Carbon Pilots



Data sources: 2014 Annual Statistical Report of the above cities, World Bank

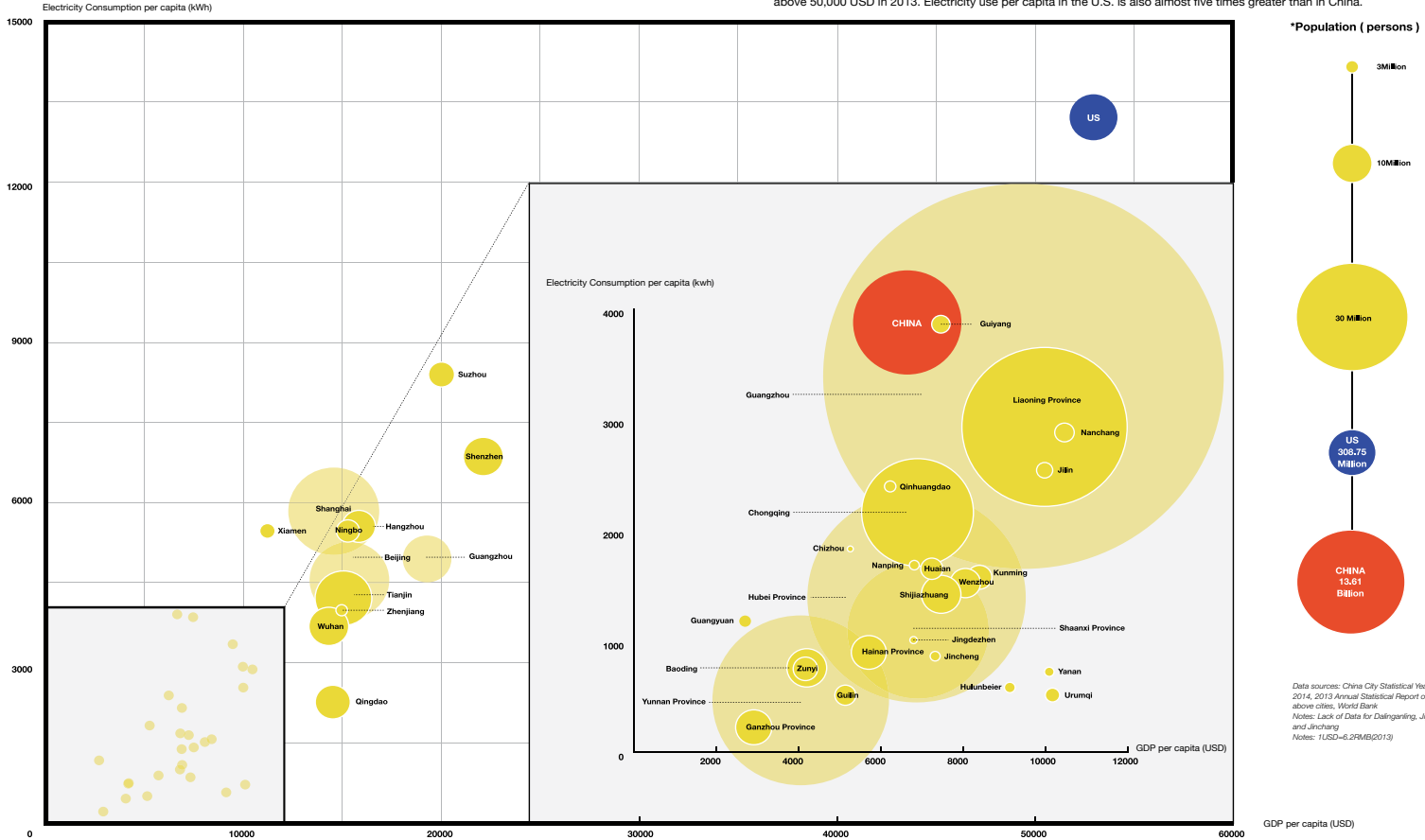
# Per Capital Energy and Per Capita GDP less than 1/4 of US

Convened by Innovative Green Development Program

Convened by Innovative Green Development Program

## Energy Use and Economic Development Status For 42 Pilots (2013)

Per capita GDP of China's low carbon pilots vary significantly among regions. The highest per capita GDP is in Shenzhen, at above 20,000 USD; and the lowest GDP per capita is in Guiyang, at less than 3000 USD. Meanwhile the U.S. average was above 50,000 USD in 2013. Electricity use per capita in the U.S. is also almost five times greater than in China.





# China's Low Carbon Pilots

2010

The first batch

8 cities

2011

The Second Batch

28 cities

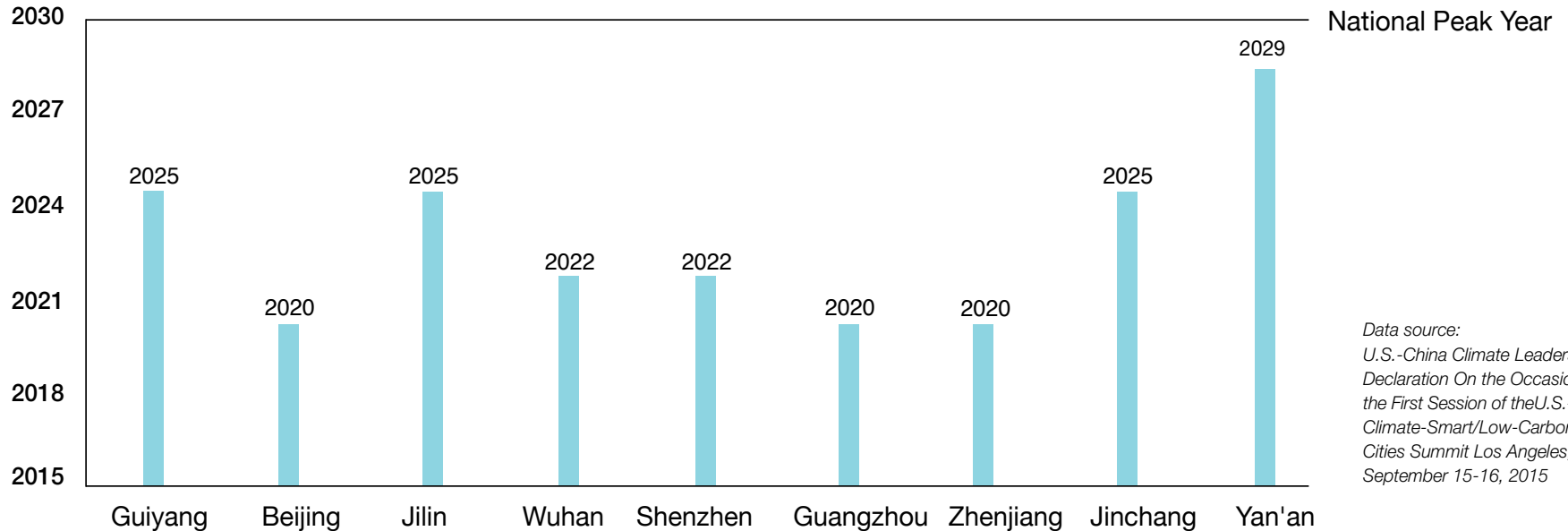
2015

9 out of 36 cities  
formed Alliance of  
Peak Pioneer Cities  
at US-China Climate  
Leaders Summit

- Progress – requirements from National Development Reform Commission (NDRC)
  - Set up low-carbon leading groups
  - Establish institution and mechanisms for low carbon decision-making
  - Develop statistics and management systems for greenhouse gas emissions
  - Etc.

# Cities Goals to Peak GHG Emission

## Peak Years for Carbon Dioxide Emissions



*Data source:  
U.S.-China Climate Leaders'  
Declaration On the Occasion of  
the First Session of the U.S.-China  
Climate-Smart/Low-Carbon  
Cities Summit Los Angeles, CA,  
September 15-16, 2015*

# Low Carbon Policy Categories Reviewed

1. Low Carbon Planning and Management
2. Decarbonizing the Economy
3. Energy Supply
4. Building
5. Industry
6. Transportation & Urban Forms
7. Forest Carbon Sinks
8. Carbon Emissions Trading Scheme

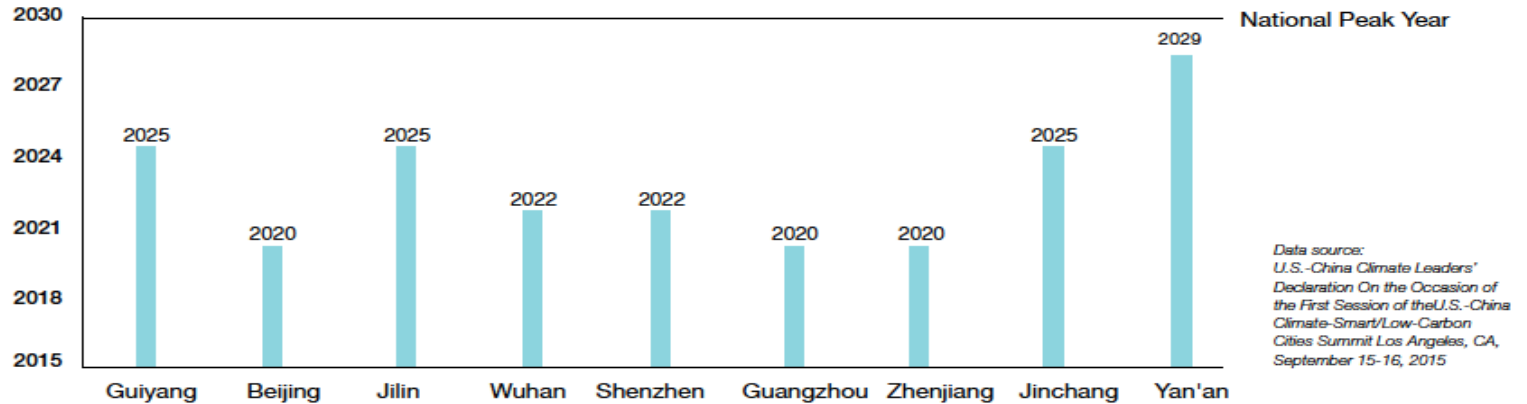
# 1. Low Carbon Planning and Management

<b>Targets</b>	Developing planning and management system for city low carbon development
<b>City Actions</b>	Municipal Target to Peak Total Carbon Emissions
	Municipal Targets for Reducing CO2 Emissions per Unit of GDP
	Municipal Targets for Reducing Energy Consumptions per Unit of GDP by 2015
	Municipal Non-CO2 GHG Emissions Projects
	Municipal Climate Change Legislation
	Municipal Low Carbon Development Action Plans Low Carbon City Pilot Work Plans
	Municipal GHG Emissions Inventory Development
	GHG Reporting and Registry
	Carbon Emissions Data Platform
	Carbon Emissions Impact Assessment Requirement

# 1. Low Carbon Planning and Management

## Best Practices

### Peak Targets

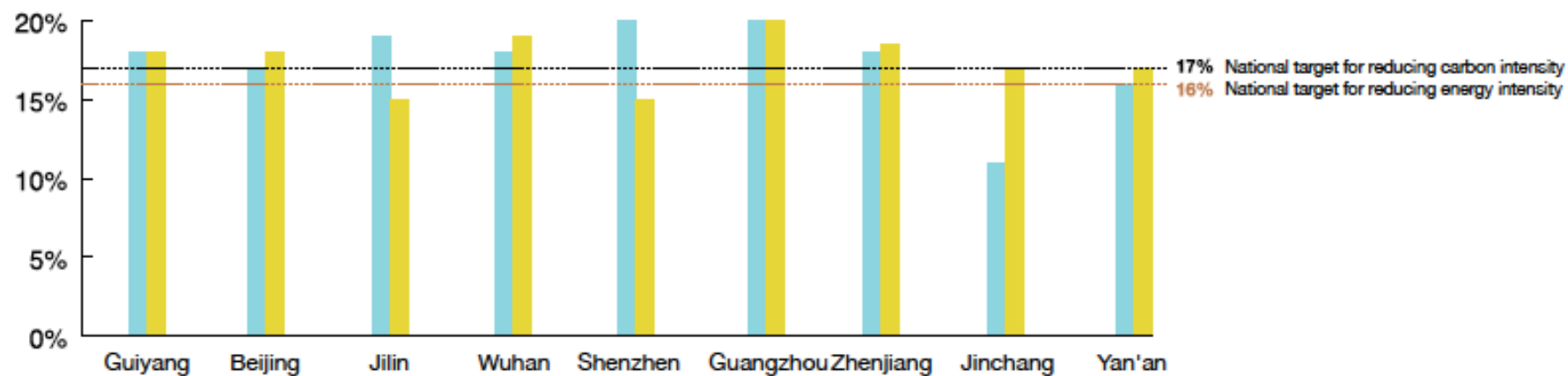


### Zhenjiang Low carbon Management System

Carbon emissions peak at 2020, 10 years earlier than the national target of 2030 and 20 years earlier than its business-as usual scenario;

First Chinese city to establish a data platform for carbon emissions accounting and management;

Carbon assessment for new investment projects



■ Municipal Targets for Reducing Energy Consumption per Unit of GDP by 2015, From 2010 Levels (%)

■ Municipal Targets for Reducing CO<sub>2</sub> Emissions Per Unit of GDP by 2015, From 2010 Levels (%)

17% National target for reducing carbon intensity

16% National target for reducing energy intensity

Climate Actions	Guiyang	Beijing	Jilin	Wuhan	Shenzhen	Guangzhou	Zhenjiang	Jinchang	Yan'an
Municipal Low Carbon Development / Climate Change Plans									
Low-Carbon Pilot Development Guideline									
GHG Emissions Inventory Development									
GHG Reporting and Registry									
Carbon Emissions Impact Assessment Requirement									
Carbon Market									

# 2. Decarbonizing the Economy

<b>Targets</b>	Decoupling economic growth from CO2 emissions through economy structural shift to low carbon sector
<b>City Actions</b>	Policies to Promote Development of Service Sector
	Policies and Goals to Promote Development of Clean Industries
	Municipal R&D Investment of Local GDP



# 2. Decarbonizing the Economy

Beijing is accelerating development of modern services sectors, including services outsourcing, cultural and creative industries. In 2007, High-tech manufacturing accounted for 67% of Beijing's gross industrial output, and total R&D expenditure accounting for 6.0% of its GDP.

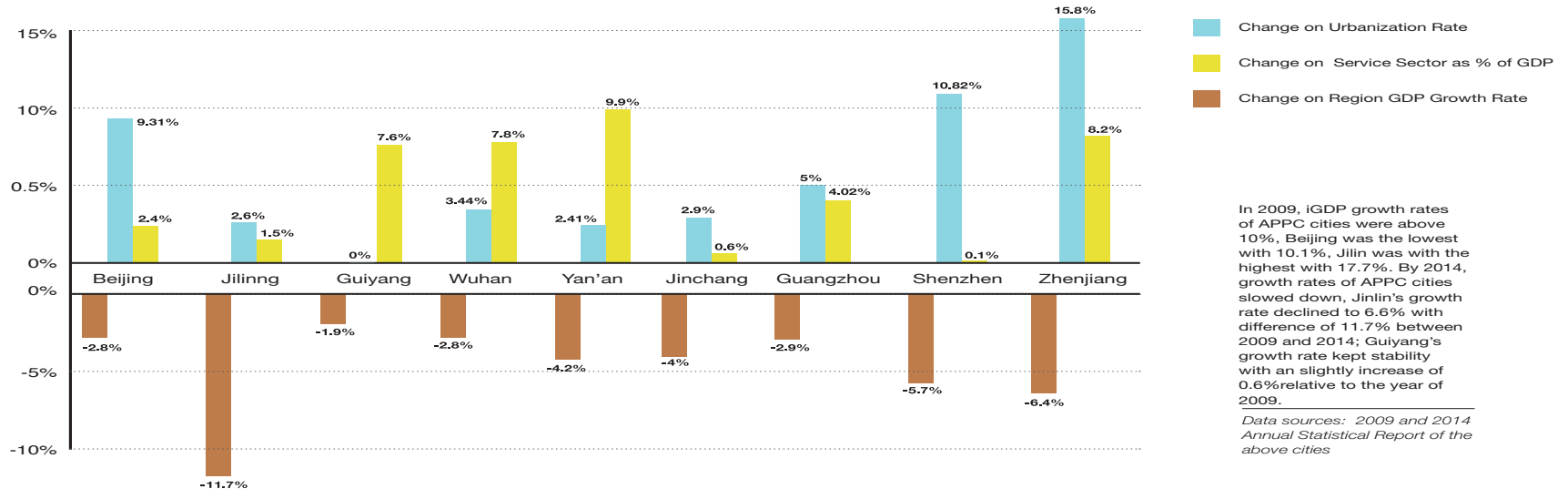
## Beijing's Composition of GDP (%)

### Best Practices

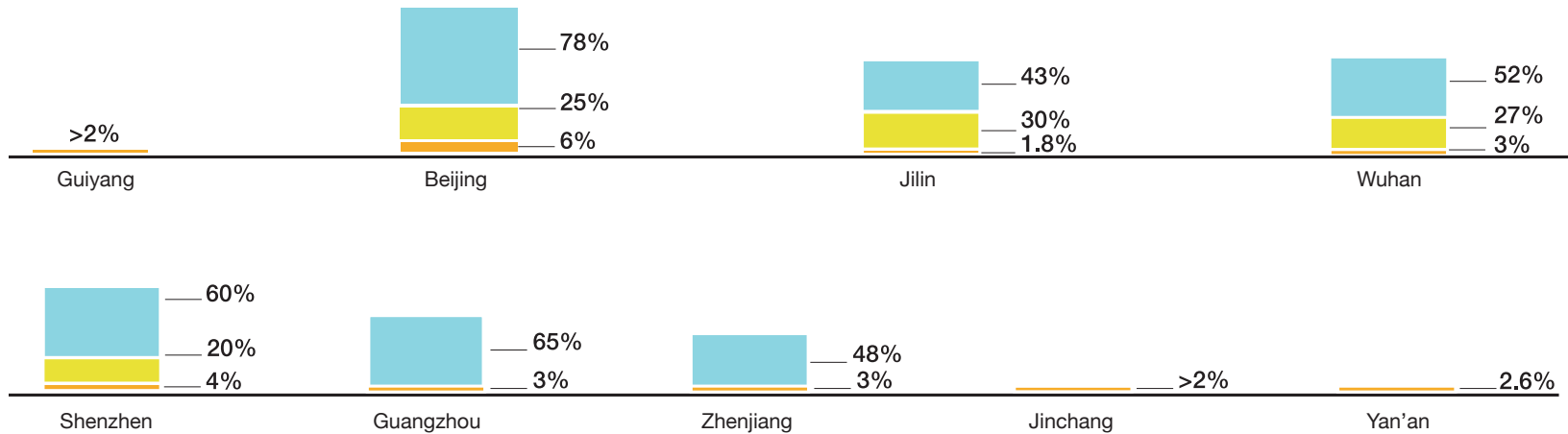
	2005	2014
Primary	1.4	0.7
Secondary	30.9	21.4
Industry	26.2	17.5
Tertiary	67.7	77.9

# APPC Cities Actions Factsheet

- Taking APPC Cities as Cases, 38 typical actions in China's 12<sup>th</sup> Five Year Plan are Categorized



## Decarbonizing the Economy



■ Goals to Promote Development of Service Sector (Share of GDP) (2011-2015) [1]

■ Goals to Promote Development of Strategic New Emerging Industries (2011-2015) [2]

■ Municipal R&D Expenditure (Share of GDP) (2011-2015) [3]

# 3. Energy Supply

## Targets

Optimizing energy consumption structure

## City Actions

Municipal Sustainable Energy Development Plan

City Strategic Plan to Develop Renewable and Alternative Energy

City Total Energy Consumption Reduction Targets

Municipal Targets for Renewables Development

Renewable Energy Development Pilot Program

Financial Incentives for Renewable Energy

Standards for Coal Consumption per unit of Electric Power Output

State and City Coal Consumption Reduction Plan

City Coal-Free Zone

Advanced Clean Coal Pilot Projects

Demand Side Management Program

CCS Pilot



# 3. Energy Supply

National Standards for coal consumption per unit of electric power output:

Before 2020,

existing coal-fired power plants: below 310g/kWh;

new coal-fired power plants: below 300g/kWh.

Best Practices

## Shanghai Waigaoqiao No.3 Power Generation

Installed Capacity	5,000 MW
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Coal Consumption per unit of Electric Power Output	279.39 gce/kWh
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Net Energy Efficiency	44%
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# 4. Buildings

## Targets

Reducing energy consumption in buildings

## City Actions

Energy Efficiency Improvement Target for Building Sector

Energy Efficiency Retrofit Subsidies for Existing Buildings

More Stringent Building Codes for Public Buildings

More Stringent Building Codes for Residential Buildings

More Stringent Local Green Building Codes

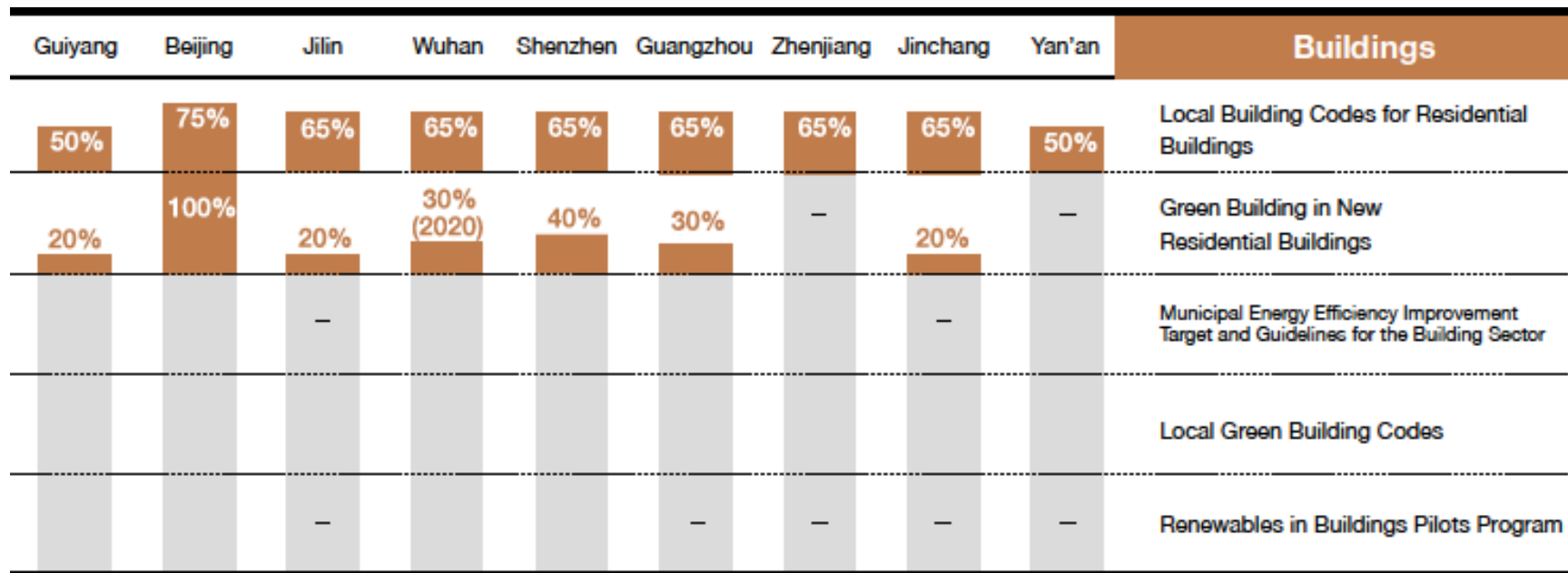
Subsidies for New Buildings that Exceed Building Codes

share of the use of renewable energy in the buildings

Zero Emission Building Pilots

Financial Incentives for Energy Efficiency Appliances

Public Campaigns Promoting an Energy Conservation Life-Style





# 4. Buildings

## Shenzhen IBR Research Building

Comprehensive Energy Saving Rate	65.9%	60% higher than the level of priority item from Green Building Standard
Energy Consumption per unit Building Area	44.4 kWh/(m <sup>2</sup> ·a)	63% lower than the city's average level
Energy Consumption for Air Conditioning per unit Building Area	15.9 kWh/(m <sup>2</sup> ·a)	63% lower than the city's average level
Share of Soar PV Generation	7%	

### Best Practices



\*IBR refers to Shenzhen Institute of Building Research

Data Sources:

Shenzhen Municipal Government Websites. <http://www.sz.gov.cn/cn/xxgk/szgg/tzgg/201403/P020140306349049464993.pdf>

# 5. Transportation

## Targets

Developing low carbon urban transport

## City Actions

Municipal Energy Efficiency Improvement Goals and Action Plans for Transportation Sector

Policies and Financial Incentives to Promote Alternative Energy Vehicles and Construction of Charging Stations

Municipal Electric Vehicle Promotion Program

Tax Credits for Efficient and Low Emission Cars

Municipal Targets for Public Transit Share in Motorized Travel

Bicycle and Pedestrian Path (Non-Motorized Transportation) Networks

Public Bicycle System

Integrated Transportation Planning Program

Policies to Control Private Vehicle Ownership Growth

Public Transit City Programs

Low Carbon Community Pilots  
Low Carbon / Eco-City Planning Programs

# 5. Transportation

## Best Practices

### Hangzhou Public Bicycle

World's largest bike sharing program with 60,600 bicycles with 2,416 fixed stations ;

Goal: Cover the last kilometer;

Investment: Municipal government investment and Discounted governmental loans

Revenue: Station billboards and bicycle advertisements

### Shenzhen New Energy Vehicle

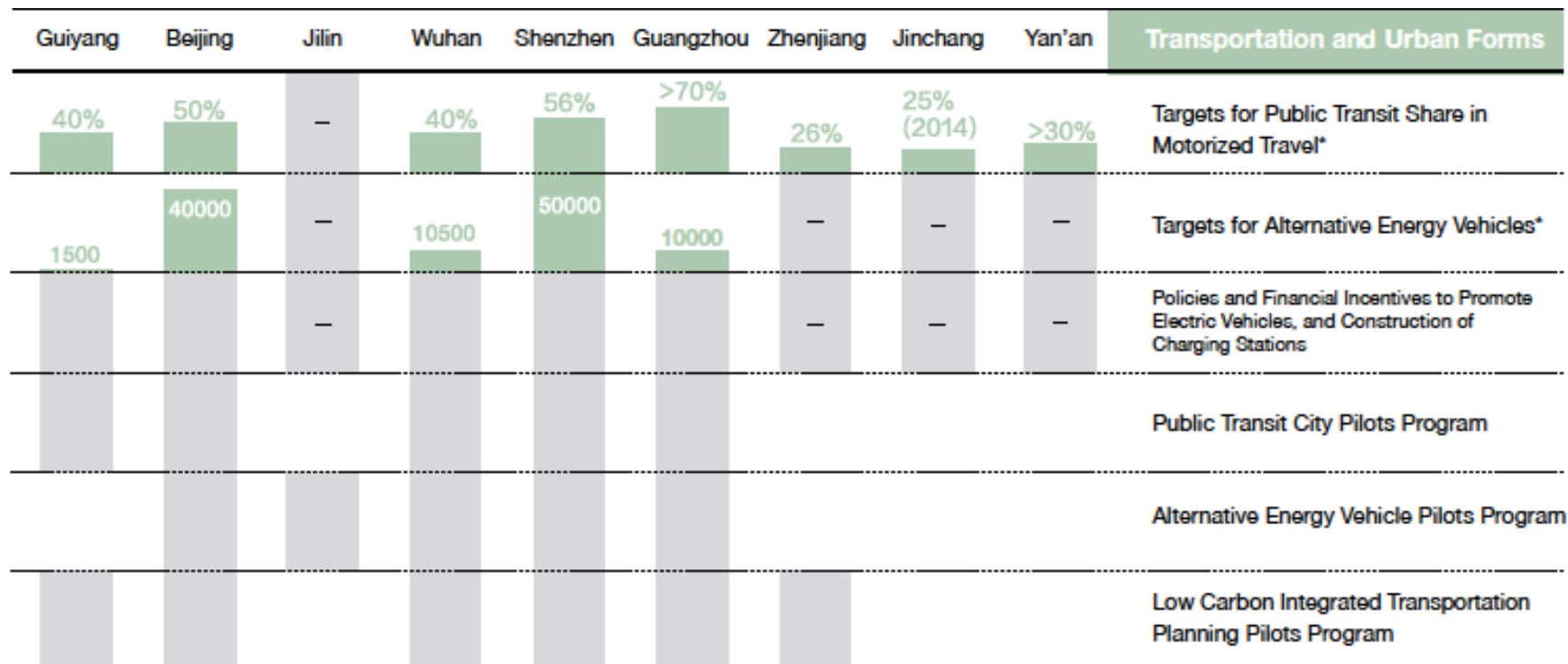
World's largest scale of new energy vehicle usage with over 10,000 vehicles  
New target : add 10,000 collaborating with BYD Company Ltd., and Tesla etc.

Data Sources:

Susan A. Shaheen, Hua Zhang, Elliot Martin, and Stacey Guzman. China's Hangzhou Public Bicycle Understanding Early Adoption and Behavioral Response to Bike sharing.

[http://www.tsrc.berkeley.edu/sites/default/files/China's%20Hangzhou%20Public%20Bicycle%20\(article\)%20-%20Shaheen.pdf](http://www.tsrc.berkeley.edu/sites/default/files/China's%20Hangzhou%20Public%20Bicycle%20(article)%20-%20Shaheen.pdf)

U.S.-China Climate-Smart/Low-Carbon Cities Summit Los Angeles, CA, September 15-16, 2015



# 6. Industry

<b>Targets</b>	Upgrading Industrial Structure and Technology to meet goals on low carbon development
<b>City Actions</b>	Municipal Energy Consumption Per Unit of Industrial Total Value-added
	Municipal Industrial energy Conservation Action Plans
	More Stringent Sub-National Energy Efficiency Standards
	Local Implementation Projects of Top Runner Program
	Energy Efficiency Audit and Benchmarking
	Energy Manger Training
	Energy Management Standards
	Financial Incentives and Rewards for Industrial Energy Efficiency
	Differential Electricity Pricing
	Low Carbon Industrial Park Pilots

# 6. Industry

## Suzhou's Energy Efficiency Star Program

**Sectors Targeted** Over 140 participants, covering Chemicals and Chemical products, Iron and Steel, Non-metallic minerals, Textile and leather, Electronics, consumer goods manufacturers, building materials.

**Ranking indicators** Compliance with legal requirements;  
Energy consumption per unit product;  
Energy savings projects;  
Implementation of energy management systems:  
Reporting on energy consumption  
Efficiency level of energy-consuming technologies and processes

**Annual Energy Saving** 7.32 Mtce

Best Practices

Data Sources:

Institute for Industrial Productivity, 2013. Suzhou Energy Efficiency Star Program. <http://www.iipnetwork.org/databases/supply-chain/suzhou-energy-efficiency-star-program#sthash.T1iJbsWr.dpuf>;

Stephanie Ohshita, Lynn Price et al., 2015. The role of Chinese cities in greenhouse gas emission reduction: Briefing on urban energy use and greenhouse gas emissions

## Industry

Guiyang

Beijing

Jilin

Wuhan

Shenzhen

Guangzhou

Zhenjiang

Jinchang

Yan'an

2015 Target to reduce Energy  
Consumption per unit of Industry  
Value-Added, from 2010 Levels

25%

21%

20%

20%

20%

20%

Industry Structural Change Guidelines

Top-10,000 Program Implementation  
Incentive Policies

Low Carbon Industrial Zone Pilot Program

# 7. Forest Carbon Sinks

**Forest Carbon Sinks refer to increase the coverage of urban forests, trees and Greenland to sequester carbon dioxide emissions by the combustion of fossil fuels.**

## City Actions

Urban Forestry Management

Municipal Program Promoting Afforestation

## Best Practices

Chongqing City

Forest Coverage Ratio (2014):

43.1%

Total Carbon Storage in Forest and Greenland:

142 million tons

Annual Carbon Absorption Capacity:

13.4 million tons

Data Sources:

Chongqing Daily Newspaper. 2015.Chongqing's Forest Coverage Ratio reaches 43.1% by the end of 2014 [http://cqrbeper.cqnews.net/cqrb/html/2015-01/29/content\\_1813886.htm](http://cqrbeper.cqnews.net/cqrb/html/2015-01/29/content_1813886.htm)



# 8. Carbon Emissions Trading Scheme

	<b>Cities</b>	<b>Percentage of covered local emissions</b>	<b>Average Price in 2015(dollar/t)</b>
<b>ETS Pilots (5 cities and 2 provinces)</b>	Shanghai	57%	3.31
	Beijing	49%	6.49
	Shenzhen	54%	6
	Tianjin	60%	2.25
	Chongqing	n/a	2.85
<b>National Carbon Market</b>	China set to launch national ETS in 2017 covering power and industry sectors		

Data Sources:

Partnership for Market Readiness.2015. China Carbon Market Monitor.

<https://www.thepmr.org/system/files/documents/China%20Carbon%20Market%20Monitor-No2-CN.pdf>

Partnership for Market Readiness. 2014.A Survey of the MRV Systems for China's ETS Pilots. <http://www.thepmr.org>



# Findings:

- Pilots action plan have touched upon all sector policies.
- The stringency of the Sectoral Policies vary a lot among cities.
- Lack of strong quantitative analysis to integrate and prioritize sectoral policies.

# Interventions Needed:

- (1) **City Level Green Growth Blueprint**, using state-of-the-art analytical tools to develop a thorough technical analysis of mitigation potential and an economic analysis of the impact on jobs, GDP, and investment. building vision and increased ambition,
- (2) adopting the most stringent energy performance standards in all sectors,
- (3) designing a smart city infrastructure system in favor of a low carbon lifestyle,
- (4) introducing economic tools to leverage policy implementation,
- (5) prioritizing an effective MRV mechanism to track and scale up best practices, and
- (6) forming a green financing platform supporting low or zero emission projects.

# GAP – Next Suggestions

- A path of deep de-carbonization needs a set of enhanced policies and practices
- An robust policymaking approach to identify, develop, and implement the strong possible policy packages
- A package of financing instruments
- MRV System



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低碳政策库  
Policy Mapping

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## Low Carbon Cities in China: Alliance of Peaking Pioneering Cities Action Factsheet

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Almost half of China's population resides in cities, which are responsible for consuming around 85% of China's total energy use and emitting more than 90% of China's carbon dioxide (CO<sub>2</sub>) emissions (Wei Guang Wang et al., 2013). Unlike cities in developed countries, the industrial sector is still the main source of CO<sub>2</sub> emissions in China's cities. Emissions from the transportation and building sectors are projected to increase dramatically as China's urbanization will bring more than 350 million people to cities in the next 15 years. Low carbon development of China's cities will be critical to achieve the nation's climate mitigation goals and to maintain global climate stability.

Fortunately, China's national government and an increasing number of

This factsheet is based on an analysis of actions taken in 9 APCC cities (drawn from China's 42 low carbon pilots). Benchmarking the low carbon actions in these 9 cities against international practices indicates that there is great room for improvement in the following areas: (1) cities need develop integrated quantitative analysis to understand the carbon mitigation potential across sectors, which allows policymakers to prioritize actions based on cost effectiveness of various actions, (2) a peer learning and race to the top mechanism should be developed to disseminate best practices among cities, (3) policies and standards in transportation, buildings and urban planning should be at least as strong as global leading practices, given the considerable challenge of

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**THE END**