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# China Clean Revolution Report III: Low Carbon Development in Cities

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THE <sup>o</sup>CLIMATE GROUP

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An aerial photograph of a modern city, likely in China, showing a multi-lane highway with several cars, green landscaped areas with young trees, and a dense urban skyline in the background under a blue sky with white clouds. A large yellow circle is overlaid on the lower-left portion of the image, containing text.

Cities are part of

**THE CLEAN REVOLUTION**

# SUMMARY OF KEY FINDINGS

## Overview

The Climate Group published its first China's Clean Revolution report in 2008. The report highlighted the emergence of Chinese low carbon entrepreneurs and businesses that were beginning to lead the global market as China began an aggressive push to set itself on a cleaner development path.

At the peak of the global financial crisis in 2009, the publication of China's Clean Revolution II reported on the continued growth of low carbon industry in China, as the government focused on creating a new domestic market for low carbon technologies.

In 2010, as China gears up to announce its 12th Five-Year Plan (FYP) for its economic development between 2011 and 2015, China's Clean Revolution III: Cities, explores the vital role of China's local governments and businesses. The report considers the role cities will need to play in ensuring China's ambitious targets on the low carbon economy are met during a period of rapid urbanization and industry restructuring.

As the 12th FYP takes shape, we examine positive examples of how the private sector and major cities are beginning to collaborate, with the national government's backing, to pursue economic and industrial transformation on an unprecedented scale. We consider the main drivers of change and opportunities going forward, and recommend actions for success toward the forthcoming five-year plan.

The full report is currently published in Mandarin only. This document summarises some of the main findings of the report for non-Chinese audiences.

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### CHINA'S COMMITMENT TO CLEAN DEVELOPMENT IS STRONG AND IS LIKELY TO CONTINUE INTO THE 12TH FIVE-YEAR PLANNING PERIOD FROM 2011 TO 2015

In the closing months of 2010, China has been pushing to meet the 20 per cent energy intensity improvement target and 10 per cent renewable energy target the national government set in the soon-to-end 11th FYP (2006-2010). At its annual conference in October, the Central Committee of the Communist Party began to set the tone for the forthcoming 12th FYP, due to be announced in March 2011.

From a carbon reduction standpoint, the 12th FYP is expected to be more ambitious than the 11th, with some observers suggesting that the energy intensity target for 2015 will be extended by a further 17-20 per cent relative to 2010. The 12th FYP will emphasize three key pillars, attempting to underpin a 'clean revolution' in China's economic development over the next decade:

- I Restructuring China's economy and reshaping its industry;
- II Improving research and development in science and technology; and
- III Establishing a resource-efficient and environmentally-friendly society.

### CITIES ARE AT THE HEART OF THE CLIMATE CHALLENGE FOR CHINA AND WILL BE CENTRAL TO THE SOLUTION IN THE 12TH FIVE-YEAR PLAN

China is witnessing an unprecedented urban growth rate, which only looks set to accelerate. Its urban population reached 620 million people in 2009, an increase of 36 per cent since 2000.<sup>1</sup>

In addition, China's urban population is becoming wealthier, consuming more energy and resources per capita. Chinese cities currently consume three-quarters of the country's energy – a proportion that is set to rise to 83 per cent by 2030.

In response to the combined pressures of rapid urbanisation and central government targets on energy intensity, many Chinese cities have started to explore their own low carbon leadership.

Programmes under the 12th FYP are expected to be implemented through more localised action plans that take into account the unique resources, knowledge and capabilities of each region of the country. Under this anticipated trend towards more localised delivery of the 12th FYP, the role of cities will be increasingly critical to success. A similar conclusion was reached in a recent policy paper on China's cities by UK economist Lord Stern.<sup>2</sup>

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1 Chinese Academy of Social Sciences (CASS), 2010 Blue Book for Cities, accessed on 2010-9-6 on <http://www.cass.net.cn/file/20100729277339.html>

2 Stern, N. 'China's growth, China's cities, and the new global low carbon industrial revolution', Nov. 2010. See <http://www2.lse.ac.uk/GranthamInstitute/publications/Policy/papers.aspx>

## LOW CARBON STRATEGIES FROM CHINESE CITIES HAVE BECOME INCREASINGLY SOPHISTICATED IN THE LAST TWO YEARS

Whilst some early low carbon announcements from China's cities were perceived as devices to secure preferential treatment from Beijing, subsequent action plans have become progressively more credible and sophisticated.

In some cases, as discussed later, these plans have been developed with support from academic institutions, non-profits and the international community.

From 2008, early mover cities have sought to grow local green GDP (Gross Domestic Product) by establishing themselves as national 'hubs' for specific low carbon industries. For example, renewable energy technology is a focus for Baoding city in Hebei Province in the north of the country, and green lighting for Nanchang in Jiangxi Province in the south-east. Subsequently, cities, such as the coastal port of Xiamen in Fujian Province, have created more comprehensive strategies encompassing green economic growth and efficient urban planning.

In July 2010 the National Development and Reform Commission (NDRC), the agency under the State Council that guides economic system and industrial restructuring, announced that eight cities and five provinces<sup>3</sup> were to become 'low carbon economy pilots'. This led to the release of comprehensive plans from the named pilot cities, such as Guiyang in Guizhou Province in southwest China.

Low carbon strategies adopted by Chinese cities to date are characterised by six focus areas:

- I Driving energy efficiency in industrial processes;
- II Restructuring the local economy to favour low carbon businesses, including establishment of low carbon industrial parks (discussed later in this summary);
- III Making new and existing buildings more energy efficient;
- IV Making low carbon transport widely available, and pursuing 'transport-oriented development' to improve access to public transport;
- V Increasing the share of renewable energy generation, including more decentralised generation and building-integrated systems (e.g. landfill gas, ground source heat pumps); and
- VI Reducing the impact of consumption – including public education programmes, the promotion of low carbon products and the introduction of energy efficiency standards for household appliances.

## BOX 1. CHINESE CITIES IN THIS REPORT: KEY STATISTICS

CITY	POPULATION (estimated 2010) <sup>a</sup>	GDP (USD 2008) <sup>b</sup>	LOCATION
Baoding	1.2 million	\$22.8 billion	North, near Beijing
Chengdu	4.3 million	\$56.1 billion	Southwest interior
Guiyang	3.9 million	\$11.7 billion	Southwest interior
Hong Kong	7.4 million	\$293 billion	South
Nanchang	2.6 million	\$23.9 billion	Inland mid-east
Tianjin	7.5 million	\$91.4 billion	North coast near Beijing
Wuxi	1.9 million	\$63.6 billion	East inland from Shanghai
Xiamen	2.7 million	\$22.5 billion	Southeast coast opposite Taiwan

<sup>3</sup> The five provinces are Guangdong, Liaoning, Hubei, Shaanxi, Yunnan. The eight cities are Tianjin, Chongqing, Shenzhen, Xiamen, Hangzhou, Nanchang, Guiyang and Baoding.

<sup>a</sup> <http://www.unhabitat.org/downloads/docs/GRHS2009/GRHS.2009.6.pdf>

<sup>b</sup> UN Habitat, The State of China's Cities, 2010-2011 <http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=3012>



## KEY DRIVERS FOR PROGRESS IN CHINESE CITIES HAVE COME FROM ALL SECTORS – GOVERNMENT, BUSINESS AND THE ‘THIRD SECTOR’

Government drivers: centrally set targets on energy intensity and renewable energy have been backed up by locally designed regulation and incentives.

To meet the 20 per cent energy intensity improvement target of the 11th FYP, all Chinese cities have been assigned compulsory targets in line with national goals. Some cities have targets beyond 20 per cent.

Energy intensity, a central indicator in China’s economic planning, is assessed as energy consumption per unit of GDP. Cities must pursue both sides of this equation to further decouple energy use from GDP - driving greater energy efficiency as well as encouraging low carbon sources of economic growth.

There are a range of regulatory tools available to city governments, including building codes, technology subsidies and investment incentives. The north eastern industrial city of Shenyang in Liaoning Province exemplifies this range. Shenyang is promoting ground source heat pump

(GSHP) systems through its building codes; subsidizing the installation of photovoltaic (PV) solar panels; and granting investment subsidies to multinational corporations looking to establish themselves in the city.

Business drivers: a growing number of Chinese cities have actively cultivated low carbon businesses within their jurisdiction as part of economic restructuring drives.

Engaging the business sector is crucial to driving China’s clean revolution and many cities have established themselves as national ‘hubs’ for specific low carbon technologies. The following examples show how successful low carbon developments can arise from close collaboration between local governments and business.

### SUNTECH & WUXI

Suntech is one of the world’s largest producers of crystalline silicon PV modules and is based in Wuxi in Jiangsu Province in eastern China. In partnership with Wuxi’s municipal government, Suntech aims to install 100 MW of solar generating capacity within three years to make Wuxi China’s leading city for domestic green energy. Suntech’s headquarters already features the world’s largest building integrated solar façade and the company has exported its products to more than 80 countries.

### HIMIN SOLAR GROUP & DEZHOU

Himin Solar Group led the expansion of a chain of industrial developments in Dezhou in north western China, powered by solar energy, earning Dezhou the label of ‘China’s Solar Energy City’. It was the first city to use solar water heaters on a large scale: 90 per cent of residential buildings now have these heaters installed. Investment of RMB 14.85 billion (US\$2.2 billion) from both government and enterprise has been made to support solar energy applications in the city. Underlining its leadership role in the solar energy sector, the city successfully hosted the 4th World Solar Energy Congress in the autumn of 2010.

### LAOGANG LANDFILL BIOGAS PROJECT & SHANGHAI

The Laogang landfill biogas power generation project began operation in Shanghai in 2008. The landfill covers 6.5 square kilometres and processes 8,000 tonnes of municipal waste a day, 70% of the total generated in Shanghai. Biogas generated electricity from Laogang could meet the electricity demand of 100,000 households and save 37,800 tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e).

Third sector drivers: NGOs, philanthropic funders, academic institutions and foreign governments have played a key role in supporting the initial evolution of low carbon strategies in the leading Chinese cities.

The concept of a ‘low carbon economy’ originated outside China<sup>4</sup> and the term ‘low carbon city’ was first publicly proposed in the country at the 2008 National Harmonious City Forum in Beijing. Subsequently, research into the low carbon city theme has expanded rapidly.

Building on the international origin of the concept, many leading low carbon city strategies in China have been supported by international organizations and developed with input from leading academic institutions. The New York-based Rockefeller Brothers Fund, for example,

<sup>4</sup> Its earliest adoption in policy circles was probably in UK government’s 2003 energy white paper Our Energy Future - Creating a Low Carbon Economy.

has supported The Climate Group and the Energy Research Institute of the NDRC to develop a low carbon-economy roadmap for the Pearl River Delta (including Guangdong and Hong Kong). In addition, the UK Foreign & Commonwealth Office has supported various international and domestic institutes to help with the low carbon strategy development for a number of Chinese cities and provinces.

**MEETING THE ANTICIPATED AMBITIOUS TARGETS UNDER THE 12TH FIVE-YEAR PLAN WILL REQUIRE CITIES TO PURSUE A RANGE OF EMERGING STRATEGIES FROM FINANCIAL MECHANISMS TO DESIGNATED DEVELOPMENT PARKS**

Financial mechanisms and credit guarantees are transforming some heavy industry cities into clean technology powerhouses.

To meet energy-saving targets, China's leading cities are restructuring their economies, using financial support in the form of credit guarantees to encourage new green businesses. In 2004 the steel town of Xinyu in Jiangxi Province started to promote alternative industries in response to rising local air pollution. It provided RMB 200 million (US\$ 24 million) in credit guarantees to LDK Solar, a manufacturer of multicrystalline solar wafers used in PV cells. By 2007 LDK had listed on the New York Stock Exchange and nine further solar suppliers had been established in Xinyu. Today the city is approaching a world leading position in PV cell and wind turbine manufacture.

Low carbon industrial parks are emerging as a model to promote innovation and industrial restructuring.

Production in low carbon industrial parks aims to minimise pollution by implementing waste exchange, recycling and clean production techniques. The state-owned China Energy Conservation and Environment

Investment Corporation (CECIC) has developed eleven such parks. It recently started to build the first 'Environmental and Hi-tech Industrial Park' in the eastern city of Suzhou to focus on environmental hi-tech research and development. The park is also a pilot to demonstrate the application of renewable energy and decarbonisation in the building and transportation sectors.

Chinese cities are developing new, diverse renewable energy sources.

Six construction projects in the port of Qingdao in Shandong Province are currently using marine energy and are now classified as national demonstration projects, receiving RMB 47 million (US\$7 million) in financial subsidies from the national government. The north-eastern city of Shenyang meanwhile has deployed geothermal energy to heat its buildings. A quarter of the total building area of the city had been installed with geothermal heating facilities by 2009. Every season, these facilities could reduce energy consumption by more than 1.5 million tonnes of coal equivalent (TCE).

## **BIOGAS GENERATED ELECTRICITY FROM LAOGANG COULD MEET THE ELECTRICITY DEMAND OF 100,000 HOUSEHOLDS AND SAVE 37,800 TONNES OF CARBON DIOXIDE EQUIVALENT.**

Photo: Sustainability officer Calvin Lee Kwan checks and waters a grass patch pilot insulation project on a roof at Hong Kong's Science and Technology University.





## USE OF PUBLIC TRANSPORT IN BEIJING WAS PROJECTED TO REACH 40 PER CENT OF PASSENGER JOURNEYS IN 2010, WITH RAIL TRANSPORT EXPECTED TO ACCOUNT FOR MORE THAN HALF OF THIS SHARE.

Photo: Electric train on MTR mass transit rail system in Hong Kong.

Under the banner of 'Transport Oriented Development' (TOD), cities' low carbon transport plans are focused on public transport and low carbon vehicles from bicycles to electric cars.

Use of public transport in Beijing was projected to reach 40 per cent of passenger journeys in 2010, with rail transport expected to account for more than half of this share.

The Hangzhou Bicycle Rental Company (HBRC), a state-owned enterprise initially supported by local financing, has developed a rental business in Hangzhou, the capital of Zhejiang province. The scheme has 2,000 rental stations with 50,000 bicycles. The company has been invited to help develop similar rental systems in other Chinese cities. The business model was based on the successful Velib cycle scheme pioneered by Paris and now also replicated in London.

By the end of 2007, there were 4,000 liquefied natural gas (LNG) buses in operation on Beijing's roads. A year later China's total LNG bus fleet had reached some half a million vehicles across more than 80 cities.<sup>5</sup>

A national demonstration project was introduced in January 2009 to deploy 1,000 new-energy and hybrid vehicles yearly in ten cities in three years. The project includes support through financial subsidies. There are now more than 2,000 new energy vehicles in use in China.<sup>6</sup> The aim is for these vehicles to account for 10 per cent of the market in 2012.<sup>7</sup>

### SIGNIFICANT CHALLENGES LIE AHEAD FOR CHINESE CITIES, PRIMARILY IN THE FORM OF A SHORT TERM 'CAPACITY CRUNCH'

To achieve the expected goals of the 12th Five-Year Plan and to secure clean and reliable energy for a rapidly urbanising population, there is an urgent need to support the capacity of city governments to deliver their objectives. Despite strong progress from leading cities highlighted in our report, anecdotal evidence suggests that many Chinese cities are struggling to meet ambitious targets devolved from central government.

#### Particular challenges include:

- I Capacity constraints in terms of skills, experience and knowledge amongst city managers;
- II The sheer scale of urbanisation;
- III Institutional and political challenges, e.g. the division of power and policy contradictions;
- IV No simple 'one-size-fits-all' solutions due to differing levels of development amongst cities;
- V Inadequate consultation and investigation processes in low carbon planning; and
- VI Development of methodology for carbon emissions inventories at the city level is not yet mature - only a few Chinese cities are currently targeting carbon emissions as opposed to energy intensity.

5 Zhou Yipei, et al: The status, trends and strategies of China's vehicle CNG, <http://www.petroecon.com.cn/2009-dby/pdf/h-1.pdf>

6 Qi Xiaohu "Central government multiple approach on climate" China Financial and Economic News 2010-01-30 [http://www.cfen.com.cn/web/cjb/2010-01/30/content\\_602602.htm](http://www.cfen.com.cn/web/cjb/2010-01/30/content_602602.htm)

7 The new-energy vehicles include the Electric Vehicles and the hybrid vehicles.

## RECOMMENDATIONS: CHINA'S CITY PLANS WILL NEED TO EVOLVE TO MEET THE CHALLENGES OF THE 12TH FYP AND SUCCESS WILL REST ON FOUR KEY PILLARS

Given the challenges outlined in this report, comprehensive and integrated central guidance for cities on the deployment of low carbon technologies is urgently needed. Cooperation and sharing of best practice models and research and development capacity will continue to be essential – both internationally and between regions in China – building on early work supported by US and European funding sources.

**For China's cities, success will rest on the following recommended actions:**

### Set clearer low carbon development targets

- Some leading cities may consider targeting absolute (rather than relative to GDP) carbon emission reductions over the next decade or more.

### Adopt a more comprehensive and integrated planning approach

- Consolidate and integrate low carbon planning with economic restructuring priorities, boosting low carbon industries to enhance competitiveness.
- Develop detailed roadmaps, identifying key project areas, investment and resource needs.

### Improve engagement with stakeholders

- Conduct wider consultation on low carbon plan development, including public involvement in framing actions required for low carbon lifestyles.
- Promote energy saving actions.
- Influence consumer behaviour.
- Participate in international cooperation processes to build capacity and understanding.

### Develop new financing mechanisms

- Develop more advanced financing models to provide greater incentives for financial institutions and private investors to accelerate support for low- carbon projects.
- At central government level, create a national market mechanism to provide a more comprehensive model for low carbon investment.

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HSBC 

The world's local bank

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## THE CLIMATE GROUP

The Climate Group is an independent, not-for-profit organization working internationally with government and business leaders to advance smart policies and technologies to cut global emissions and accelerate a clean industrial revolution.

Its global coalition of companies, states, regions and cities around the world recognize the economic and environmental imperatives of taking decisive action now.

The Climate Group is working with the world's most influential business and government leaders to make clean technologies commercially viable.

These people hold the power to create the financial mechanisms and policy incentives that are needed to rapidly end our dependency on dirty energy and create a clean industrial revolution.

A 'Clean Revolution' – a swift and massive scaling-up of clean technologies such as LEDs, EVs, ICT, CCS and Solar – will help create economic growth, jobs and secure a cleaner, smarter, better, more prosperous future for all.

The Climate Group was founded in 2004 and has operations in Australia, China, Europe, India and North America.

### Photography:

Cover image of Shenzhen by Zhong Weiguo.

Photos on pages 4-5 by Jiri Rezac.



For more information, please contact:

**Callum Grieve, Global Director of Communications, The Climate Group**

**Email:** [cgrieve@theclimategroup.org](mailto:cgrieve@theclimategroup.org)

444 Park Avenue South | New York | NY | 10016 | USA

[WWW.THECLIMATEGROUP.ORG](http://WWW.THECLIMATEGROUP.ORG)