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China's pilot low-carbon city initiative: A comparative assessment of national goals and local plans

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ABSTRACT

In the past decade, China's unprecedented urbanization has paralleled a 250% growth in primary energy demand and urban areas have emerged as the crux of energy and CO_2 emissions reduction in China. In recognition of cities' importance in mitigating future energy and CO_2 emissions growth, the Chinese government launched a demonstration program of 5 low-carbon pilot provinces and 8 pilot cities in 2010 to promote low-carbon urban development. As one of the first national programs to promote low-carbon urban development, the recent plans and policies adopted by these 8 pilot low-carbon cities can shed light on if and how low-carbon cities can shape China's future energy and emission trajectories. This paper reviews the historical development and context for low-carbon urban development in China and then presents an ex-ante comparative assessment of the low-carbon development plans and supporting measures formulated for each of China's 8 pilot low-carbon cities. We find that while the 8 pilot cities have made progress in establishing low-carbon plans, key barriers such as a lack of explicit definition for low-carbon city, complexity and confusion resulting from several parallel programs, and insufficient supporting policies and market-based instruments may hinder urban development that is truly low carbon.

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1. Introduction

The Chinese government has started to emphasize greenhouse gas and particularly carbon emission mitigation as part of its national strategy for development in recent years. In 2007, China issued its National Climate Change Program (NDRC, 2007); in 2008, a White Paper on China's actions and strategy on climate change was published (State Council, 2008); in 2009, the State Council announced a target of reducing the carbon intensity of its GDP by 40–45% by 2020 compared to the 2005 level (State Council, 2009). This emissions mitigation target was incorporated into the national 12th Five Year Plan (FYP) for the very first time with the setting of a binding target of 17% reduction in CO_2 emissions per unit of GDP from 2011 to 2015 (National People's Congress, 2011).

As the centers of population, industry, transport and infrastructure, cities have a profound impact on global carbon emissions. Cities and urban areas are estimated to use 75% of the world's energy and produce up to 80% of its greenhouse gas emissions (Williams, 2007). China has been undergoing fast urbanization, with the annual migration of approximately 13 million people from rural areas to urban centers. The number of cities[1] in China has also increased from 193 in 1978 to 657 in 2010. By the end of 2011, China's urbanization rate, or the share of urban population, reached a record 51.3%, and is expected to further rise to 75% by 2050. Because urban energy use per capita is estimated to be three times higher than that of rural areas (excluding non-commercial energy sources such as biomass), and indirect energy use (i.e., embodied energy use) through infrastructure and urban consumption of goods is even higher, the development of low-carbon cities is crucial to mitigating the growth of carbon emissions in China.

At the beginning of 2008, Shanghai and Baoding became the first cities to join a new World Wildlife Fund (WWF) initiative to explore low carbon development strategies for China's urban areas. Domestically, the National Development Reform Commission

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[1] Chinese cities are defined by administrative boundaries and contain at least 100,000 non-agricultural residents. City size classes, however, are defined by the non-agricultural inhabitants only. Three administrative types of cities (provincial-level municipalities, prefecture-level cities and county-level cities) exist in China, and are designated based on non-agricultural population, total GDP and share of GDP in tertiary sector and on-budget revenues.

(NDRC) – China's top planning agency responsible for formulating and implementing national economic and social development strategies – initiated a low carbon pilot province and city program in July of 2010, including five provinces and eight cities across the country. The eight low carbon pilot cities are located across the country and include the municipalities of Tianjin, Baoding, Hangzhou, Chongqing, Nanchang, Guiyang, Xiamen and Shenzhen and the five low carbon pilot provinces include Yunnan, Guangdong, Hubei, Shaanxi, and Liaoning provinces (NDRC, 2010).

As low carbon urban development – and particularly the idea of low carbon cities – is receiving greater attention from Chinese policymakers, an increasing amount of literature has started to look at the theoretical concepts, tools and methods and case studies of low-carbon city development in China. For example, Yang and Li (2013) discusses the motivation and concept of low carbon cities and propose possible actions in different sectors for building a low-carbon city, while Li et al. (2012) reviews the development of low-carbon towns in China. Another group of recent literature has focused on tools and methods for helping cities to plan and evaluate its low carbon development actions, including Price et al. (2013) and Cao and Li (2011). There has also been increasing number of case studies on individual cities' efforts in promoting low-carbon development, with Feng and Zhang (2012), Bi, Zhang, Wang, Liu, and Wu (2011), Lehman (2012) and Lehmann (2013) focusing on the emissions implications for major cities including Beijing, Nanjing and Shanghai on the path of its low-carbon development. However, because low carbon development is a relatively new concept and policies have only been introduced within the last few years, there is very little academic literature evaluating the policy-driven low carbon urban development efforts being implemented in China and the strategies and plans being considered and adopted by multiple cities in order to achieve the national goals of becoming low carbon cities. Moreover, while there is ample literature on the theory and motivation behind low carbon cities, existing literature has very limited analysis of the actual progress and challenges facing Chinese cities seeking a path of low carbon urban development.

This paper addresses these gaps by specifically evaluating the targets, plans and strategies being adopted by the eight low-carbon pilot cities under the NDRC's pilot program. As part of a program established by China's top policymaking agency, the experiences of the eight low carbon pilot cities will likely serve as important models for the future development of low carbon cities in China. This paper thus first reviews the historical development and context for the pilot low-carbon cities and related eco-city initiatives in China as strategies for addressing urbanization challenges. An ex-ante assessment of China's pilot low-carbon cities is then conducted through comparative desk research and review of the low-carbon development plans and supporting measures formulated for each pilot city. These plans are compared and evaluated in terms of the policy scope, targets and focus areas as well as supporting local policy measures, strategies and tools already put in place to date. A case study of the pilot city of Hangzhou's planning and implementation process is used to illustrate progress in implementing low carbon plans. The paper ends with key findings from the evaluation of the pilot city plans and discussion and conclusions on implications of these findings for the future development of low carbon cities and the broader context of the future role of cities in China's CO_2 emissions mitigation efforts.

2. Overview of low carbon and eco-city development programs in China

In addition to the low carbon pilot program launched by the NDRC, parallel programs have also been initiated at both central and local government levels in recent years. By February 2011, 230 of 287 prefecture-and-above level cities have proposed plans to develop new "eco-cities", while 133 of these cities have gone a step further by setting targets to become "low-carbon cities." In addition, China currently has 11 major indicator systems for low-carbon and eco-city development. Zhou, He, and Williams (2012) compared the major concepts of eco-city, low carbon city and low carbon eco-city and found the following defining traits:

Eco-city: enhances well-being of citizens and society through integrated urban planning and management that harness benefits of ecological systems and protects and nurtures assets for future generations.

Low carbon city: emphasizes the climate change challenges that cities may be confronted to, decouples economic growth from fossil fuel use by shifting toward consumption characterized by energy efficiency, renewable energy and green transportation.

Low carbon eco-city: combines both concepts by featuring energy-saving and environmentally friendly city symbolizing low energy consumption and low environmental impact (e.g., low pollution and low carbon emissions).

2.1. Eco-city program of the Ministry of Environmental Protection

To promote the scientific development of a "resources saving and environmental friendly society", the Ministry of Environmental Protection (MEP) initiated a program to establish eco-counties, eco-cities and eco-regions within China by issuing the "Development of Indicators for National Ecological County, Municipality and Province (trial)" on December 13, 2003. The program requirements were revised by the MEP in 2005. Under the revised plan, basic requirements had to be met by cities to be considered eco-cities, including (MEP, 2007):

- Establishing an "eco-city construction plan", promulgated and implemented by the Municipal People's Congress.
- Establishing independent environmental agencies.
- Achieving energy saving levels of beyond government-assigned targets.
- Achieving eco-environmental quality evaluation index that is among the best in the province.
- 80% of counties (including county-level cities) must reach the national ecological construction targets to be named National Environmental Protection Model City.

By July of 2011, 38 cities have been named "Ecological City (County)" under MEP's guideline and assessment, including cities in Jiangsu, Zhejiang, Shandong, Guangdong, Sichuan, Anhui, Shaanxi, Liaoning provinces and the municipalities of Shanghai, Beijing and Tianjin.

2.2. Eco-garden city program of the Ministry of Housing and Urban–Rural Development

The Ministry of Housing and Urban–Rural Development (MOHURD) initiated the National Garden City program as early as 1992 and by the end of 2010; MOHURD had announced the selection of 13 groups of National Garden Cities with a total of 184 participating cities under this program. In June 2004, MOHURD decided to initiate the establishment of Eco-Garden City based on the program on National Garden City.

The general requirements to be qualified as an Eco-Garden City include (China Society for Urban Studies, 2010):

- Developing complete urban ecological development strategy, measures and action plans.
- Establishing a complete urban green space system.