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## Practice of low-carbon city in China: The status quo and prospect

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### Abstract

It is vital to construct low-carbon city in China in order to mitigate the huge cost of climate change especially when considering the great contribution of cities to the national greenhouse gas emissions. Many Chinese cities have made efforts in construction of low-carbon city in recent years from various aspects. The low-carbon practice in Chinese cities was reviewed in this paper, including setting up urban low-carbon development planning, establishing low-carbon demonstrative areas, focusing on such specific fields as sustainable energy system, ecological industry, green transportation, and green building. The effect of the low-carbon practice was also evaluated and certain issues requiring further concerns were discussed. It is expected that the discussion in this paper is helpful for promoting the construction of low-carbon city in China.

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### 1 Introduction

The report of UN Habitat claims that climate change is “an outcome of human-induced driving forces”, with immeasurable unfavorable consequences for planet and human settlements [1]. According to “Stern Review: The Economics of Climate Change”, the overall costs and risks of climate change will be equivalent to losing at least 5% of annual global GDP, and could rise to 20% of global GDP or more if a wider range of risks and impacts is included [2, 3]. As home to >50% of the World population, cities

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consume 67% of the energy in the world and cause more than 70% of global CO<sub>2</sub> emissions [4]. Under such condition, the vulnerability of cities to climate change will be increased by the limitations on governance and planning especially in developing countries [1]. Undoubtedly, developing low-carbon cities is a feasible and sustainable way which emphasizes the climate change challenge and decouples economic growth from fossil fuel use [5].

China, as the largest carbon emitters in the world since 2006 [6], faces more urgent situation to develop low-carbon cities, for 86% of the energy-related CO<sub>2</sub> emissions comes from the cities [4] and the carbon density per urban areas increases with the rapid urbanization [7]. In fact, China has actively adapted to climate change and made great efforts to construct low-carbon cities. In January 2008, the Ministry of Housing and Urban-Rural Development and World Wildlife Fund jointly launched the demonstration project of low-carbon city when Baoding and Shanghai were selected as the pilot areas, which is regarded as the formal start of construction of low-carbon city in China [8]. Subsequently, the first pilot project of low-carbon city and province (LCCP) was launched by the National Development and Reform Commission in August 2010, when five provinces and eight cities were selected as the cases [9]. Since then, more and more Chinese cities such as Guangzhou, Fuzhou, Nanjing, Dalian, and Ji'nan actively jointed and conducted low-carbon practice from different aspects [10, 11]. And in December 2012, the Ministry of Housing and Urban-Rural Development announced the second pilot project of LCCP where more detailed targets, task, and requirements were proposed based on the specific local situations [12].

Although a series of practice has been taken for construction of low-carbon city in China, there is still a long way to go to mitigate climate change. On 30th June 2015, China launched a series of actions in INDC (Intended Nationally Determined Contributions), e.g., achieving the peaking of CO<sub>2</sub> emission before 2030, and reducing 60–65% of emission intensity (CO<sub>2</sub> emission per unit of GDP) from the 2005 level [13], which puts forward higher requirements for low-carbon city construction. It is necessary to review the practice of low-carbon city construction to further move forward its process.

## 2 Practice of Low-carbon City in China

Many Chinese cities have made their efforts to construct low-carbon cities. As shown in Fig. 1, the pilot project of LCCP has covered most of regions in China, except for Hunan, Ningxia, Tibet, and Qinghai provinces. Totally, 6 provinces and 36 cities in China are selected as the pilot areas of low-carbon construction, i.e., most provinces have at least one pilot city [12]. It is found that the first group of LCCP mainly locates in the east of the “Heihe-Tengchong Line” [14], where took up 80% of the total population with only 25% of the total area in China in 2008 [15]. Among the first 13 pilot cities and provinces, five low-carbon provinces accounted for 38% of the total number. However, there was only one low-carbon province (Hainan) in the second 29 pilot cities and provinces. Moreover, there appeared more pilot cities in the northwest (e.g., Urumqi) and northeast (e.g., The Greater Higgan Range) of China. Additionally, there was some overlapping area between the first and second group, e.g., Guangzhou in the second group of pilot cities locates in Guangdong, one of the first group of low-carbon provinces. It is estimated that the 36 pilot cities account for 33% of the national GDP and 18.5% of total population in 2011 [16, 17]. It is undoubtedly believed that construction of low-carbon city in these pilot areas will greatly prompt Chinese low-carbon development.

Besides these pilot cities, a number of Chinese cities have also taken construction of low-carbon city into practice with different focuses. Some cities set up the overall low-carbon targets and planning, some conduct the low-carbon management, some establish the low-carbon demonstrative areas, and some pay attention to specific fields including sustainable energy, ecological industry, green transportation, green building, and low-carbon life.

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