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Low-carbon City in China

Li Yang[a], Yanan Li[b,*]

[a] College of Architecture & Urban Planning, Tongji University, Institute for Advanced Study in Architecture and Urban Planning, Key Laboratory of Ecology and Energy Saving Study of Dense Habitat (Tongji University), Ministry of Education, Shanghai, PR China
[b] Department of Environment and Architecture, University of Shanghai for Science and Technology, Shanghai, PR China

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ABSTRACT

The establishment of low-carbon city is the key to achieving low-carbon future. Low-carbon city should give consideration to both low-carbon production and low-carbon consumption. Based on the rapid development of economy and continuous improvement of living standard, the low-carbon transformation of economical development, the consumption concept and living style is conducive to achieve the goal of low energy consumption and low carbon dioxide emission. The development of low carbon city is the need to cope with global climate change, which is also the must choice for China to guarantee sustainable development of economic society. As the second largest economy in the world, China is in the economical transition period. Actions need to be taken to speed up the development of ecology city construction according to our national condition, formulating and implementing related policy. Meanwhile, low-carbon technology and low-carbon industry should be vigorously developed to advance the green, cyclic and low-carbon development. We are striving for resource-saving and the environment-protecting industrial structure, production method and life style. To keep running in front in the third Industrial Revolution medium-distance, to complete the well-off society comprehensively and to realize the sustainable development, the reason why China has to choose the low-carbon road and the way of developing low-carbon city are analyzed in this paper. Then some specific requests to establish low-carbon city are put forward.

1. The proposal of low-carbon city

In recent years, global warming has caused common concern around the world. Under this background, in 2003 the British Government published the "Energy White Paper" entitled "Our Future Energy: Creating a Low-Carbon Economy" (DTI, 2003). For the first time "Low-Carbon Economy" was proposed. It explained that low-carbon economy is the achievement of more economic output and high-quality living standard with less natural resource consumption and environmental pollution. It creates more business and job opportunities for the development, applications and output of advanced technologies. In 2007, Japan also put forward the concept of "Low-carbon Society" and they pointed that "No Low-carbon Society, No Low-carbon Economy". All measures above are trying to transform people's consumption concept and living style, and then promote low-carbon technologies and related institutions to reduce carbon emission. Although the emphasis of "Low-carbon Economy" and "Low-carbon Society" are different, they are still closely related. "Low-carbon Economy" emphasizes the transformation of production models and the enormous business opportunities of new technologies. While "Low-carbon Society" put more emphasis on the transformation of living and consumption styles. However, the final goal of them is to reduce CO_2 emission. Based on the two concepts mentioned above, Chinese scholars put forward the concept of "Low-carbon City". They thought that the development of low-carbon city is the key point of the future development. The low-carbon city should give consideration to both low-carbon production and low-carbon consumption and maintain a good sustainable energy and ecology system within certain urban areas (Liu, 2009).

2. Why to develop low-carbon city

2.1. Pressure from international society

In order to deal with the global warming crisis, many symposiums about international agreements have been reached since 1990. The United Nations began the international climate negotiation in 1990. Kyoto Protocol became effective on February16, 2005, etc. Even now today in 2012, from November 26 to December 7, the International Climate Conference is being held in Doha, Qatar. Finally, the latest UN climate conference extended the Kyoto

* Corresponding author. Tel.: +86 18817582995.
E-mail addresses: Pudong111@163.com, hanxueer111@hotmail.com, yanxue850686417@126.com (Y. Li).

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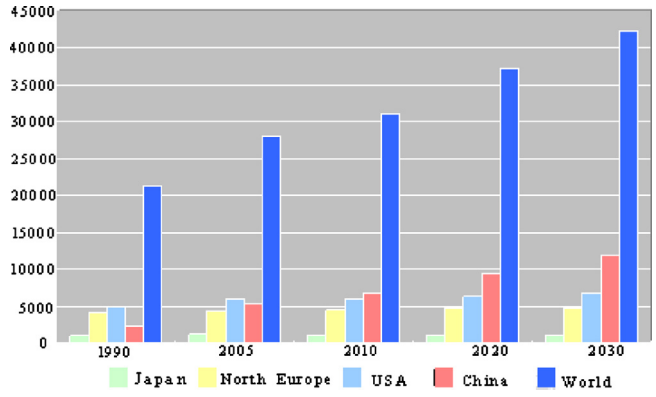
Protocol to the end of 2020 (Anonymous, 2013), the only internationally binding treaty on cutting emissions of greenhouse gases. It is clear that, with the coming scientific reality of climate change, the international society is paying more and more concerns. And the low-carbon transformation of the world is both inevitable and necessary.

Since 1970s, the international society has been devoted to finding corresponding plans to deal with the global climate change, "Kyoto Protocol" is the most important achievement. It aims to maintain the greenhouse gas at an appropriate level and avoid the harm of strong climate change to humans (Qiu, 2009). "Kyoto Protocol" is the first international law in human history which sets an index of the specific reduction amount timetable of greenhouse gas and to every developed country. It promotes the international cooperation and means a lot in reducing the emission of greenhouse gas around the world. However, "Kyoto Protocol" doesn't reach its original goal, for it lacks effective reward and punishment measures in the process of implementation. As a result, many countries have no interest in this plan and even quit. For participated countries: how to implement the "shared but different responsibility" become the hot topic. As known to all, developed countries have always been the main contributors to the greenhouse gas emission (Zhou & Hong, 2010). But since they have stepped into a higher development stage, their demand for energy is limited, and carbon emission is decreasing continuously because of the high technology. While in developing countries, the CO_2 emission is increasing constantly with the economical development. However, the main greenhouse gas in earth mainly comes from the developed countries in industrial revolution period. Therefore, the developing countries don't need to pay for developed countries' remained bill. And then China takes no responsibility to reduce the emission of CO_2 at the first stage. This becomes one main factor impacting the implement of the negotiation. Once, the absence of China's duty became the reason to quit for the United States of America and other developed countries (Fu, Wang, & Li, 2008), because with the continuous extension of development, China has already passed the United States as the largest emitter of CO_2 (The Global Carbon Budget, 2008). On December 3rd, 2012, the special edition of "Nature" published a report named "to maintain global warming less than 2 °C challenge". The report says, the global carbon emission will increase to a record 35.6 billion tons in 2012. Research shows that, the large carbon emission counties include: China (28%), the United States (16%), the European Union (11%) and India (7%). China and India, two countries emissions in 2011 increased by 9.9% and 7.5% respectively. The United States and the European Union was reduced by 1.8% and 2.8% respectively. Despite China's total emissions is high, the per capita emissions is only 6.6 tons, much lower than America's per capita emissions of 17.2 tons (Nature Climate Change, 2013). But what's alarming, due to the European Union pay great effort in carbon emission reduction field, the European Union's per capita emissions is down to 7.3 tons, China's per capita emissions are close to the level of the European Union. From the total number, China has become the world's biggest emitter. Now the enormous carbon emission amount of China has become a hot topic among western politicians. From Table 1, we can see that China is becoming the world's biggest carbon dioxide emitter year by year and the world's carbon dioxide emitter is increasing heavily.

2.2. Grim domestic situation

According to the estimation of IEA (International Energy Agency), the energy consumption in cities reached equivalent to 7.9 billion oil which made up 2/3 in the global energy consumption. This ratio will reach to 3/4 in 2030. In China, urban account for 40% of the population and contribute 75% of the national economy

Table 1
Carbon dioxide emissions by country, 1990–2030 [].



(Dhakal, 2009). Therefore, the increase of CO_2 emission related with energy mainly comes from the city in the future.

Now China is in the urbanism period. From Table 2 (Chen, Lu, & Zhang, 2009) we can see that the number of cities in China is increasing heavily. The urbanization level increased unprecedented from 17.9% in 1978 to more than 50% in 2011 (China Energy Statistical, 2010). And it accounts for 17% of the world's the urban population in 2007.The average growth rate reached almost 1% per year. Currently, the total city number of China is 661, and the town population number is 5.6 hundreds million. It is predicted that the urbanization level in China may reach 60% in 2020 (Jian & Huang, 2010). Then the urban population will reaches 8 or 9 hundreds million. With the rapid urbanization process, a large number of rural residents will flock to the cities, and this will cause the change of energy consumption.

Cities, as the center of the human production and living, are the main source of CO_2 emission (Liu, 2009). Developing low-carbon city is the inevitable and necessary choice for China to deal with the climate change, and to develop low carbon economy, to face the "Post-Kyoto times"(Bai, 2008). Cities in China are faced with serious challenges in development: rapid urbanization, enormous energy consumption, rapid increase of urban population, etc. Comparing with developed countries, urban residential energy consumption of China is 3.5 times higher, building steel for per square meter is 55 kg

Table 2
Urbanization level, amount and developing stages of China.

Year	Urbanization level	The number of cities	Urbanization stage
1949	10.64	132	
1952	12.64	153	Start-up periods
1957	15.39	176	
1958	16.25	184	Rapid urbanization
1961	19.29	208	
1962	17.33	194	Counter-urbanization
1965	17.98	168	
1966	17.86	171	
1971	17.26	181	Stagnation periods
1978	17.9	193	
1979	18.96	216	
1985	23.71	324	Acceleration periods
1991	26.68	479	
1995	30.00	630	
2000	36.09	663	
2002	39.10	660	
2003	40.5	660	
2004	41.8	661	Stable periods
2005	43.0	661	
2006	43.9	661	
2007	44.9	665	
2008	45.68	665	

Chen et al. (2009).