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Low-Carbon Policy and Action in the Chinese Mainland: An Overview of Current Development

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Abstract

This paper analyzes existing low carbon policies as well as policy instruments in the Chinese mainland, where policy making is focused shapely on how to enhance energy efficiency in the high energy-consuming sector of industry to ensure optimal reduction of its energy intensity and carbon emission. In terms of implementation, command and control instruments significantly outweigh market-based instruments. And, among the instruments, Target Responsibility Contracts (TRCs) dominate and work the most effectively.

Keywords

Low Carbon, Policy Analysis, Energy Efficiency, The Chinese Mainland

1. Introduction

The concept of low-carbon society was first proposed alongside a common action of the stabilisation of greenhouse gas concentrations and mitigation of climate change. Then with the related sustainable development practices, the transitions to low-carbon society have been the nation's objectives for attainment of the sustainable socio-economic development.

With a rapid economic development, China is experiencing industrialization, information-ization, urbanization, market-ization and further internationalization. Fast economic development and high productivity growth lead to fast growth in not only capital stock, labour force, and employment but also energy use. China has surpassed the United States to become the world's largest energy consumer in 2010 (BP, 2012). Coal is the dominant energy in China's energy supply. According to the US Energy Information Administration (EIA), coal cur-

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rently fuels about 66% of the electricity generation in the Chinese mainland (EIA, 2014). Due to heavy reliance on coal as a source of energy and inefficient use methods of energy, this growth results in the ever rising CO_2 emissions, which has made China the world's largest CO_2 emitter in 2007 (IEA, 2007).

Chinese government, in response to climate change, has been quick to take part in worldwide actions to mitigate climate change, though China, as a developing country, is under no obligation to act in line with the Kyoto protocol to reduce greenhouse gas emissions. In fact it was the first developing country to issue a National Climate Change Program 应对气候变化国家方案. As part of the 2009 Copenhagen Accord, China pledged to reduce its carbon intensity by 40% - 45% by 2020 relative to 2005 (NDRC, 2009). China also has set up the low-carbon targets in the 11th and 12th five-year plans (FYP henceforth) for national economic development to build an energy-saving, resources-recycling and ecologically friendly society, which would require various measures ranging from expanding non-fossil renewable energy capacities to promoting end-use energy efficiencies throughout the economy.

A public policy is an action which employs governmental authority to commit resources in support of a preferred value (Considine, 1994). The primary responsibility for the transition to low carbon society must lie with governments, for they are almost the only provider of the long-term policy direction and various tools, of which guidance and regulation constitute the most effective means for the harmonious development of energy, economy and environment.

In this paper, I will first conduct a preliminary desk study based on the analysis of primary and secondary sources regarding the existing low carbon policies as well as the policy instruments in Chinese mainlands then analyse their implementation with the aid of policy analysis. The aim is to do a comprehensive study on the implementation of low carbon policies as an attempt to gauge the extent within which the implementation contributes effectively to the construction of a more energy efficient and low-carbon society. I will also analyse historical and geopolitical reasoning of related policies and acts. It should be pointed out that low-carbon policy making and formulating can be affected by different degrees of industrialization, endowment resource, energy mix, final energy demand and relative importance of the transportation sector, geography, and climate.

2. Market-Based Instrument: The Development of Carbon Emission Trading

In order to achieve the mandatory target of reducing emissions by 5% below the 1990 levels in 2008-2012, carbon trading scheme was introduced by Tokyo Protocol in 2005. Countries can reduce emissions at home, buy permits from one another, or buy carbon offsets from projects in developing countries under the Clean Development Mechanism (CDM).

Since the adoption of the Kyoto Protocol, some of European governments and private sectors have been influential in the European Emission trading Scheme (EU ETS). China also hoped to learn from the European experience to use market mechanisms to achieve the targets of reducing energy and carbon intensity. CDM is the first concept and practice of carbon trading introduced into China. Since 2004, the National Development and Reform Commission 国家发展和改革委员会 (NDRC) in China issued a white paper with CDM guidelines which marked the government-endorsed implementation of CDM. Only in October 2005, did carbon trading under the CDM launch. The trading is administered by the NDRC at a national level (Han et al., 2012).

The government also strongly support the development of basic carbon trading infrastructure. In 2008 and 2009, several environment and carbon exchanges were established, including the Tianjin Climate Exchange 天津排放权交易所 (TCX), the China Beijing Environment Exchange 北京环境交易所 (CBEEX), and the Shanghai Environment and Energy Exchange 上海环境能源交易所 (SEEEX). In 2010, the Shenzhen Emission Exchange 深圳排放权交易所 was established. Just because of its abundant "carbon finance" resources, China has become a great fundamental story for the trade market of world carbon emissions. By March 2010, 2369 CDM cooperation projects had been approved (Zhuang, 2005). By July 2011, there had been up to 3154 CDM projects and China claimed 43.52% of CDM projects in the world (see **Figure 1**).

CDM might have played an active role in introducing the practice of carbon trading into China, but its contribution is limited with regard to both the reduction of the actual emission reductions in China and China's effort to achieve what would be expected. Because almost all buyers in China come from abroad, there lacks stimulation for internal competition when it comes to finding the best ways to reduce carbon intensity and improve energy efficiency. And since, in carbon finance markets, China had almost no say and, especially, no prising power due to its disadvantage in low-carbon technology, capital flow and accumulation, it benefited little

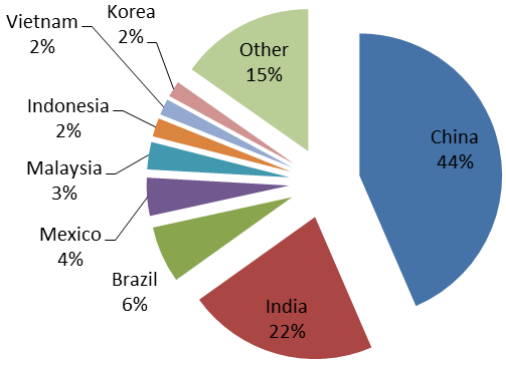

Figure 1. CDM projects share by the end of 2011. Source: UNEP Rios's CDM Pipeline, http://www.cdmpipeline.org/.

from the existing carbon trading mechanisms. Thus, some research suggested that China should increase academic research on carbon finance to solve the problem of its lagging behind in carbon finance construction and that China should know how to construct development system (Zeng & Zhang, 2011).

In addition to CDM-based carbon trading experiences, China also approved pilot of carbon trading as a part of low-carbon development pilots in 2011 (The State Council, 2011; The State Council Information Office, 2011). Up to now, it has already launched seven regional pilot markets in Beijing, Chongqing, Guangdong, Hunan, Shanghai, Shenzhen, and Tianjin in a bid to gain experience ahead of a nationwide scheme. A national trading scheme is expected by 2016. At the same time, there have also been various proposals for sector-based carbon trading schemes for energy-intensive industrial sectors (The Climate Group, 2010).

Carbon market development is still in its infancy in the Chinees mainland, where most of the carbon trading is exclusively CDM based. With the seven regional carbon trading pilots and other sectoral based pilots initiating under the 12th FYP, China will succeed in carbon markets development. However, the effort to achieve long-term targets for the reductions of greenhouse-gas emissions is not limited to the development of carbon finance based on low-carbon economy. Some big questions that must be answered by the Chinese would include how to implement green development strategy and how to protect the environment and thereby solve the problems in both the transformation in the Chinese mode of economic growth and the unsustainable expansion model of low-cost investment in growth-oriented economy (Xia & Xia, 2009).

3. Command and Control Instrument: The Implement of Target Responsibility Contracts (TRCs)

So far, China's approach to the control of greenhouse gas emissions has been based on a direct regulatory system—which is known as Target Responsibility Contracts 目标责任制 (TRCs henceforth)—through administrative and political measures. During the 11th FYP, the government implemented the responsibility system for fulfilling energy-saving targets and public announcement of GDP energy consumption. It has played a critical role in achieving energy conservation targets since the 11th FYP (Qi, 2013).

TRCs are implemented at such four administrative levels as province, city, county, and township across a broad range of energy intensive enterprises. The central government divides and assign targets to provincial-level administrations (including the autonomous regions and municipalities directly under the central government) and sets up a target responsibility assessment system. Achievement of the energy-saving targets is part of the provincial government evaluation system in which no promotion is given to officials who fails to meet their share of the energy-conservation targets (The State Council, 2007).

In this target responsibility system for carbon intensity reduction, energy intensity targets have been set at national, provincial, and corporational levels. The NDRC, representing the State Council, is responsible for the centralized administration. They supervise indicator system of evaluation and examine energy conservation progress in provincial governments annually. Cities, counties, and large companies should all report their energy-saving performance to their provincial government, and provincial government also need report up to central government annually. According to an independent statistic system, the National Statistic Bureau 国家统计局

(NSB), after reviewing and evaluating provincial-level GDPs and energy consumptions, reports the results to the NDRC and the State Council and releases information on the average or total energy use or energy use by industry (Zhou, 2010).

The policy regarding energy conversation and emission reduction was not only one of the most important public policies formulated by the central government, but also one of the most strictly public policies carried out by local government at various levels during the 11th FYP. And the system of target responsibility assessment is the key to successful implementation of the policy (Ma et al., 2011). The use of this system provides strong incentives to governments at all levels to take strong measures in order to reach their objectives in energy-saving.

4. Implementing the Top-1000 Program and Top-10,000 Program

In the 11th FYP, the central government established an ambitious goal of reducing energy intensity reduction by 20% by 2010. The achievement of this goal will require a reduction in energy use or savings but it will still maintain a GDP-growth rate of 7% every year. Industry sector is an energy-intensive consumer. It uses about 70% of the total primary energy according to the figures released by the Office for National Statistics in several years.

Thus, a top-down policy of total emission control was implemented in industrial sectors. Known as the Top-1000 Energy-Consuming Enterprises program (Top-1000 program), the policy was launched in April 2006 by the Central government, which has set up energy-saving targets for 1000 highest energy-consuming enterprises in nine energy-intensive major industries, including iron and steel, non-ferrous, coal, electric power, petroleum and petrochemical, chemical, building materials, textile, paper and other industries. The policy stipulated that these enterprises within the Top-1000 program save 100 Mtce (2.9 EJ) by 2010 (NDRC, 2006).

Under a contract signed with the NDRC that promised to reach energy-savings target and cover a number of enterprises within its jurisdiction, an energy-efficiency target contract was signed by the governments of some provinces with the energy-consuming enterprises. For example, the NDRC signed an agreement with the Beijing Municipal Government covering ten enterprises within Beijing's jurisdiction. The Beijing Municipal Government, in turn, signed energy-efficiency target contracts that include energy saving amounts with each of the ten enterprises (Wang, 2006). All the participating enterprises that have signed energy conservation agreements with local governments are required to report their quarterly consumptions of energy and fuel to NBS.

The Top-1000 program has had important effect on the fulfilment of the targets of the 11th FYP. The "Top-1000 Enterprises Energy Use Report" 千家企业能源状况利用公报 2007 released in September 2007 (NDRC & NBS, 2007) shows a calculated total energy savings of 20 Mtce in 2006, 14.92-Mtce (437 PJ) energy savings by sector, and 5.08 Mtce of non-allocated savings (149 PJ). The reported energy savings for the first year of the program (2006) indicate that it is on target to reach the program goal of saving 100 Mtce in 2010. In fact, total energy savings from 2006-2010 is 150 Mtce (NDRC, 2011), surpassing the target of 100 Mtce. The total reduction of emission from 2006-2010 is almost 400 $MtCO_2$ (ClimateWorks, 2011). Between 2005 and 2010, industrial enterprises' energy-conservation investment in the upgrading of technology and equipment totalled USD 92.6 billion, four times over the past five years, of which the 1000-Program enterprises invested approximately 40% (Qi, 2013).

Of course, because the Top-1000 Program was designed and implemented quickly in 2006, deficiencies are inevitable. Some studies (e.g. Price et al., 2008) evaluated the 1000-program and pointed out that the target setting was not reasonable enough; a harmonized set of supporting polices and program were not established prior to the announcement of 1000 program; a systematic means to gather or disseminate energy efficiency information sources had not been developed; and there had been no effective monitoring guidelines established in the beginning. Once its implementation is optimized, this program will contribute greatly to China's reduction in energy use per unit of GDP.

Based on the experience of the Top 1000 program, the government further perfected the design of program and expanded it as the "Top-10,000 Program" in the 12th FYP, covering two thirds of the total energy consumption in the Chinese mainland, aiming to save 250 million tce and contribute to 37% of the total national energy saving target by 2015. The supporting programs and policies in the implement of the Top-1000 program, such as facility audits, assessments, benchmarking, monitoring, information dissemination, and financial incentives, have also been improved and enhanced. A core new element is Energy management, the central government officially mandated that provinces implement energy management programs (EnMPs) and target the programs at companies covered in the Top-10,000 program. As of November 2012, there were 37 institutions in 13 indus-

tries that had conducted EnMS certification pilots (CNCA, 2012).

Compared with the Top-1000 program, the Top-10,000 program has been designed and implemented more thoughtfully. Overall, the 1000 and 10,000 Enterprises programmes, as the core measure in the energy conservation policy to be implemented in China, play a key role in energy saving and emission reductions in the most recent two FYP phases.

5. Implementing Code and Standards for Energy Efficiency in Civil-Engineering Industry

Civil-engineering industry (CEI henceforth) can be an important contributor to the energy consumption and CO_2 emissions in almost any country in the world. With large scale urban expansion along with frequent renovations and demolitions of older buildings, the energy consumption in China's CEI has been growing at a high speed. In fact it has almost doubled from 2003 to 2009. The number was 3.48 billion tce in 2012 (CABR, 2013), accounting nearly a third of the primary energy consumption (BERC, 2011; NBS, 2010). According to the forecast of Chinese Academy of Engineering (CAE), China's energy consumption will reach 7.9 billion tons tec in 2020 if it maintains an annual increase of 8.9% (CABR, 2013). At the same time, CO_2 emissions associated with energy consumption in the sector of CEI was 1260 million tons, accounting for nearly one fifth of the total CO_2 emission in the Chinese mainland that year (Qi, 2010).

Since 1980's, the Ministry of Housing and Urban-Rural Development 住房和城乡建设部 (MOHURD), on behalf of the central government, has been working on a project to enhance energy efficiency in CEI based on the principle of taking into consideration the regional characteristics and types of building. In terms of energy efficiency in CEI, China has established a new—and relatively complete—system for CEI, including design standards and acceptance codes related to walls, curtain walls, doors and windows, roofing, flooring, HVAC, power distribution, lighting, monitoring and quality control, cover residential and public buildings, multiple climate zones. Enforced by the MOHURD, the Standards for Design & Construction were also adopted by the 11th FYP to require a 50% reduction of a building's total operational load. Construction enterprises were asked to meet the new standards. If they do not comply with the regulation, they may face a penalty ranging from CNY 200,000 to CNY 500,000. Design institutes that violate the rules will face penalties from CNY 100,000 to 300,000 (The State Council, 2008).

In order to promote the implementation and enforcement of the said standards, the MOHURD started hundreds of green-building demonstrations and hundreds of demonstrations for the building of low energy consumption buildings at the ended of 2007 (MOHURD, 2007). To go with these projects, a series of regulations on the labelling of green buildings and the evaluation guidelines of this labelling system have been released in the CEI and market. Among them there are regulation on green building evaluation, regulation on one star and two star green building, and specific technical guideline for green building evaluation, and so on. The evaluation system of green building mainly include one priority requirement and six general requirements of land efficiency, energy efficiency, water efficiency, material efficiency, indoor air quality and operation and maintenance. Primary objectives include the reduction of the waste of resources, reducing pollutants, particularly carbon dioxide, and providing users with a healthy living environment.

Furthermore, some demonstration projects based on a market-oriented system of code for energy efficiency buildings are supported by the central and local governments. For example, China has been cooperating with Singapore on planning and implementing Tianjin eco-city construction to demonstrate the green building technology and low energy consumption rooted in local conditions. As for Beijing, a "City of Future Science and Technology" has been planned and constructed in Changping 昌平, which has joined the new northern district of Haidian 海淀北部新区, and "lize 丽则 financial business district" in Fengtai 丰台 as the three demonstration parks of green building.

Based on National Outline for Medium and Long Term S&T 2006-2020, the central government spent more than 300 million USD on the R&D of energy efficiency in CEI and green building in the 11th FYP. From 2008 to 2012, there were 742 demonstration projects of green building approved with their star ratings granted. They include 237 one-star projects, 295 two-star projects and 210 three-star project, which covered 7582 square kilometre of residential and public building in 2012 (see **Figure 2**).

During the 12th FYP, the government put forward an objective for further development, according to which green building's gross floor area must increase up to more than 1 billion floor areas. By the end of 2015, 20% of urban building will be green building, and by 2020 the percentage must go beyond 30% of the total construction.

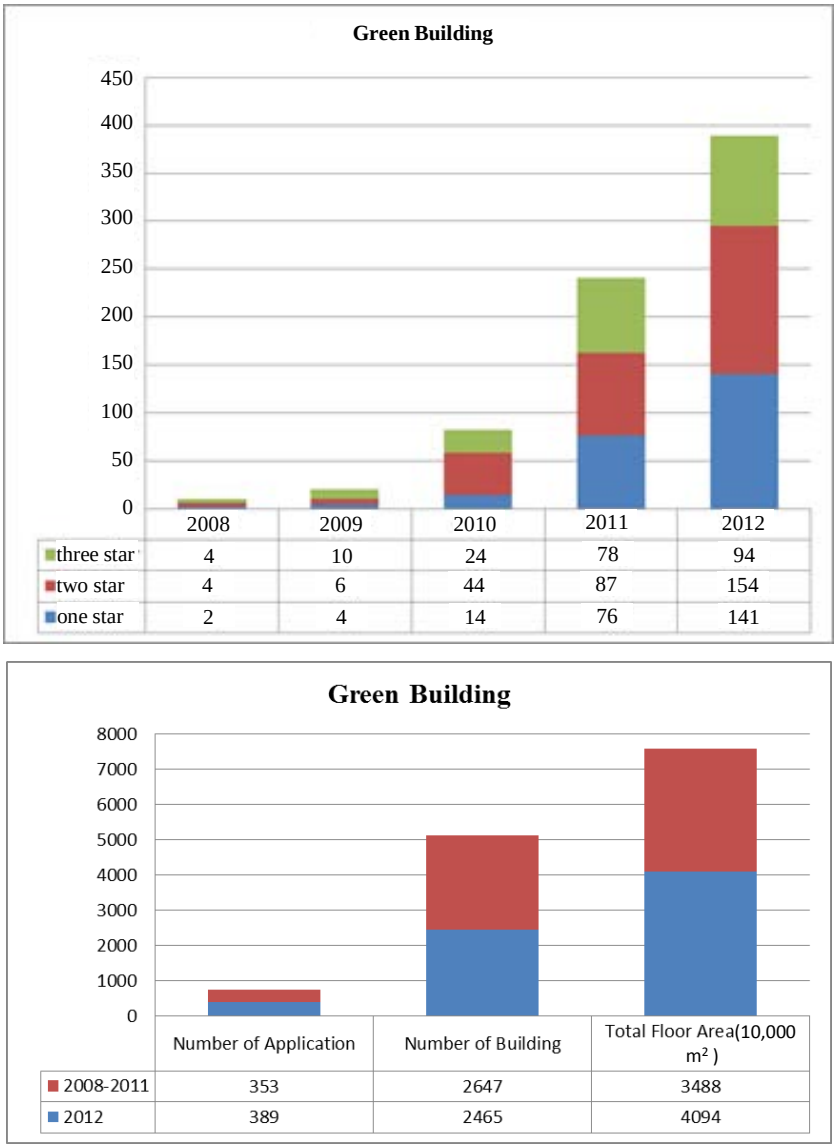

Figure 2. The approved green building from 2008 to 2012. Source: China Academy of Building Research (CABR), 2013/SCSC/WKSP1/013.

Since 2014, the kinds of buildings invested by the government, indemnificatory apartment and large public buildings, must comply with the green building standards since 2014 (The General Office, 2013). Thus, a series of incentive policies, such as financial award, tax preference, preferential policies of land use and the improvement of finical service have been enacted by the central government. In 2012, the MOHURD put forward its new incentive policies of green building which would provide ¥45/(7 USD) subsidy for two-star green building, ¥80/(13 USD) for three-star green building and ¥50,000,000 (8,000,000 USD) subsidy for the green ecological district (MOUHRD, 2012). There could be some shortcomings in the system design regarding mandatory codes and standards of building energy efficiency, such as weaknesses in monitoring mechanisms and legal enforcements. And there lacks a single institution to coordinate energy policy at the national level etc. (Richerzhagen et al., 2008). These problems would influence the implementation of EEB policies and measures in China. But obviously, mandatory codes and standards of building energy efficiency have a very positive impact on the reduction of energy consumption and greenhouse gas emissions. With the financial incentives and implemented mandatory in some cities, green building will grow quickly and play a key role in the enhancement of energy efficiency in CEI.

6. Conclusion

In general, given the rapid growth of economy, the coal-dominated energy mix and the massive inefficient use of energy have put huge pressure on the environment in the mainland of China. The government has initiated many policies and measures, such as facilitating adjustment of industrial structure, launching national low carbon pilot provinces (cities) project, and developing green low-carbon energy. At the same time, policy making in the government is focused particularly on issues of energy efficiency, on the question of how to enhance energy efficiency in the high energy-consuming sector of industry and building to reach its goals of reducing its energy intensity and carbon emission. This is where China and Japan greatly differ. The latter would attach more importance on energy security. In the implementation process, command and control instruments are applied much more than market-based instruments. Among the instruments, the TRCs are dominant thanks to its high effectiveness in the implementations of all kinds of low carbon actions, such as the implementation of Top-1000 program, Top-10,000 program, and code and standards of building energy efficiency.

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