

Research on China's Low-carbon Economy Development*

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Abstract At present, China is in the dilemma between grasping the opportunity of economic growth and low carbon transformation. We must follow the general rule of keeping economic and social development going with the climate protection, and conform to the trend of the economic development of low carbon. At the same time, we should accord to China's basic national conditions and the interests of the state, looking for coordination between a long-term and short-term interest and balance of policy targets and seeking for a win-win low carbon development path. Based on the overview of low carbon economy and the requirements of the development, finally, the paper analyses and gets several strategies of China's low-carbon economy development.

Key words Low carbon economy; Low energy consumption; Energy resources

1 Introduction

Ice melted and the sea level rose, the ecosystem degradation, frequent natural disasters, such facts show that global climate warming consequences will involve the security of food, water resources, energy, ecology and public, even direct a threat to the survival and development of the mankind. In order to cope with the climate condition and worsening energy shortage, the British government published white paper on energy in 2003, and initially brought out the concept of “the low-carbon Economy”.

2 Sketch of Low Carbon Economy

2.1 Concepts of low carbon economic

So-called low carbon economy refers to the concept of under the guidance of sustainable development, through the method of technological innovation, institutional renovation, industry transformation, and exploiting new energy, as well as to reducing high carbon and energy consumption, such as petroleum and coal, and reducing greenhouse gas emissions, in order to reach a win-win status between community and economic development and ecological environment protection.

In the sake of developing low-carbon economy, on the one hand, we should undertake the duty for environmental protection; complete the country's requirements of energy consumption indicators, on the other hand, we have to adjust the structure of economics, improve the efficiency of energy utilization, develop new industries, and promote a conservation culture.

2.2 Background of low carbon economic

The main background of “low carbon economy” is global warming, which brings great challenges to human survival and development. Along with the growth of global population and economic scale, the use of energy and the environmental problems it have taken to us and its reasons have been gradually realized by humans. Not only the threatens from smog photochemical smog and the acid rain, but also the increasing carbon dioxide (CO₂) concentration in the atmosphere can change global climate, which has been identified as a incontestable fact.

In this context, “carbon footprint” and “low-carbon economy”, “low carbon technology” and “low carbon development”, “low carbon lifestyle”, “low carbon society”, “low carbon city”, and “low carbon world” and so on a series of new concepts and policies rise in response to the proper time and conditions. And the result of transformation in energy and economic up to the great changes in values may probably gradually lead a new road towards ecological civilization, that is abandoning the traditional growth pattern of the 20th century, applying new technology and innovation mechanism directly, and achieving the sustainable development of society through low-carbon economy model and low carbon lifestyle.

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3 Analysis of the Necessity of China's Development of Low Carbon Economy

China's economic development of low carbon is facing various pressures, specifically including the following aspects.

Heavy pressure on the environment in the process of China's industrialization. China is in the process of the intermediate stage of industrialization, industrial proportion in GDP has substantial increase, and features of heavy industry industrialization are very obvious. Compared with any other economies in the world, China has a very huge population, so the material production and consumption that China needs in the industrialization process will be larger than other countries. Meanwhile, China's economic growth has been more than the world average level, and will continue to maintain the tendency of fast growth (Ji JianGuo etc.2005).Rapid urbanization and infrastructure construction have the basic characteristics of high consumption of resources and intensive pollution.

The seriousness of China's ecological environment problem is not only lies in the total increase in sewage and the scope of ecological destruction spread out, and the contradiction between supply and demand of resources is becoming more serious, but also in mutual influence between serious environmental problems and resources along with the social and economic development, which has endangered the base for the sustainable development of national (Zhuang Guiyang 2005). The existing research shows that China's environmental pollution and ecological destruction of economic loss is quite great, the incomplete conservative estimate is equivalent to T~20% of GDP (Guo xiaoming 2004). Because China must take economic development as the central task, the future development will inevitably face tremendous pressure on the environment, and this pressure will be increasingly larger.

China is facing the pressure of resources shortage. Since 2003, the economic growth has passed out a clear signal: China supply of resources cannot satisfy the needs of sustained economic rapid growth, the pressure on resources increased rapidly (Zhuang Guiyang 2005). In the next 15 years China will be in the high-speed development of the industrialization, this phase is the peak of resource consumption. While China's per capita amount of resources is far lower than the world's average level. Therefore, China's economic growth will push the world's primary product prices to new heights in a short future, the friction of interest between China and the main resource importers will increase.

China has to deal with climate challenge. From 1990-2001, China's CO₂ net emission reached 8.23 million tons, is 27% of the world's total growth. The net additions tendency of China's energy consumption and emissions of greenhouse gases shows that it is necessary to reduce its own greenhouse gas emissions. Some international popular opinions thinks that, in order to realize the ultimate goal of the convention , the prerequisite is to implement a carbon emission reduction in China(Kang Gengke 2002). Energy supply and energy security has become China's the main restrict factors in industrialization. Reducing greenhouse gas emissions to a certain extent can also help to achieve the goal (Chen Panhu, 2005). Therefore, in the next 20 ~ 50 years, China needs to balance between the development of industrialization and greenhouse gas emissions. The only choice for China is to transfer pressure into motive power for seeking road to low-carbon development.

Table 1 Trend of Emission Structure Some Countries and Regions

countries and regions	1990		2003		2015		2030	
	quantity	%	quantity	%	quantity	%	quantity	%
the world	212.23	100	250.38	100	336.63	100	436.76	100
USA	49.78	23.46	57.96	23.15	67.18	19.96	81.15	18.58
EU	40.89	19.27	42.64	17.03	46.23	13.73	52.23	11.96
Japan	10.11	0.48	12.06	4.82	12.28	3.65	12.19	2.79
India	5.78	0.03	10.23	4.09	15.92	4.73	22.16	5.07
China	22.41	10.56	35.41	14.14	70	20.79	107.16	24.54

4 Feasibility Analyses of China's Development of Low-carbon Economy

There exists several potential advantages for China in realizing the transformation to low carbon economy development, it includes the following aspects.

4.1 Large space for emission

Our industrial structure and consumption structure is still in energy-intensive stage, and energy saving technology level is lower than other countries as well as a lot of loopholes in energy management, China's energy intensity and energy efficiency is obviously lower than the world's average level.

Research shows that China's energy efficiency of the system comes out to be 33.4% , and is one percentage point lower than the international advanced level. And the unit products consumption of eight industries (including steel, nonferrous, petrochemical industry, building materials, chemical industry, light industry and textile industry) is 40% higher than the international advanced level on average, motor vehicle fuel consumption level is 25% higher than in Europe and 20% in Japan, energy consumption per unit in heating building area is equivalent 2 ~ 3 times as developed countries with similar climate-changing condition (Jin Leqin, 2009). Therefore, the room will be bigger if we realize energy saving and emission reduction through approaches such as restructuring and technological innovation and improvement of management.

4.2 The low cost in reduction

Compared with developed countries, China has lower cost in reduction. Internationally, the framework convention set the emission cost per ton is more than \$30, while China is in the cost of \$15. Along with China's energy demand growth, a large number of items qualified the conditions for emission reduction, and obvious features in scale economics, these all contribute to the development of international trade, and thereby attract funds into international carbon emissions projects(Yu Leqing,2009).

4.3 Potential in technical cooperation

On the one hand, there exists big gap between China and developed countries in low carbon technology , China still have large room for improvement. On the other hand, opportunities in low carbon international cooperation are increasing. As a big country with high energy consumption and emissions of greenhouse gases, China should seize the opportunity, and introduce advanced technology actively, accelerate the low carbon technological innovation and promotion speed. But we should also aware that there are some difficulties in the actual process. Because of involving intellectual property and business interests, China still have to rely mainly on the commercial channel to introduce technology (Jin Leqin, 2009).

5 China's Choices of Development Path in Low-carbon Economy

According to the Kyoto protocol, China as a developing country has no commitment to reduce greenhouse gas emission. China's current priority target is the economic and social development, but needs environment protection policies adapt to the economic and social development and the greenhouse gas emissions space. Therefore, China should achieve the low carbon development under the precondition of not affect the social economic development targets in the future, its possible approaches include several ways.

5.1 Development in the low carbon industry

Adjust the industrial structure, develop the industries with the characteristics of low carbon, and set restrictions in market accessing for high carbon industries. The adjustment of industrial structure is a very important approach for economic development of low carbon (Ren Weifeng, 2008). As is known to all, the knowledge intensive and technology-intensive industries belong to the low carbon industries. Such as the information industries, whose energy and material consumptions is very limited, and its impact on environmental is negligible. IT industry has the ultimate potentiality in developing low-carbon economy, both hardware and software has low energy consumption and low pollution. Another example is modern service industry , which is a low carbon industry with low energy consumption and low pollution, but has large employment capacity .

Therefore, it is of strategic significance to optimize the industrial structure and improve high threshold for carbon industry admittance, actively develop the low carbon industry.

5.2 Development in the low carbon agriculture

Reduce our dependence on fossil fuels, and seek a new way on organic ecological and agriculture efficiency. Modern agriculture is based on the foundation of fossil fuels. Fertilizers and pesticides is the key to the development of modern agriculture, which had ever made contribution to human with solving the problem of grain. However, the disadvantages of fertilizers and pesticide contamination because of high energy consumption have been known gradually, it is not only affected soil organic composition, crop of pesticide residues and food safety, but also consume large amounts of fossil energy, produce large amounts of carbon dioxide emissions in the production process itself. So, the modern agriculture can be even called "high carbon agriculture".

The paths of low carbon agriculture development are: First, greatly reduced dosage of fertilizers

and pesticides. Reduce dependence on fossil fuels in agricultural production process, and lead new road with organic ecological agriculture. Second, make full use of agricultural surplus energy. Third, promote technology of solar and biogas, Using the effective ways of low carbon countryside by popularize solar energy collector in rural areas.

5.3 Development in the low carbon industry

Optimize the energy structure and improve energy efficiency, reduce carbon dioxide emissions. Traditional industrial development can not be divided from tremendous energy provided by fossil fuels. Energy structure of high carbonization is the inevitable result of the traditional industrialization. So in the exploiting of new energy , we should combine the adjustment in the energy structure and the improvement in energy efficiency, adopt low carbon technology, energy-saving technology and reduction technology ,and gradually reduce the excessive dependence on fossil energy of traditional industries. Then improve the overall efficiency of the existing energy system, contains the total cost fossil energy, restrict and eliminate high carbon industry and products, develop low carbon industry and products. At the same time, the government should formulate tax policies on high energy and carbon industries and products, while making preferential policies to encourage the development of low carbon industry, so that we can make low carbon industry become entrepreneurs profitable emerging industries.

5.4 Development in the low carbon city

Develop a low carbon living space; provide low carbonization of urban public transport system. Low carbon city construction cant live without the unit of low carbon buildings , the development of low carbon buildings must start with from the two aspects of the design and operation (Ren Weifeng, 2008) . Import the concept of low carbon in the architectural design, such as utilizing solar energy, selection of the building heat preservation materials, reasonable design ventilation and select lighting system heating and refrigeration energy-saving system. In the process of operation, advocate the low carbon adornment in living space, choose low carbon adornment material, avoid excessive decorate, advocate energy conservation and promote home appliances, encourage the use of energy efficient kitchen ,effectively reduce carbon emissions per family from all aspects of the system of "saving".

Urban traffic tool is main cause of greenhouse gases; low carbon emitter traffic is the direction of development in the future. First, develop the slow traffic system of using bicycle and walking (Ren Weifeng, 2008). Second ,encourage the development of the bus system and rapid rail transit system ,such as the rail and the subway system (Zhang Xuemei ,2005). The third is to restrict the private cars as urban traffic tools. In addition, the urban transportation should advocate the development of hybrid cars, electric cars, hydrogen cars, solar cars and fuel ethanol cars as low carbon transportation, in order to achieve the goal of low carbonization in urban operation.

5.5 Guiding the finance to develop innovative low-carbon economy

Establish Carbon trading market mechanism, developing carbon emissions reduction futures and options markets. Global trading of greenhouse gas emission reductions gradually formed a special carbon finance market (including direct financial investment, carbon index trading, and bank loans). Carbon finance market is facing such a situation (Ren weifeng, 2008): Financial institutions urgently need to develop the products of owning carbon emissions right and improve financial services, the actual demand side of greenhouse gas emissions right-large enterprises should now build various types of emission reduction portfolio of assets to reduce costs of emission reductions. Now there are four global carbon exchanges specializing in financial transactions, many well-known financial institutions are active in these markets, according to the World Bank report, the amount of transactions of the international carbon finance market in 2006 has reached more than 300 billion dollars. Chinese government should also develop financial innovation; develop carbon trading-related financial activities to promote solution to the environmental protection problem.

5.6 Focus on carbon sink and carbon reduction

Afforestation, biological carbon sequestration, expand carbon sinks. To development low carbon economy, we should not only contain the carbon source effectively to reduce the carbon emissions, but also should try to makes efforts in carbon sink. Carbon source refers to the source of carbon dioxide. It is both from the natural world and the process of human production and life. Carbon sink, refers to the physical nature of carbon storage, forest vegetation is considered as a huge carbon sink on the earth (Ren weifeng, 2008). The results show that: the growth of forest vegetation in the land can absorb and fix carbon dioxide in biological organisms in the forest, the annual net carbon uptake of forest vegetation is about 1000 to 1500 million tons through photosynthesis. Therefore, the function of afforestation is not just a simple green environment, but to become an important component of low

carbon economy, and to become a most effective way of biological sequestration, expanding carbon sinks, mitigation greenhouse effect, reducing carbon dioxide emissions (Jiang zehui, 2003).

6 Conclusion

Low carbon economy is the outlet for human society in sustainable development, its development rely on the adjustment of industrial structure, the energy structure and consumption structure, and we need policies and regulations support ,as well as innovation of science. Generally speaking, China's road in low carbon economy is according with the requirement of sustainable socio-economic development, and also coinciding with the requirement of global climate environmental cooperation. Can China went to the top of the world in development in the coming decades, largely depends on China's adjustment ability in economic development with low carbon. Therefore, China should take some actively actions as soon as possible to deal with the severe challenges: establish low carbon energy system, low carbon technology system and low carbon industry structure, establish mode of production, consumption patterns, make international and domestic policies along with legal system and the market mechanism to encourage the development of low carbon, and finally achieved the goal of changing from "high carbon" to "low carbon" era, and realize the harmonious development between economy and society, man and nature.

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