



全球变化系列丛书

GLOBAL CHANGE SERIES

国务院参事室“我国绿色低碳发展的关键支撑政策与技术研究”课题资助

中国绿色低碳发展的对策 及国际碳税的审视

COUNTERMEASURES FOR CHINA'S GREEN LOW CARBON DEVELOPMENT
AND INTERNATIONAL CARBON TAX REVIEW

崔伟宏 蒋样明 霍文娟 / 编著



人民教育出版社



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序 言

2003年,英国能源白皮书《我们能源的未来:创建低碳经济》中首次提出“低碳经济”的概念,随后被各国政府部门、国际组织、学术界、商业界和社会团体与非政府机构广泛利用。近两年的气候变化谈判更是把低碳经济提到前所未有的高度。

2011年,联合国环境署发布《迈向绿色经济》,报告提出绿色经济应覆盖经济转型、资源效率和社会福利三个领域。2012年,在巴西里约召开的联合国可持续发展大会,提出了全球绿色经济发展基本框架。

2015年,党的十八届五中全会提出了创新、协调、绿色、开放、共享的发展理念。坚持“绿色发展”指明了中国特色社会主义发展道路。

在全球化绿色经济发展框架下,发达国家和发展中国家是不同的,发达国家提出的绿色经济发展模式是基本上解决了产业化对传统环境影响以后,提倡的新的发展模式,发展低碳经济是以新能源、低碳技术,以及后续的行动为主;而我们尚处于工业化周期和大量农村人口向城市转移的城市化中期阶段,且以煤为主要能源结构,也要经过一段时间才可以有根本的改变。发展绿色经济,我们与发达国家有不同的目标和内容。针对我国所能接受的目标,在开发新能源的同时,必须兼顾传统农业生产、能效和资源利用效率的提高。对其加以改造,探索符合我国国情的绿色低碳发展模式。

崔伟宏教授领导下的气候变化研究组,几年来参加了科技部“我国



绿色低碳发展关键支撑政策与技术研究”等多项气候变化研究,在跟踪气候变化不确定性和国际碳税及碳交易等问题的同时,着重研究我国绿色低碳发展趋势和对策,这也是探讨中国特色的绿色低碳发展模式的一种尝试。课题组集思广益,汇集了大量资料,进行初步分析,这对于拓宽研究思路,促进中国特色的绿色经济发展有重要的参考价值。

刘燕华

国务院参事
国际欧亚科学院院士
国家气候变化专家委员会主任
2016年12月

/ PREFACE /

The concept of “low carbon economy” was firstly proposed in the UK Energy White Paper “Our Energy Future-Creating a Low Carbon Economy” in 2003. It was then widely used by governments, international agencies, academia, business and social groups, and non-governmental organizations. The climate change negotiations in the past two years have brought the low carbon economy to an unprecedented importance.

The United Nations Environment Programme (UNEP) issued a report on “Green Economy-Pathways to Sustainable Development and Poverty Eradication” in 2011, which indicates that the green economy should cover three domains, which are economic transformation, resource using high efficiency and social welfare. The United Nations Conference on Sustainable Development in Rio, Brazil put forward the basic framework of global green economy development.

The concept of innovation, coordination, green, open and share was proposed by the recent 5th Plenary Session of the 18th Central Committee of the Communist Party of China. The socialism roadmap of “green development” is a path with Chinese characteristics.

Under the framework of global green economy development, it is totally different between developed countries and developing countries. The green economy development model proposed by developed countries is the new development model after solving the traditional problems of the industrialization impact on environment. This model is basically dominated by new energy and



low-carbon technologies, and are indeed a series of follow-up actions. China are still in the mid-stage of industrialization and urbanization with large rural populations moving to cities. It will take a long time to make fundamental changes of the energy structure of coal being the main energy source. To develop green economy, we have different goals and actions from developed countries. In response to the goals that China can accept, traditional agricultural production, energy utilization efficiency and resource utilization efficiency should be considered while developing new energy sources. We need to transform the model and explore a green and low-carbon development model that is in line with China's current stages.

With the leadership of Professor Cui Weihong, the Climate Change Research Group has participated in several climate change research projects, such as "Research on Key Supporting Policy and Technology for China's Green and Low Carbon Development" sponsored by Chinese Ministry of Science and Technology. Based on tracking the research on climate change uncertainties, international carbon tax and carbon trading, this group has been studying the development trend and policies of green and low carbon development in China. This is an attempt to explore the green and low carbon development model with Chinese characteristics. The research group gathered and analyzed large amounts of data for compilation of the book. This book is an important reference for widening relative research ideas and promoting the development of green economy with Chinese characteristics.

Liu Yanhua

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前言

最近几年我们一直致力于跟踪国际气候变化研究。本书是在承担科技部“我国绿色低碳发展关键支撑政策与技术研究(2012BAC20B08)”等多项气候变化研究项目基础上完成的。在跟踪气候变化不确定性研究和跟踪国际碳税发展的同时,着重研究我国绿色低碳的发展趋势和对策,同时对国际上碳税、碳排放交易等经济手段控制碳排放进行跟踪和审视。

项目至今共编写了 37 期简讯和 4 份建议报告,约 128 万字,编写过程中与俄罗斯科学院、美国科学院,以及法国科学院等开展了气候变化方面的密切合作,实现了与全球布设的 5000 个网点进行数据传输与共享,增强了各国之间关于气候变化信息和政策的互联互通。在此期间,还利用温室气体观测卫星(GOSAT)观测数据,建立了地面 975hpa 的 CO_2 浓度遥感监测方法,研究了中国区域近地面 CO_2 浓度分布的时空变化特征。

关于气候变化,联合国政府间气候变化委员会(IPCC)前后公布了第四次和第五次评估报告,指出过去 100 年全球地表平均温度升高了 0.74°C ,过去 50 年观测到的数据显示,地球平均温度升高,95%以上的可能性是由于人类活动(石化产品)引起 CO_2 排放的大量增加导致的。要控制气候变暖,就必须大量减少 CO_2 的排放,发展低碳经济。

但是我们也注意到,联合国环境署于 2011 年发布《迈向绿色经济》的报告,巴西里约联合国可持续发展大会郑重提出全球绿色经济发展基本框架,提出过去 40 年是褐色经济,在褐色经济下,各国在经济发展



的同时,资源与生态环境遭到严重破坏,自然环境退化,空气严重污染,水资源短缺,环境出现全面危机,要实现可持续发展,必须全面推动绿色经济。

综合上面两方面的交汇点,结论和方向是一致的,那就是发展绿色经济。尽管目前关于气候变暖归因的科学分析还有待进一步论证,是否人为的(石化产品) CO_2 增加就一定导致气候变暖,还有不同争论,但是我国经过 30 年高速发展之后,转变经济发展模式,节能减排,发展绿色经济已经成为刻不容缓的重大问题。党的十八届五中全会提出创新、协调、绿色、开放、共享的发展理念,表明已经把绿色发展放在我国经济发展的重要战略地位。

但是如何发展绿色经济,我国的绿色经济与发达国家发展的绿色经济有何不同,根据中国经济的特点和问题,发展中国特色的绿色经济,是我们深入探讨的重要问题。本书的编写,就是试图探讨如何根据中国特点发展绿色经济,为我国绿色低碳发展提供对策研究。

全书包括三篇:

第一篇是全球气候变化及绿色低碳发展的国际形势,包括两章,评估我国在全球气候变化中面临的挑战。我国积极采取“碳减排的战略方案”,本篇重点讨论碳排放空间对我国经济发展的影响。

第二篇是中国特色的绿色经济发展的理论方法及对策途径。第二篇包括七章,介绍了绿色发展的重要意义;提出绿色能源是绿色经济的基础;论证了核能、太阳能、风能、地热能、水能发展及存在问题及对策。针对我国是以煤为主要能源结构的现状,论证了煤制油和低价煤的有效利用,论证了绿色建筑、绿色交通和循环经济发展的必要性及发展措施。并提出了区域绿色低碳循环经济评价体系和 MRV 碳排放监测系统。

第三篇是国际碳税及对我国碳排放交易体系的启示,共包括七章。对碳税进行简单的介绍,主要跟踪目前各国的碳税征收情况及相关的经验;对不同形式的碳税影响做简要地分析和评述;介绍了目前征收碳税存在的问题;介绍了欧盟的碳排放交易体系和中国的碳排放交易市场,同时

针对航空碳税进行了评述;分析了碳关税对中国经济发展的影响;总结了各国碳税征收经验;最后针对我国国情提出我国实施碳税的可能性建议。

本书得到国务院参事室的大力支持和合作,由中国科学院遥感与数字地球研究所气候变化课题组完成,并得到国务院参事室张彦通司长、课题顾问刘燕华参事指导并为本书写了序言,同时特别顾问清华大学低碳经济研究院何建坤院长给予了热情指导,谨致由衷感谢。

本书完稿于2016年年底,最近两年关于绿色发展有重要进展。习近平主席在2017年5月“一带一路”高峰论坛上明确提出两项合作倡议:建设生态大数据服务平台和“一带一路”绿色发展联盟。为贯彻习近平同志的重要指示,国家四部委提出“推进绿色‘一带一路’”文件,推动了“一带一路”的绿色发展。目前,“一带一路”沿线绿色城市、绿色农业、绿色经济等已有所发展,其经验可为其他国家提供参考。

本书涉及范围较广,由于作者水平有限,书中内容可能有不妥之处,谨抛砖引玉,衷心希望广大读者不吝赐教,批评指正。

崔伟宏

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2017年10月

FORWARD

We have been working on international climate change research tracking in recent years. This book is the result of several climate change research projects, such as “Research on Key Supporting Policy and Technology for China’s Green and Low Carbon Development (2012BAC20B08)” sponsored by Chinese Ministry of Science and Technology. As we are tracking the international research of climate change uncertainties and carbon tax, we paid attention to China’s green and low carbon development trend and policies, and we further tracked and reviewed the influences of carbon tax and carbon emissions trading on the control of carbon emissions.

Till now, the project has compiled 37 newsletters and 4 reports including approximately 1.28 million words. During the research, we have carried out close cooperation on climate change with Russian Academy of Sciences, American Academy of Sciences, and French Academy of Sciences. Data in global 5000 sites were deployed, transmit-

ted and shared. Our work enhanced the interlinkages between countries on climate change information and policies. In the meantime, using the observation data of greenhouse gas observation satellite (GOSAT), combined with the geoscience analysis method, we established the remote sensing monitoring method of CO₂ concentration (ground 975hpa). The temporal and spatial variation characteristics of CO₂ concentration distribution patterns near the ground in China were studied.

About climate change, the United Nations Intergovernmental Panel on Climate Change (IPCC) published the 4th and 5th assessment reports, indicating that over the past 100 years, the global average surface temperature has risen by 0.74°C. The reports further indicated that according to the data observed over the past 50 years, the temperature increase (> 95% possibility) is due to the large increase in CO₂ emissions caused by human activities (petrochemical products). To control global warming, it is necessary to reduce CO₂ emissions and develop a low carbon economy system.

The United Nations Environment Programme (UNEP) issued a report on “Green Economy-Pathways to Sustainable Development and Poverty Eradication” in 2011. The United Nations Conference on Sustainable Development in Rio, Brazil put forward the “Basic Framework for Global Green Economy Development”. It indicated that the economy in the past 40 years is “brown economy”. The resources and ecological environment were being severely damaged, the natural environment was degraded, the air was seriously polluted, and the water resources were being wasted and remain deficient which led to the environmental crisis under this brown economy system. The green economy should be fully



promoted to achieve the sustainable development.

The conclusion and direction are the same considering the above two points: developing green economy. Although the current views of the attributions of global warming remain unclarified and there are still disputes on whether artificial CO₂ increase (petrochemical products) will definitely lead to the warming or not. However, after 30 years of rapid development, it is a major issue for China to transform the economic development model, saving energy and reduce emissions, and developing green economy. The 4th and 5th Plenary Session of the 18th Central Committee of the Communist Party of China have proposed green development and the concepts of innovation, coordination, green, open and share. The “green development” was in an important strategic position of China’s economic development.

Questions on how to develop green economy, what features of China’s green economy that makes it different from those of developed countries, and how to develop green economy with Chinese characteristics according to the characters and problems of China’s economy, all these are important issues that we should try to explore deeply. Based on China’s characteristics, this book aims to explore how to develop green economy and provide polices for China’s green and low carbon development.

Three main parts are included in the book which are listed below.

The first part includes two chapters. The main content is about the international situation of global climate change and green and low carbon economy development. The challenges in global climate change China faces were assessed. China has adopted the “Strategic Plan for

Carbon Emission Reduction". We focus on the impact of carbon emission quota on China's economic development.

The second part includes seven chapters. The main content is about the theoretical methods and practical policies for the development of green economy with Chinese characteristics. The significances of "green development" were introduced. The idea of green energy being the foundation of green economy was proposed. The development, existing problems and policies of nuclear energy, solar energy, wind energy, geothermal energy, and hydropower were demonstrated. Pinpointing the current structure of coal being the main energy source in China, the effective use of coal-to-liquid (CTL) and low-price coal was demonstrated. The necessities and development measures of green building, green transportation and circular economy development were demonstrated. Both the regional green low carbon recycling economic evaluation system and the MRV carbon emission monitoring system were introduced in the last chapter of this part.

The third part includes seven chapters. The main content is about the international carbon tax and its illumination to China's carbon emission trading system. The carbon tax was briefly introduced; the current carbon tax and related experiences in various countries were reviewed. The different forms of the impact of carbon tax were briefly analyzed and commented. The current problems of carbon tax were introduced. The carbon emissions trading system in EU and the market in China were introduced, and the aviation carbon tax was at the same time reviewed. The impact of carbon tariffs on China's economic development was analyzed. Base on the experiences of carbon tax levy in various



countries and the current situation of China, we finally proposed suggestions on China's implementation of carbon tax.

The research was conducted by the Climate Change Research Group of the Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences. The compilation of the book was strongly supported by the Counselor's Office of Chinese State Council and led by Director Zhang Yantong. Counselor Liu Yanhua supported and guided the compilation and wrote the preface. As the project consultant, Director He Jiankun (Institute of Low Carbon Economy, Tsinghua University) gave us enthusiastic encouragement. I would like to express my sincere gratitude to them.

The draft of this book was firstly finalized at the end of 2016. There have been important progresses about green development in the last two years. President Xi Jinping proposed two initiatives on the Belt and Road Forum for International Cooperation in May, 2017. They are building an ecological big data service platform and building the "Belt & Road" green development alliance, respectively. The four ministries and commissions of China put forward the guidance of "Promoting the Green Belt and Road" to implement the instructions of President Xi and to promote the green development of the Belt and Road. The green city, green agriculture, and green economy along the Belt and Road region, have begun to develop fast. This book could be used as references in the future.

The content of the book covers a broad range. There might be errors and inadequacies due to our limited knowledge. As the old saying goes, *Throw out a brick to attract a jade*, I wish our readers could give

us comments. Any of your opinions will be highly appreciated.

Cui Weihong

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Digital Earth, Chinese Academy of Sciences

Team leader, Climate Change Research Group

Academician, International Eurasian Academy of Sciences

Academician, National Natural Academy of Sciences, Russia

Member of presidium, National Natural Academy of Sciences, Russia

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