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*Perspective from Green Economy*

Guo, Zhengquan; Niu, Dongxiao; Wang, Daojuan

*Published in:*

2012 International Conference on Materials for Renewable Energy & Environment

*Publication date:*  
2012

*Document Version*  
Early version, also known as pre-print

[Link to publication from Aalborg University](#)

*Citation for published version (APA):*

Guo, Z., Niu, D., & Wang, D. (2012). China's Strategic Choice of the Coal Industry: Perspective from Green Economy. In *2012 International Conference on Materials for Renewable Energy & Environment* (pp. 2021-2024). <http://www.shmeeting.org/>

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# China's Strategic Choice of the Coal Industry: Perspective from Green Economy

Zhengquan Guo  
School of Economics and Management  
North China Eclectic Power University  
Beijing, China  
zhengquanguo@163.com

Daojuan Wang  
Department of Business and Management  
Aalborg University  
Aalborg, Denmark

Dongxiao Niu  
School of Economics and Management  
North China Eclectic Power University  
Beijing, China

**Abstract**-Coal mining industry is one of the most influential industries on environment pollution. In recent years, most studies have shown that green and circular economy is the way to solve the deteriorative environment issue. After introducing green economy theory, including background, concept, and features, the paper gives us the strategic choice of China's coal industry. By theoretical analysis, many suggestions have been proposed, including establishment of a people-oriented scientific development ideology, strengthening the implementation of green mining model, encouraging the development of circular economy model, promoting coal industrial technological progress, improving management and security technological innovation.

**Keywords** - coal industry; green economy; strategic choice

## I. BACKGROUND AND FEATURES OF THE GREEN ECONOMY

### A. Background of the green economy

1) The effectiveness of sustainable development has been constantly stressed in the past 20 years. The concept of "sustainable development" has been introduced into the international community for over 20 years, which prompts people to held a number of international conferences on this theme and take actions to perform it. However, it still failed to reverse the trend of resource depletion and environmental degradation. Nearly 70 million people, on one hand, use large quantities of supplies, on the other hand, turn these materials into the waste in the limited space on the earth. The growth of these materials use will eventually lead to the ecological disaster.

Still, the gaps of the income, quality of life and poverty between developed and developing countries are large. The sustainable economic growth is absolutely necessary before the gap is bridged. Even the developed countries also need to maintain a certain economic growth as the basis for the development of the social and economic environment. The key point is to transform the current development pattern into sustainable style. The approach is to minimize the pressure on natural resources.

2) The frequent crisis forces human beings to look for new ways of sustainable development. The worldwide financial

crisis broke out in 2008 in developed countries, and then followed by serious economic recession. It has brought a huge impact on both developed and developing countries. In the past two years, it is not only financial crisis, but also a series of crises including the growing volatility of global energy, food prices, the food shortages and the lack of water and so on. The climate change exacerbates these issues. The crisis has reversed the achieving progress in sustainable development in the past to some extent. The poverty rate began to rise after a slowly drop. The incidence of hunger and malnutrition are increasing. How to achieve the UN Millennium Development Goals should have a new initiative.

### B. The concept and characteristics of the green economy

Through undergoing the 20th century crisis of economic and social environment, human being began reflect on their behaviors. The 18th meeting of the United Nations Commission on Sustainable Development held in May 2010 proposes to lead a new stage of sustainable development and to flourish the core concept of sustainable development with the intelligence and policy. The core idea is not only using a synergetic way to integrate the environment and development, but also considering effectively how to insure sustainable economic development. We should make the environment and resources which are respected as "natural capital" as an important driver of economic prosperity. We need to invest sufficient resources to promote sustainable economic growth. And also, we need to create job opportunities and reduce poverty, while reduce degree of carbon dependency and resource constraints.

The best choice to achieve sustainable growth, solve climate change and promote the prosperity of future employment is to turn the emphasis of the global economy to the investment of clean production technologies, forests, soils and other natural infrastructure. On October 22nd, 2008, UNEP and the famous economists co-sponsored the Green Economy Initiative. In early April 2009, UNEP released the "Global Green New Deal Policy Briefs" report. The UNEP thinks that in the short-term implementation of the Green New Deal can recovery global economy, create employment, and protect

vulnerable groups. In the middle-term, it can reduce dependence on carbon, prevent degradation of eco-environmental system and develop the economy with a clean, sustainable and stable path. In the long-term, it can achieve sustainable, broad-based growth, realizing the Millennium development Goals and eradicating the extreme poverty throughout the world by 2025. Subsequently, the national Green New Deal policies are prevalent all over the world. What is the green economy? Green economy is a creative strategy which refers to a new economy system of production exchange and consumption in an environment-friendly manner.

The characteristics of green economy are described as follows:

1) Green economy emphasizes the importance of the environment, which means pressure on natural resources need to be reduced. It also requires changing the influence of environmental degradation and ecosystem destruction in the process of economic and social development. At the same time, it emphasizes saving energy resources and reducing carbon dependency and carbon emissions.

2) Green economy highlights the “people-oriented” concept of sustainable development. The term of “People-oriented” is the core of sustainable development. It emphasizes to respect the human being’s choice. At the same time, people are asked to shift their production and consumption value into sustainable patterns. It strengthens education training and publicity, and encourages public participation in the process of green economy development.

3) For realizing Green Economy, enterprises, non-governmental organizations, universities and research institutions should take joint enforces, international cooperation and exchanges should be strengthened. In the process of green economic development the governments take actions in the formulation and implementation of policies, strategies and plans, as well as the legislative, regulatory and other institutional and social system. The enterprises should take on their responsibilities to be a good citizenship on environmental and social affairs. The non-governmental organizations and the institutes of science and technology, education, culture, health, and etc. should involve as stakeholders and share responsibility, contribution and the results.

4) Technological innovation is the driving force of promoting green economic development. Green economy means that the production and consumption patterns should be changed. It requires new ideas and values. The entire life cycle of products and services should meet the requirements of green economic development. The cost of products and services will be calculated from purchase and use of raw materials to the final consumption. Technological innovation is an efficient way to reduce the cost. At the same time green economy development bring us into new fields which are not previously involved with and are rare in research and development.

## II. PRESENT SITUATION OF CHINA’S COAL INDUSTRY

### A. *China is rich in coal resources. But the supported capacity of resources is facing challenges.*

According to the “National Notification of Mineral Resources” issued by Ministry of Land, by the end of 2006, the national identification resources were 1.1658 trillion tons. The basic reserves were 333.5 billion tons. And the resources were 826.3 billion tons. China had vast coal resources in terms of exploitation and utilization prospects. The national coal resources were 5.57 trillion tons under less than 200 meters depth. The national coal resources were 2.86 trillion tons under less than 1000 meters depth.

Because of rapid growth in coal demand, the supported capacity of coal resources is facing serious challenges, Which shows that the level of exploration is low, exploiting coal is difficult, the high-quality coking coal is in shortage, the coal resources in eastern are gradually depleting, the pressure on ecological environment in Shanxi and Mongolian regions is increasing.

### B. *The Coal Production grows rapidly, but the recovery rate is low.*

Since 2002, China’s coal output is rapidly growing. It had increased from 14.5 million tons in 2002 to 2.749 billion tons in 2008. The output of the state-owned key coal mines, local state-owned coal mines and collective coal mines accounted for 50.13 %, 12.72% and 37.15% in the national total coal output in 2008. Although the state had adopted a series of measures to shut down small coal mines, but the township coal production still accounted for a large proportion.

The recovery rate of the coal resources is still significantly lower than foreign advanced level during the rapid growth of coal production. According to the special inspection data of the National Coal Resource recovery ratio, the taken out rate of state-owned key coal mines is 40% -50% ,state-owned local coal mines is 25%-35%, towns coal mines is 15%-20%. The average recovery ratio is about 35%. But the exploitation out rate of the United States, Australia and other countries is more than 60%. The low coal mining exploitation rate has led to a large number coal resources wasted.

### C. *Environmental problems caused by coal development have become increasingly prominent*

In recent years, Because of China’s rapid growth of coal production and consumption, irrational industrial structure and crude growth manner, the contradiction among the land resources, water resources, atmospheric environment and coal resources is more and more serious, the ecological damage caused by long-term mining lacks effective management, and the environmental degradation trend fail to be curbed.

The approximately 95% of China’s coal production is from underground mining. The mining subsidence damage is the main form of land in the coal industry. According to incomplete statistics, by the end of 2005 land subsidence caused by coal mining had been more than 700,000 ha. Now the average annual coal production is 3.2 billion tons. The new coal collapse area is 64,000 ha -96,000 ha.[1] The large-scale

collapse seriously affects the ecology environment. The large-scale waste gangue was more than 1900 seats by the end of 2005, which covered 70km<sup>2</sup> lands. And the cumulative stock is about 38 million tons. To be worse, the growth rate of gangue every year is still more than 150 million tons. The added covered land is about 300 - 400ha [1]. Billions of tons of untreated mine water is discharged each year, which contains a lot of suspended solids. Some mine water is high salinity, some is acidic, and a small amount of mine water even contains radioactive material. The untreated mine water results contamination of shallow groundwater and causes serious environmental problems pitted into the collapse area or the near surface water. Over ten billion cubic meters gas emissions into the atmosphere each year from coal mining. The greenhouse effect is 21 times of that CO<sub>2</sub>. the damage capacity to the ozone layer is 7 times of that CO<sub>2</sub> [1]. It seriously damages the atmospheric environment, and causes the global warming.

*D. The level of resources comprehensive utilization in coal industry is not high.*

The gangue emissions from coal mines were 560 million tons in 2009. The utilization rate of gangue was only 62.50%. The gas drainage was 4.7 billion cubic meters in 2007. The utilization rate of extraction gas was only 1.446 billion cubic meters. The gas drainage was 9 billion cubic meters in 2010. The utilization rate of drainage gas was only 35 billion cubic meters. The mine water discharge was 6 billion cubic meters in 2009. The utilization rate was only 61.67%. [4] The use levels of other associated minerals, such as kaolin and oil shale also were very low.

The development of resources comprehensive utilization faces several the problems: low economic efficiency, high production cost, and lack of market competitiveness. Especially, many enterprises is in the state of little profit or deficit in gangue building materials field. And the enterprises of resources comprehensive utilization are generally small scale, backward technology and poor equipment.

*E. The safety situation of coal production is still grim.*

The safe problem of Chinese coal production has been the focus of the government and society over the years. Toward coal mine production safety, the government has introduced a large number of regulations and policies. From 1990 to 2008 mortality rate on mining one million tons coal had declined from the 6.16 to 0.89. The improvement was remarkable, but the mining safety accidents still frequently occurred. The mortality rate is much higher than foreign main coal production countries, such as the United States, India, South Africa, Poland, and Russia.

Especially, at the local and township coal mines the mortality rate is much higher than the state-owned key coal mines. Due to small scale, in pursuit of economic benefit at the local and township coal mines, they pay attention to mining production instead of emphasizing security investment. The managers' safety awareness is weak. The management system is not in place. The technology and equipment of safety is backward. The investment of security science and technology is serious shortage. The safety technical means of monitor is

lack. The safety training to employee is lack. The mortality rate of one million tons was still 1.63 and 2.37 in 2008. The serious security situation has resulted in a significant loss of life and wealth, and seriously affects the healthy development of China's coal industry.

### III. THE STRATEGIC CHOICE OF CHINA'S COAL INDUSTRY GREEN ECONOMIC DEVELOPMENT

*A. Strengthen the human resources construction and establish a people-centered scientific development ideology*

The human resources are the primary resource of the coal industry scientific development, and are an important driving force of coal industry technological transform. With the rapid development, structural adjustment and development pattern transformation and the rapid construction of large-scale mines and coal bases, it is of great significance to cultivate a group of experts in coal industry. At present, the national coal industry has total 5.705 million employees. The problem of low human resource quality is still very prominent. The personnel loss is serious. The human resource structure is irrational. The human resources situation is incompatible with the rapid development of the coal industry. In order to meet the requirements of green economic development, the coal industry must improve human resources team. We thus can improve the quality and level of development, promote the transformation of development manner and adjust the industrial structure, achieve the stable, health, sustainable development.

In addition, the coal enterprises should pay more attention to the employees' material and spiritual life, concern about people livelihood in hard mining area, implement the people livelihood projects, and promote the project of mine shantytowns. The coal enterprises should raise the income level of employees, improve the safety level of working environment, establish a people-centered development idea, and promote the economic and social harmonious development in the mining area.

*B. Strengthen the implementation of green mining model in coal industry*

The green economy emphasizes the importance of resource conservation and environmental protection. So the coal industry actively implements the green mining model. The green mining model is to improve coal mining recovery ratio, to produce with high efficiency, to develop and utilize the associated mineral resources, to reduce the environmental and ecological damage, to reduce the coal mining process energy and material consumption, and etc. issues in the course of the coal mining process. It mainly includes the use of modern mining technology to improve the efficiency of resource extraction and recovery, the exploration of mining technology to protect groundwater resources, the exploitation coal resources under the building, villages and water through land sink slow technology, the implementing of the coal and gas together mining technology to increase clean energy supply and improve coal production safety, the rational exploitation and utilization of associated mineral resources, the extension of water-saving and energy-saving technology to reduce

material and energy use and the implementation of air pollution control project, dust boiler system reform, ground dust control and so on.[2-3]

### *C. Encourage the circular economy model in the coal industry development*

The circular economy is short of material recycling and flowing economy, and it is a new economic form and economic development model. Circulation of resources is the main features of it, we should use resource in the environment-friendly mode, we should combine the environmental protection and economic development, we should bring the human production actions into the natural cycle, all the raw materials and energy should be reasonably and efficiently used, we should do our utmost to control the impact of economic activities to the natural environment.

China's coal industry should take conservation and efficient utilization of resources as a precondition, take "minimization, re-use and resource" as the principle, and embody the unity of development, conservation, environmental protection and raise efficiency in the process of developing circular economy. According to the key links of the coal industry circular economy, the coal industry should gradually forms a green exploration model at coal mining process, should extend the industry chain at coal processing and utilization process, should take resources comprehensive utilization model at waste use process, should take an ecological mine development mode at mine ecological environment construction process. We should organize coal economic activity based on the closed mode of "resources-products-consumption-renewable resources" in order to achieve the unity of economic, social and environmental effectiveness.

### *D. Actively promote the technological progress of the coal industry*

China's coal industry have made significant technical progress in the survey, mine construction, coal mining, coal safety production, coal processing and comprehensive resources use since the reform and opening 30 years. But compared with the foreign main coal-producing countries, the geological structure is more complex in Chinese coal industry, the natural disasters is more, mining is more difficult, the basic research of industry development is more lag. The development and utilization of coal resources still faces many problems. The safe and efficient coal mining needs to be further researched. The manufacturing capacity of many types of equipment needs to be improved. The coal mine safety and emergency rescue system needs to be improved. The technologies of clean use and waste utilization need to be breakout. Meanwhile, the innovation system of the coal industry is not perfect. The enterprises' capability of independent innovation is weak. The obstacles are still exiting between scientific and technological achievements and industrialization.

Technological innovation is a driving force to promote green economic development. In order to meet the

requirements for green economic development, we must accelerate the implementation of coal science and education strategy, we must rely on technological innovation to improve the overall quality of the coal industry, we must vigorously promote the industry technology innovation system construction, including the state, enterprises, and universities. Besides we should improve the strategic alliance mechanism of industry-studying-research, we should constantly enhance the ability of independent research. We must strengthen science and technology infrastructure condition to carry out fundamental research and to enhance the support capability of technology innovation. We must respect knowledge and talents, and take education and personnel training as an important basis for coal scientific and technological progress. We must encourage international academic exchange and cooperation to effectively absorb advanced technology and international experience. We must strengthen intellectual property protection and actively promote the industrialization of scientific research.

### *E. Strengthen the safety management and security technology innovation*

The accidents have plagued healthy development of Chinese coal industry. The accidents not only cause great economic losses, even the loss of life. The green economic development model highlights the "people-oriented" concept of sustainable development. Therefore, Chinese coal industry must strengthen the safety management and actively promote the safe production technology innovation.

To meet the requirements of the green economy, we must continue to improve coal production safety management system, we must study how to establish the standard classification system of the risk management and control of the coal accidents; we must systematically study the reasons caused accidents, the mechanism of disaster occurrence, and control techniques; we must continue to research on the common technology, the key technology and practical techniques around the mine safety, such as mine safety monitoring and warning, gas outburst, mine flood, fire prevention and control technology; and we must actively explore the safe and efficient coal mining and technological innovation of the emergency rescue fields. [5]

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