

Contents lists available at [SciVerse ScienceDirect](http://www.sciencedirect.com)

## International Journal of Mining Science and Technology

journal homepage: [www.elsevier.com/locate/ijmst](http://www.elsevier.com/locate/ijmst)

## Sustainable development and upgrading mode of coal industry in China

Gao Zhengguo\*

School of Economics, Wuhan University of Technology, Wuhan 430070, China  
 Zhengzhou Coal Industry (Group) Co., Ltd., Zhengzhou 450007, China

## ARTICLE INFO

## Article history:

Received 19 October 2011  
 Received in revised form 2 November 2011  
 Accepted 26 December 2011  
 Available online 22 May 2012

## Keywords:

Sustainable development  
 Upgrading mechanism  
 Upgrading mode

## ABSTRACT

It is an emerging realistic problem on how to promote a high level of technology in the coal industry, find new upgrading powers and create new competitive advantages, which are also the core problems to efficient transformation pattern of economic growth for coal industry in the “twelfth five-year” period, involving the key to China’s energy supply and energy security. Through field surveys and inductive analyses, analyzing the content of upgrading the coal industry as an entry point, this paper analyzes the sustainable development mechanisms for the coal industry from the aspects of work force, power, methods, goals, and so on; and puts forward corresponding developmental modes according to the mechanisms which can improve resource recovery and mineral resources utilization rates by putting them into practice.

© 2012 Published by Elsevier B.V. on behalf of China University of Mining &amp; Technology.

## 1. Introduction

Coal is an important non-renewable energy, which has a key position at the national economy. With new reforms and opening up policies, the coal industry has made considerable developments and progresses, and it also has made significant contributions to the progress of socio-economy. However, as a whole, China’s coal industrial structure is not reasonable. The degree of industrial concentration is low, and some large-scale coal enterprises are experiencing unbalanced developments. In the coal-based chain industry, the high productivity and high value-added products only have a small proportion. A large number of small coal mines do not have higher skills and better security safeguarding production safety abilities. At the same time, the environmental pollution is severe. The presence and impact of the above problems (as above mentioned problems) make the upgrading of coal industry very important and urgent. The 2008 global financial crisis gave a big strike on the development of China’s coal industry. It also showed that speeding up the upgrading of coal industry is an important way of promoting the core competitiveness of coal industry, which can also enhance the ability for resisting market risks. The developing status of China’s coal industry makes the research on upgrading of coal industry have an important practical and theoretical significance.

In the late 1990s, foreign scholars introduced the concept of industrial upgrading into the GVC framework, and divided it into three categories: product, process, and functional upgrading.

Among them, the product upgrading referred to the expansion and extension of a range of products, process upgrading referred to converting inputs to outputs in a more effective way and functional upgrading referred to enhanced ability of obtaining higher value-added products. Some scholars considered industrial upgrading as an economic role transfer process in which industrial manufacturers successfully transfer from labor-intensive production and low value products to higher value production capital or technology-intensive products successfully [1–5]. A scholars recognized the levels of the industrial upgrading earlier, they thought that the industry can be divided into four level: first is the product upgrading level, that is, from simple products to more complex products; second, upgrading the level of economic activity, including constant design improvement and ability to producing and marketing; third, upgrading within the department, such as from manufacturing the final link to produce higher value goods and services, including supply chain forwards and backwards contraction; fourth, upgrading between the departments, that is, from low value, labor-intensive industries to the capital and technological-intensive industries [6–8]. On the basis of this classification, Humphrey and Schmitz explicitly put forward a method that put enterprising at the center, i.e., four upgrades from the low to high levels. One is the process upgrading, through expense management production system or introduction of advanced technology for transferring the inputs to outputs. The second is the product upgrading, according to the unit value added to yield more high-end production line. The third is function upgrading, getting a new chain and with better functions, such as designing and marketing, or giving up the existing low value-added function to focus on the link of high added value. The last is upgrading within the departments, i.e., applying the ability

\* Tel.: +86 371 87783166.

E-mail address: [gaozg5678@163.com](mailto:gaozg5678@163.com)

that gets from a particular part to a new field or a new GVC, also known as chain upgrading [9–14].

Based on the theory of industrial upgrading, the upgrading of coal industry refers to the economic activities that accords to the general rules of the development of the industrial upgrading and inherent requirements for the development of the coal industry, in domestic and international economic environmental conditions, relying on coal resource enrichment and mining conditions, taking measures to increase technological input, improving the technology for coal safety production, extending the coal industry chains, promoting the level of coal industry structure and development, realizing the transformation from low added value to the high added value, from labor intensive to technology and from the extensive style to intensive economy, facilitating sustainable development for coal industry, and guaranteeing the demand of national economy.

The developmental trend of China's coal industry in recent years can be presented in following three aspects:

- (1) Acceleration of construction of large base enterprise. Since 2003 the state began to establish large-scale coal base construction planning programs. With the support of a series of policies, the main coal-producing provinces actively carried out the merger and reorganization of coal enterprises, built up a batch of large coal enterprise groups, industrial concentration improved significantly as reflected in the continuous relying on technology progress and improvement of labor productivity and increasing of market share, transferring from low quality, low added value and low efficiency to high quality, high added value and high benefit, changing from extensive to intensive economy. During the "eleventh five-year plan" period, the new construction of large and medium-size coal mines is mainly distributed to the large coal base, i.e., large coal mine production was up to 1.45 billion tons, large coal production base reached 2.24 billion tons, accounting for 56% of the country's coal production.
- (2) The acceleration of transformation for the economic development mode. The development of coal industry is restricted by conditions related to the resource, i.e., the degree of the resource scarcity determines the development diversities of the industry. Only by the way that the coal as a foundation extends the industry chain, development of diverse industries could lead the industry to realize sustainable development.
- (3) The resource concentration is continuously perfecting, and the mining level is improving. In recent years, Hebei province reorganized large-scale coal enterprise groups like Jinniu Energy Group Company, however, large-scale coal enterprises were reorganized downward from seven to three: Kailuan, Jinneng and Fengfeng. The total number of coal enterprises reduced to 532. Henan province started coal enterprise reorganization and merger of small-scale coal enterprises since 2004. The coal resource output for six main large-scale coal enterprises account for more than 90% in the whole province, with annual production capacity of up to 100 million tons. The small-scale coal mines reduced from 1569 to 550, while closed 923 small-scale coal mines. Coal enterprises in Shanxi integrated from 2600 to 1000.

But to analyze the development of the coal industry accurately needs to recognize the following existing problems:

- (1) The overall level of technology is low. After years of development, China's large coal enterprise basically realized mechanized mining, and management means are also improving, but compared with developed countries, China's coal indus-

try as whole is at low level of technology, small-scale coal mines have extremely low level of production technology equipments; production process lags behind, the wastage of the resource is serious.

- (2) The industrial concentration is low. According to the statistics of SAWS, the overall output of China's largest 10 coal production enterprises accounted for about 25.6% of the total output of domestic coal in 2006. In sharp contrast, the coal production of an American large private coal company was above 200 million tons, accounting for about 18% of the total U.S. coal production; a big coal mining company in Russia produced 250 million tons of coal, accounting for 95% of the country's total coal production; big coal mining company in India produced 240 million tons of coal, accounting for 77% of the country's total coal output. The concentration of coal industry in China is low, and on one hand it cannot form very good scale economy, whereas on the other hand it causes wastage of the resource.
- (3) The coal industry is affected by the downstream industry. The boom of the coal industry is closely related to the boom of the four main coal consumption industries: downstream electric power, metallurgy, chemical and building materials industries and winter which is relatively a seasonal sale.

In summary, there are three types of the domestic coal industrial upgrading methods: first, with large coal enterprises as the main body to promote the upgrading of the coal industry; second, the upgrading of the domestic coal industry to wholly stick to the "coal-based" principle and to be "coal" word fuss, with the ultimate goal of making full use of coal products and concomitants; Third, the development of large domestic coal enterprises mostly with strong support from the government, at the same time with solid material base, rich human resources and technology as a guarantee. Consequently, these are the main paths for China's coal industry upgrading: bringing the large scale state-owned coal enterprises' technical advantages into play, continuous exploration and development of advanced coal production technology, promotion of industrial intensification of coal production; bringing the large-scale state-owned coal enterprises into play laterally and longitudinally advantages the coal industry from the upstream to downstream industries, spins coal-based industry chain, adjusts the structure of coal industry, speeds up the development of the new product and makes coal resource to maximize its benefits; Giving a full play of the government's ruling to the coal industry advantages large-scale coal enterprises to promote upgrading of coal industry platform structures, create new conditions and provide employment opportunities. But to certain level it orientates the upgrading coal industry.

## 2. Analysis of the mechanism of sustainable development in the coal industry

### 2.1. Connotation and characteristics of sustainable development in the coal industry

Sustainable development of the coal industry means realizing the profitability and survival ability of a coal industry through continuous improvement and development, and at the same time making the industry meet the need to promote economic, environmental and social improvement through perfecting and improving the internal factors and external space for industrial development, improving the quality and ability to develop the industry.

The sustainable development includes ecological, economical and social sustainable developments. Sustainable development is based on protecting nature, and adapting to the bearing capacity

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات