

# COAL

## 煤炭产业发展模式研究

——基于绿色矿业理念

RESEARCH ON THE COAL INDUSTRY  
DEVELOPMENT PATTERN  
FROM THE PERSPECTIVE OF GREEN MINING

马岩 著



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## 图书在版编目(CIP)数据

煤炭产业发展模式研究: 基于绿色矿业理念/马岩著. —北京: 社会科学文献出版社, 2015. 10

ISBN 978-7-5097-8004-6

I. ①煤… II. ①马… III. ①煤炭工业-研究-中国 IV. ①F426.21

中国版本图书馆 CIP 数据核字(2015)第 209058 号

## 煤炭产业发展模式研究

——基于绿色矿业理念

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责任编辑 / 陈凤玲 陈 欣

出 版 / 社会科学文献出版社·经济与管理出版分社(010)59367226

地址: 北京市北三环中路甲 29 号院华龙大厦 邮编: 100029

网址: [www.ssap.com.cn](http://www.ssap.com.cn)

发 行 / 市场营销中心(010)59367081 59367090

读者服务中心(010)59367028

印 装 / 三河市东方印刷有限公司

规 格 / 开 本: 787mm × 1092mm 1/16

印 张: 11.5 字 数: 149 千字

版 次 / 2015 年 10 月第 1 版 2015 年 10 月第 1 次印刷

书 号 / ISBN 978-7-5097-8004-6

定 价 / 59.00 元

本书如有破损、缺页、装订问题, 请与发行中心联系更换

## 摘 要

作为我国最重要的能源资源，煤炭在我国的一次能源生产与消费中的比例均大约为 70%。煤炭资源，相对于石油或天然气等矿产资源，不仅具有储量优势和价格优势，而且是可以清洁利用的矿产能源。在实现城市化和工业化发展的过程中，日益扩大的能源需求以及我国粗放式的经济增长方式无形中给我国的能源供给带来了巨大的压力。同时，煤炭资源消费在我国国民经济中的特殊地位，使得实现煤炭产业与经济、环境的和谐发展，不仅成为支持国家能源安全的重要课题，而且是煤炭产业实现绿色化发展的重要内容。

国内外研究与实践表明，在绿色矿业理念指导下构建的煤炭产业发展模式是一种低碳的、可持续发展的新模式。在煤炭产业内实现绿色化发展不仅符合当前我国以人为本、构建和谐社会的本质要求，而且是应对气候变化、解决煤炭产业单一化发展以及发展国家经济的重要举措。目前，作为矿业实现绿色化发展重要内容的煤炭产业绿色化发展正处于理论指导、局部试验、全面推行的关键时期，无论是在理论研究方面，还是在具体实践方面都取得了一定的成绩。然而，在煤炭产业绿色化发展的推进阶段，地方政府层面和煤炭企业层面对绿色矿业理念指导下煤炭产业发展模式的概念及内涵认识不清、实践不够，在发展过程中“循环不经济”等问题依然存在，这些都在一定程度上阻碍了煤炭产业实现绿色化发展的进程。本书旨在系统、全面地

研究绿色矿业理念指导下的煤炭产业发展模式的几个基本问题，为煤炭产业的绿色化发展实践提供理论支撑。

本书在阐述煤炭产业发展模式转变的相关理论的基础上，首先，对我国煤炭产业发展现状进行了阐述，结合煤炭产业发展特点，对其存在的问题进行了分析，指出了产业模式调整的必要性；其次，借鉴发达国家的煤炭产业发展的先进经验，结合我国的具体国情以及经济的运行模式，总结了对本国煤炭产业发展的几点启示；最后，在绿色矿业理念的指导下构建了煤炭产业发展的新模式，基于新模式对我国煤炭产业以及经济的发展进行了初步的展望，并构建了相关的政策保障体系。

通过较为系统的研究，本书得出的基本结论如下。

(1) 通过对产业绿色经济研究进展和国内外煤炭绿色经济文献的综述，归纳煤炭产业绿色化发展研究的主要成果和不足，提出本书研究的主要内容、研究方法及主要的创新点。

(2) 煤炭产业作为我国国民经济的重要支柱同时也是能源、矿产资源、废煤资源和水资源等消耗量很大的能源和资源密集型产业。我国煤炭产业的发展是一个包括煤炭的开采、加工、储运、燃烧使用、废弃物的二次利用、资源型城市建设以及煤炭行业人才队伍建设等多环节、多因素的复杂过程。近年来，在我国宏观经济环境以及相关政策的支持下，不仅煤矿的探测开采技术取得了显著的提高，而且煤炭产业在发展理念、自主创新能力、产业发展的结构布局、煤炭市场的供给能力、煤炭固定资产投资、煤炭经济运行质量、煤炭绿色经济的产业化发展水平、煤炭产业发展的对外开放水平等方面也得到了整体的提升，和谐矿区的建设、煤矿安全生产环境等方面也有了明显的改观。然而，整个煤炭资源开发利用以及下游产业的兴建和发展过程，也存在不容忽视的环境问题，给我们的生活和工作带来了很大的困

扰。①煤炭的开发利用方面。在开采过程中,受矿井的地下环境、采掘方式、深度等因素的影响,矿井的地质环境、地下水和空气环境以及地下噪声环境等都很糟糕,矿区土地被占用,大量资源遭到严重的破坏,大气环境、生态环境也受到了严重的污染。煤炭加工过程中的洗煤水对矿区环境、下游农田灌溉水源和周围居民的生活用水都造成了很大的污染,煤炭储运过程中的粉尘等对运煤公路、铁路的沿途生态环境,特别是农作物和植被均造成严重污染。煤炭转化过程中煤气洗涤产生的废水也给环境带来了很大的污染。②煤炭行业人才队伍建设方面。专业人才数量少,知识水平和学历水平不高;高层次专家和专业技术带头人少,人才断层现象严重;人才队伍结构不合理,分布不均衡;煤炭产业经济效益不高、人才供求严重失衡。③煤炭产业资本运营方面。由于国家对煤炭企业的资金长期投入不足,煤炭行业人力资本利用率极低、运用效果差,再加上政府角色定位不明晰、发展观念陈旧,改革往往浮于表面。④资源型城市的发展方面。无论是传统的资源型城市还是新兴的资源型城市,在发展中均有以下问题:资源耗费严重、回收率低、综合利用能力不高;城市经济结构层次不高,行业横向关联度较差,接续产业发展缓慢。这些都在不同程度上阻碍了煤炭产业实现绿色化发展的进程。因此,基于绿色矿业理念实现煤炭产业的绿色化发展,不仅是我国应对全球发展变化的实际需要,而且是当前我国经济发展的内在要求。

(3) 煤炭产业的发展涉及环境问题、经济问题,更与发展问题有着千丝万缕的联系。目前,许多发达国家为解决煤炭产业在发展过程中遇到的各种问题已展开积极的探索。本书选取美、德、日、俄、澳五个比较有代表性的国家,分别从其基本国情及经济发展的实际情况出发,介绍了其如何扬长避短,成功地走出了具有本国特色,适应国内经济发展并有利于社会长远发展的煤炭产业发展之路。这些对于探

索研究我国煤炭产业发展的总体目标、战略取向、实施路径等都具有十分宝贵的经验启示和借鉴意义。

(4) 绿色矿业即环保型矿业，该模式充分体现了环保及可持续发展的矿业发展理念，它将社会因素、生态因素以及经济因素融入矿产资源开发利用的整个过程并对三者进行了综合的考量。其基本出发点是：从开采环节入手，最大限度地减少或杜绝煤炭开采造成的周围资源和环境的破坏和污染，从而可以获得社会效益和经济利益的最优化。

根据国家发展绿色矿业的相关要求，绿色矿业理念指导下煤炭产业发展模式的优化途径主要有煤炭产业绿色化发展的技术支持体系、资本运行体系、人才培养机制以及市场促进新机制。发展的总体目标为：构建以市场运行为基础，以科技创新为条件，以人才队伍建设为支撑，以资本运作为平台的新型煤炭产业发展模式，通过调整产业结构，加强对资源与环境的管理，逐步建立起一个经济效益、社会效益、环境效益三者协调发展的具有较强发展潜力和市场自我调节能力的新型煤炭产业运行体系。具体实施路径包括：①煤炭产业绿色化发展的技术扩散机制；②煤炭产业绿色化发展的资本运行体系；③煤炭产业绿色化发展的人才培养机制；④煤炭产业绿色化发展的市场促进新机制。通过在煤炭产业绿色化发展的技术支持体系中引入技术扩散的动力机制和激励机制形成有效的社会驱动力，在为产业发展营造政策驱动、市场驱动和中介环境驱动等有利发展环境的同时，以各种激励手段保证煤炭资源开发的新技术及时得以推广和应用。为了适应绿色化发展的需要，本书从设立专项基金、企业的资本运行以及矿业权管理三个维度进一步完善了企业绿色化发展的资本体系，对产业绿色化人才的培养提出“国家—学校—企业”和“产—学—研”的融合模式，学校在国家财税等方面优惠政策的倾斜下，基于国际现代化建

设对高层次、高技能人才的需求，结合煤炭产业多元化及市场发展的实际需求，加强对具有学科交叉背景的复合型人才的培养。这些人才通过规范的人才引进机制进入企业，在企业为其提供优厚待遇及科研环境的前提下发挥能力，这些都为绿色矿业理念在煤炭产业的顺利实现提供了有效的路径保证。新模式的实施将会提高资源利用效率、降低污染物对环境的影响、推动经济社会与资源环境和谐发展方面产生积极的作用。与此同时，洁净煤、煤转油、煤替油等新技术的研发和应用，也对我国的能源安全具有十分重要的现实意义和深远影响。

(5) 在绿色矿业理念指导下，构建煤炭产业发展的政策保障体系。围绕绿色经济、绿色矿业的内涵，从行政管理体制出发，形成一套包括技术与安全保障、制度与政策保障、法律与文化保障、人才建设保障的政策体系。首先，根据煤炭产业绿色发展及安全生产的具体要求，政府为煤炭企业发展提供政策指导。对矿业中出现的各种利益矛盾进行调节和控制。其次，给政府部门管理者，尤其是法律、法规、制度起草人和法律制定者提供指导。最后，对绿色矿业理念进行舆论宣传，给予文化保障，在引导绿色矿业人才培养的同时获得全社会对绿色经济、绿色矿业的支持。

本书的主要创新体现在以下几方面。

第一，对我国煤炭产业发展水平的演变特征与形成机理进行历史分析和理论解释，并结合低碳经济发展的背景，提出了我国煤炭产业高效率、清洁化、可持续发展的产业发展方向。

第二，结合当前建设资源节约型和环境友好型社会的要求，对绿色矿业的概念进行了全新的界定。通过对绿色产品、绿色文化、绿色经济等“绿色”事物概念的分析，结合绿色矿业理念的提出背景，基于煤炭产业发展的实际情况，对其概念、内涵、特征进行了全新的界定。



第三，建立基于绿色矿业理念的煤炭产业发展模式。在基于绿色矿业理念的煤炭产业发展模式的构建中，结合我国煤炭产业发展的特定情况，从煤炭产业绿色化发展的技术扩散机制、资本运行体系、人才培养机制、市场促进新机制四个维度构建了煤炭产业发展的“绿色”模式。

第四，建立基于绿色矿业理念的煤炭产业发展的政策保障体系。本书分别从煤炭产业绿色化发展的技术与安全、制度与政策、法律与文化和人才队伍建设四个层面，建立了我国煤炭产业发展的政策保障体系，并对四个层次间的关系进行了阐述，指出只有四者同步发展才能推动绿色矿业的顺利实现。

## **ABSTRACT**

### **Research on the Coal Industry Development Pattern from the Perspective of Green Mining**

As China's most important energy resources, coal in China's primary energy production and consumption in the proportion of approximately accounted for more than 70%. Coal resources, relative to the oil or natural gas reserves of mineral resources, not only has the reserve Advantages and price advantage, but also can clean mineral resources. In the process of the city rapid development and industrialization development, the growing demand for energy and type of our country extensive mode of economic growth has invisibly brought great pressure to the energy supply of our country. At the same time, the special status of the coal resources consumption in China's national economy, made how to realize the harmonious development of the coal industry, economy and the environment, become not only the important support of national energy security, but also the important content of green mining of coal industry.

The domestic and oversea studies and practices indicate that the coal industry development pattern built under the instruction of the green mining industry concept is a new one, which is low-carbon and sustainable development. To achieve greening development in coal mining industry meets the

essence requests of building a harmonious society people-oriented in current China, but also is an important measure to answer climate change, solve the homogenization of coal mining industry and lift economy in China. Currently, as the important part of mining industry greening development, the greening development of coal industry is at a critical stage of theoretical avocations, local experiments and expanding outwards. We get great achievements in both theoretic construction and practical experience. However, in the promoted period of coal industry greening development, both the local governments and coal industry companies are failed to understand the concept and connotation of coal industry development pattern which is built under the instruction of the green mining industry concept clearly, and the practice is not enough. There are some problems such as “circular but economical” as before. Those become barriers to coal industry turning to be greening development partly. This paper aims to study on a few questions in coal industry development pattern under the instruction of the green mining industry concept systematically and comprehensively and provide theoretical support for greening develop practice of coal industry.

In this thesis, on the basis of correlation theories of coal industry development pattern transformation; we describe the present status of coal industry in China firstly, analyze the problems in it, and indicate the necessity of industry modes transformation on the basis of developing trends. Then we take examples from advanced experience of coal industry development abroad, compare with specific national conditions and status and economy operation modes in China, educe some revelations suitable for the development of the domestic coal industry development. In the conclusion, we build the new mode of coal industry development under the instruction of

greening mining concept, give the preliminary prospect of domestic coal industry and economic development under the new mode, and construct some security system of the policy.

Through a more systematic study, the basic conclusions drawn from the paper include:

1. Based on the research progress of industry green economy and domestic and oversea coal green economy, summarized insufficiency of the literature of green development of coal industry, puts forward the main contents of the study, research methods and main points of innovation.

2. As an important pillar of our national economy—coal industry but also energy, mineral resources, coal resources waste and water consumption is a big energy and resource intensive industry. Chinese coal industry development is a coal mining, processing, storage and transportation, burning, waste two times using, construction of resource type city, coal industry talent team construction and other links, factor in the complex process. In the past five years, in the environment of our country macroscopically economy and related policy support, not only the detection of coal mine mining technology made significant progress but also in the development of the concept of the coal industry, independent innovation ability, industry structure, coal market supply ability, coal investment in fixed assets, the quality of economic operation of coal, coal green economic industrialization development level of coal industry development, the level of opening to the outside world have made the ascent of the whole, compared to past, the construction of harmonious mining, coal mine safety production environment and other aspects have obviously improved. However, in the development and utilization of coal resources and the downstream industry construction and development

process, environmental problems to our lives also have been ignored and brought great distress: (1) On the development and utilization of coal. In the mining process, due to the mine underground environment, mining methods, depth and other factors on mine geological environment, groundwater and air environment and the underground noise environment have caused the influence in various degree; land occupied, a lot of resources have been seriously damaged; atmospheric environment, the ecological environment has been seriously polluted. Coal processing in the process of preparation of water, either for the mining area environment, downstream farmland irrigation water or the surrounding residents living water have caused a lot of pollution; coal storage and transportation process of coal dust in highway, railway along the ecological environment, especially the crops and vegetation will cause serious pollution. Coal conversion processes of gas scrubbing wastewater generated by the environment bring great pollution. (2) On the coal industry talent team construction. The problems that professional personnel is lack, knowledge level and education level is not high; high level experts and professional and technical leaders are not sufficient, talent structure is unreasonable and the distribution of talents is uneven, coal industry economic benefit is not high, talent supply and demand is seriously unbalanced still exist. (3) On the capital operation of coal industry. As the inadequacy of country coal enterprise capital input for a long time, the extremely low rate of human capital utilization with poor results, coupled with the unclear positioning of government role and stale development idea, which cause the reform to float on the surface. (4) On the development direction of resource type city. Whether a traditional resource type city or a burgeoning resource city, the problems in development are: serious resource

waste, low recovery rate, low capacity utilization, low city economic structure administrative levels, poor industry horizontal correlation, slow development of linking industry, which differently from the extent hindered the coal industry to realize green development process. Therefore, from the perspective of green mining of coal industry, green development is not only the actual needs of the China's response to global development changes, but also conform to the inherent requirement of China's economic development in the current situation.

3. The coal industry involves environmental problems, economical problems, and it has countless relations with development. Recently, several foreign developed countries are on the road to find how to solve kinds of problems in the developing period. Five rather typical countries are focused on: the USA, Germany, Japan, Russia, and Australia. We do research on their national conditions and economic status; introduce how to take their advantages and avoid weakness, then walk out a successful coal industry developing path, which is not only with its own national characteristics but also adapt to their economic development and social long-term development. Those provide valuable experience and inspiration to search for the overall goal, investment and operating path of domestic coal industry development.

4. Green mining, an environment friendly perspective, reflects environmental, protected and sustainable developing concept fully. It puts 3 elements into the whole process of mineral resources exploitation and utilization, such as society, ecology, economy. We consider those three elements synthetically. Essentially, to start from the aspect of exploitation, reduce to the hilt or stop the destruction and pollution on the surrounding fields caused by coal exploitation, and then get the optimization of benefit from so-

ciety and economy. According to the need of green mining development in China, there are several optimization methods under the instruction of green mining concept: technological support system, capital operation system, professionals mechanism and market promoting mechanism. The overall goal as the development is to construct the new coal industry development pattern, which is based on market operation, supported by professionals, with the condition of scientific and technological innovation and with capital operation as a platform. We strengthen the management of resources and environment, build up a new coal industry operating system which has strong potential and self-control ability in the market step by step, with the economic benefit, social benefit and environmental benefit developing to coordinate. The specific methods include: (1) The technology diffusion mechanism of coal industry greening development; (2) The capital operation of coal enterprises greening development; (3) The personnel training mechanism of coal industry greening development; (4) Market promoting a mechanism of coal industry greening development. From the effective driving power for society by introducing the driving mechanism and incentive system of technology diffusion in technology supporting system. As beneficial developing environment such as effective drives, market drives, mediation environment drivers and so on for industry development is built up, some incentives could be carried out to keep the new technology for coal resources exploitation being promoted and applied in quality and on time. To suit the need of greening development, the capital operation for enterprises greening development is improved from 3 aspects: establishment of a special fund, capital operation of enterprises and mineral properties management. The three merged modes of “country-school-enterprise” and “production-learn-

ing-research” are put on for industry greening professionals training. Because of the lack of high-level, high-tech talents in global modern construction, schools strengthen the culture to versatile talent who are in interdisciplinary context. They are admitted into enterprises through normative professionals-introducing system, well-paid and devoted themselves to enterprises. These provide effective path assurance to smooth realization of green concept. The implementation of new mode will take active action on improving the utilization of resources, reducing the impact on pollution to environment, promoting social and economic and environmental resource harmonious development. Moreover, the research, development and application of new technologies such as clean coal, coal into oil and coal for oil, will bring practical significance and profound interest to energy security in China.

5. Under the instruction of green mining concept, construction of security system of the policy of coal industry development centered on green economy, the connotation of green mining start from system of administrative control. An integrated policy system comes up which includes technical safeguard security, system and policy security, law and culture security and professionals construction security. Its main functions are as follows; (1) Policy implications are put forward for coal enterprises development according to the detailed demands of coal green development and safe production from government’s standpoint. Various kinds of interests contradictions in the process are adjusted and controlled. (2) Guidance is provided for government departments and managers, especially the draftsman or constitutor for law, regulation, and regime. (3) Media publicity for the goal of green mining is pushed on. Culture is protected. We lead not only green mining professionals training but also the support to green economy and



green mining from the whole society. No other than the 4 aspects develop in step can promote green mining realization smoothly.

The main innovations of this essay are as follows:

Firstly, in conjunction with the analysis of industry development level, we discuss the historical analysis and academic explanation of the evolution character and mechanism for domestic coal industry development level. We direct the way to high efficiency, clean and sustainable development in domestic coal industry under the background of low carbon economy development.

Secondly, the concept of green mining is newly defined in its concept, connotation, characters combining background for raising green mining concept under the background of resource-conserving and environment-friendly situation. Based on the real situation of coal industry development we analyze the concepts of “green things” such as green production, green culture, green economy.

Thirdly, the coal industry development pattern from the perspective of green mining is built up. With the particular situation of domestic coal industry development, we construct the green mode from four perspectives: technical diffusion, capital operations, personnel training and promoted mechanism for leading the green development of market.

Fourthly, the security system of the policy from the perspective of green mining for coal industry development is established. We built it from 4 aspects: technology and safety, procedures and policies, law and culture, professionals construction and describe the relationships among them. Finally, we find that it is necessary to keep the four parts developing simultaneously.