

国家自然科学基金青年项目 (50908225)

“城市生态空间结构调控下的矿业废弃地再利用规划研究
——以徐州地区为例”项目资助

走近“老矿”

—— 矿业废弃地的再利用

**APPROACHED THE MINING AREA:
RE-USE OF THE MINING WASTELAND**

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走近

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Figure 1. The effect of the concentration of the solution on the adsorption of the dye.

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Preface

This compendium has two birthplaces:

A Sino-German workshop was held by the China University of Mining & Technology (CUMT) and the Technical University of Berlin in September 2008. The main goals of this common workshop were the collection and analysis of different concepts for the treatment of post-mining landscapes. In this regard it was important to gain the required knowledge of the basics of mining landscapes and its recommendation to make exchanges of ideas and concepts possible.

In September 2009 at the international conference “Opportunity: Post-Mining Landscapes” in Großräschen/Lusatia/Germany organized by International Building Exhibition IBA Fürst Pückler Land. In this conference more than 200 experts from all over the world discussed for the first time their experiences in dealing with post-mining landscapes. The message was: Post-mining landscapes offer unique opportunities. Where else is it possible to reshape the landscape from scratch! But how should this new landscape look like? How can this process be controlled?

This compendium will give you a first overview of the relevant state of the art in dealing with post-mining landscapes. Hopefully the exchange of experiences of Chinese and German experts helps to manage the big challenges in dealing with mining processes in a sustainable way.

Adrian HOPPENSTEDT
2011 - 06

本书的出版源于以下两个机遇:

2008年9月,中国矿业大学与柏林工业大学举办了中德联合教学。这次联合教学的主要目的是通过对现有资料的收集及科学系统的分析探究矿区工业废弃地再利用的可能性。前期相关基础知识的学习对之后设计概念的提出及深化有着不可或缺的作用。

2009年9月德国国际建筑协会 Fuerst Pueckler Land 在德国劳齐茨矿区的 Grossre-
aschen 市举办了主题为“机遇——矿区工业废弃地的再开发”的国际会议。来自世界各地的200多名专家参加了会议,并就矿区工业废弃地景观重建的实践交换了经验和教训。结论是:矿区工业废弃地的再开发为矿区景观重建提供了独一无二的机遇,但是什么样的迹地需要重塑景观体系?新的景观体系应该是什么样的?如何控制这一进程?

本书将简明扼要地向读者呈现从景观设计的角度对废弃地景观处理到废弃地再开发的全新视角。希望中德双方专家间的经验交流,在解决矿区工业废弃地可持续发展的重大挑战中起到积极的作用。

艾德里安·霍本斯德
2011年6月

Foreword

We are pleased to be able to present to you this publication, the result of a cooperative effort between China and Germany in the field of environmental planning and design in the context of post-mining landscapes that has now been underway for several years. On one hand, it documents the results of a joint Sino-German Workshop on post-mining landscapes, held at the China University of Mining and Technology (Xuzhou), together with many experts from China and Germany. On the other hand, however, the articles in this volume have a more ambitious goal: to identify the essential spatially-relevant environmental and design problems in China, and, via a transfer of knowledge, to initiate solutions and strategies of a wide variety of types. In this respect, initial indications for future research and work perspectives are also provided in the individual articles.

Questions of planning and landscape design-oriented direction of re-construction development in the post-mining context of areas like Xuzhou in China and the Federal State of Brandenburg and Saxony in Germany play a major role in this respect. At issue are restoration and re-development processes, which may be directable with the aid of legislative, economic and planning/design instruments. Also at issue, however, is a new definition of the roles and tasks of spatial planning in China and Germany, in which the social and environmental aspects must not be neglected. A major emphasis is on the protected assets water, biodiversity and cultural heritage landscape and industrial architecture. Moreover, we place special emphasis on dealing with post-industrial landscape elements. This is one problem area identified by workshop participants, in which solutions for China are urgently needed in the research field of landscape planning and landscape architecture.

We hope that this publication will become yet another component in the growing relations between our two countries in the area of environmental planning and landscape design—a component of the overall structure of a “bridge” between Germany and China, designed to reach common solutions for the sustainable development of our future. We would like to express our thanks to all authors who have helped to lay this foundation stone. We have now entered onto the path of cooperation.

CHANG Jiang Wolfgang WENDE
2011-06

前言

很高兴能为大家介绍这本书。本书是中德双方数年来在环境规划与景观设计领域合作,针对矿区工业废弃地进行景观重塑的成果总结。它完整地收录了中德双方专家在徐州中国矿业大学举办的有关矿业废弃地景观重塑的联合教学的成果。本书的另一个重要目标是要探讨中国有关矿区空间环境和景观设计方面的问题。作者希望通过知识的传播,激发起多种类型的针对矿区工业废弃地的解决方案和策略研究,书中各个篇章对将来的研究方向和工作视角也作了初步阐述。

针对类似中国徐州矿区、德国勃兰登堡州和萨克森州矿区的工业废弃地,以设计为导向的规划和景观重建在废弃地再利用方面发挥着重要作用。有关工业废弃地景观恢复和再开发进程的问题可以在立法、经济、规划与设计等手段下得到解决。但是,问题的关键还在于中德双方对空间规划的作用及任务的新定义。在此,社会和环境两个方面均不容忽视,同时还需要强调对水资源、生物多样性、文化遗产和工业建筑的保护。此外,需要特别重视如何处理采矿基地的景观元素。联合教学的参与者们认识到,在中国景观规划和景观建筑学的研究领域迫切需要为以上各项内容寻求解决方案。

我们期望本书的出版能够成为中德两国间在环境规划和景观设计领域日益紧密的友好关系的一个重要组成部分,成为我们走向未来可持续发展的中德合作的一座“桥梁”。我们衷心感谢所有为本书奠定基石的作者们。现在,我们已经踏上了合作之路。

常江 (德)沃尔夫冈·文德尔

2011年6月

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Part 1 **Articles**

Rehabilitation/Reclamation of the Mining Landscape in China—a Major Challenge

CHANG Jiang LI Yabo ZHANG Jincui

Abstract: Coal is the main source of energy in China, and coal mining contributes significantly to the development of the national economy. However, coal mining also does great harm to the environment. It damages the forests, the soil and water resources around the mining area, and pollutes the air, thus causing an ecological imbalance of the environment in mining areas. This paper describes the development from land reclamation to eco-reconstruction, and some valuable experiences gained from the process. On that basis, it also reviews the problems and difficulties, and predicts future trends.

Keywords: eco-reconstruction; land reclamation; coal mining

1 Foreword

Social, economic, industrial and environmental development are setting the stage for dramatic changes in almost every aspect of society. Industrial wasteland, a by-product of these changes, increases both in quantity and in its influence on the urban development. The great expanse of industrial wasteland has caused many social problems, such as an imbalance of the environment, the separation between urban and rural development, and the stagnation of economic development. Many scientists have investigated the deteriorating environment of mining areas, and conducted relevant studies; this has been true in China as well. This paper reviews the history of eco-reconstruction of mining areas in China, and evaluates relevant concepts and guiding principles on, while also analyzing the present research situation in the country, and predicting the trend of future development.

2 From land reclamation to eco-reconstruction

“Land reclamation”, also known as land rehabilitation in the late 1950s in China, generally refers to the agricultural reutilization and restoration of post-coal mining wasteland. The *Regulation on Land Reclamation* issued by the State Council of the People’s Republic of China in 1989 defines “land reclamation” as “the restoration to a utilizable state of land damaged in the production process due to excavation, cave-ins and construction”. According to this definition, reclamation not only refers to agricultural reclamation, but also covers reutilization for animal husbandry, industry, forestry and fisheries. On January 1, 1999, the law on Land Administration of the People’s Republic of China (fourth revision), which further stipulates protective measures for cultivated land, came into force. Under this law, when land is damaged due to excavation, cave-ins and construction, the units or individuals occupying the land are to be responsible for reclamation, according to the relevant State provisions. If they lack the ability to carry out reclamation or fail to undertake the required reclamation, land reclamation fees are to be paid for that purpose. Land reclaimed is primarily to be used for agricultural purposes. From 1980s to 1990s, the restoration and reutilization of mining wasteland and damaged land was carried out under this regulation.

However, as the concept of sustainable development arose and spread during the 1990s, the traditional manner of land reclamation became increasingly unable to meet the actual needs. Coal mining causes many

从土地复垦到生态重建

常江 李亚博 张金翠

摘要:我国是以煤炭为主要能源的国家,煤炭开采在为我国的国民经济作出重要贡献的同时,也给生态环境带来了巨大的破坏,譬如对矿区周边林地、土地、水资源的破坏和大气的污染,引起矿区原有生态环境的失衡。本文总结了我国矿区从土地复垦到生态重建的发展历程和成功经验,并对存在的问题和未来趋势展望进行评述。

关键词:生态重建;土地复垦;煤矿区

1 前言

矿业城镇兴起与衰亡,资源开发与环境破坏,社会经济的昌盛与衰落等,在时间维度上起伏波动,交替更迭,形成城乡环境大尺度的空间演化。大量的工业废弃地也正是在这一过程中诞生,并不断扩大延伸。由于矿产开采和大量工业废弃地的存在,导致矿业城镇空间格局割裂、经济发展滞缓、生态环境失衡、社会矛盾凸显等现象普遍存在。世界各国对日益严重的矿区生态环境都制定了相关的应对机制和科学研究,国内各个领域的专家学者也开始重视这项研究,并做了大量工作。本文回顾我国矿区生态重建工作开展的研究历程,对矿区生态重建的相关概念、理论基础、研究现状及未来趋势展望进行综述。

2 从土地复垦到生态重建

20 世纪 50 年代末,“土地复垦”一词在我国被称为“复田”、“造地复田”、“垦复”等,实质上是对采矿活动毁损的土地以恢复农业生产进行再利用方式的通俗讲法。直到 1989 年国务院颁布了《土地复垦规定》,才对“土地复垦”一词有了明确的界定。土地复垦是指对在生产过程中,因挖损、塌陷、压占等造成破坏的土地,采取整治措施,使其恢复到可供利用状态的活动。在这一定义中,复垦指的不再仅仅是耕地复垦,而是包括了养殖、林业、渔业等多方面的再开发和再利用。1999 年 1 月 1 日,《中华人民共和国土地管理法》(第四次修订)正式生效,新的土地管理法进一步规范了耕地保护措施。其中第四十二条对土地复垦作出了专门的规定:“因挖损、塌陷、压占等造成土地破坏,能够复垦的,用地单位和个人应该按照国家有关规定负责复垦;没有能力复垦或者复垦不符合要求的,应当缴纳土地复垦费,专项用于土地复垦。复垦的土地应当优先用于农业。”从 1980 年到 1990 年,我国对矿区废弃和毁损土地的恢复和再利用开发,都是在这一定义下完成的。

environmental problems, such as water damage, air pollution, eco-imbalance and the extinction of certain species; these problems all put involve new requirements on land reclamation. Moreover, due to cave-ins and environmental deterioration, farmers in the coal mining areas lose their land, thus leading to a worsening of their living conditions. These social problems are also in no way negligible^[1]. With this background, some scholars have proposed another solution; eco-reconstruction. They have analyzed the evolution of the ecological system in the mining areas and established basic eco-reconstruction models for various mining areas, while also conducting experimental practice in some regions. However, comprehensive research did was not initiated at that time^[2].

With the coming of the 21st century, some mining cities, with those in the old industrial base of the Northeast the most typical examples, began to suffer economic stagnation or even recession due to resource exhaustion^[3]. Mine closures caused great difficulties for the economic development of mining areas, and at the same time created large expanses of industrial wasteland. This phenomenon attracted the attention of many scholars. The eco-reconstruction research they conducted broke crossed disciplinary boundaries and linked ecological concerns with landscape design. Land function replacement, ecological restoration of mining areas, the transformation of economic structures and the protection of industrial remains have drawn increasing attention, both of the local authorities and of researchers^[4]. In 2008, the Chinese Ministry of Land and Resources revised the Regulation on Land Reclamation, so that now, land reclamation is defined as the "restoration of land damaged in the production process due to excavation, cave-ins and construction to a utilizable state, or restoration of the ecological system". Ecological restoration has thus placed new requirements on land reclamation.

The eco-reconstruction of mining areas does not involve merely the repair or restoration of the land, but must also take the actual situation into consideration. In general, if the land is suitable for forestry, eco-reconstruction ought to be based on forestry; if the land is suitable for agriculture, then agriculture should be the prime concern; if the land is suitable for fisheries, eco-reconstruction should be based on fisheries; if the land is suitable for housing, then housing should be the major focus of the land reclamation process. Eco-reconstruction should emphasize ecological concerns; at the same time, attention should be paid to the balance between economic development and ecological restoration. Only in this way can we really achieve our purpose of eco-reconstruction. The eco-reconstruction of mining areas in China has come a long way, from the simple agricultural reclamation of coal mining areas to the establishment of a multi-functional, multi-purpose system, from one-dimensional to comprehensive, from nascent to mature. Land reclamation and eco-reconstruction have thus gradually been enriched and perfected, both in theory and in practice. Generally speaking, this process can be summarized in three points:

(1) Land reclamation aimed at restoring agricultural production

Since the 1980s, the Ministry of Land and Resources has sponsored a series of projects to promote the land reclamation of mining areas. These projects aimed at reducing land deterioration in mining areas and the sharp decrease of cultivated land. Among these projects, the National Agricultural Comprehensive Development/ Land Reclamation Project is the most successful. It is sponsored by State Agriculture Comprehensive Development Office, and carried out by the Ministry of Land and Resources. This project mainly focuses on the reclamation of land damaged in the production process due to excavation, cave-ins and construction. This kind of reclamation can effectively increase agricultural land, especially cultivated land. The cities of Tangshan, HuaiBei, Xuzhou and Huainan have achieved significant progress in this respect.

The HuaiBei mining area in Anhui province is an example. As one of the largest coal production bases in China, it has 37 pairs of mineshafts with an annual productivity of 30 million tonnes. However, coal mining also causes serious environmental problems; the total area of subsided land has reached 16000hm², and agricultural production has been severely damaged. Over 250000 peasants have lost their farmland. In 1995, the City of HuaiBei was listed as one of three demonstration areas for land reclamation by the State Agriculture

进入 20 世纪 90 年代,随着可持续发展概念的深化,传统的土地复垦思维方式已难以适应实际发展的需要。采矿引起的水体破坏、大气污染、生态失衡和物种灭绝等环境问题都对土地复垦提出了新的要求。此外,由于采矿区土地塌陷、环境恶化等导致的矿区农民失地、生活条件恶化等社会问题也不容忽视^[1]。在此背景下,有学者提出矿区生态系统重建的思路,从资源经济、生态经济的角度出发,分析研究矿区生态系统的演变,初步研制了适合我国不同类型矿区的土地复垦关键技术体系和生态重建模式,并在部分地区进行了有益的实践性尝试,但对矿区综合性研究并未真正展开^[2]。

进入 21 世纪,以东北老工业基地为首的部分矿业城市的资源开采进入中后期,矿山关闭后大宗工业废弃地的产生和闭矿所带来的矿区经济发展的危机,引起了众多学者的关注^[3]。对矿区土地复垦、生态环境重建等方面的研究突破了仅从生态学、景观设计学的角度考虑问题,土地功能置换、矿区生态恢复、经济结构转型以及工业遗产保护等研究内容日益受到重视^[4]。2008 年,国土资源部对《土地复垦规定》进行修订,根据新规定,土地复垦是指“对在生产过程中,因挖损、塌陷、压占等造成破坏的土地,采取整治措施,使其恢复到可供利用状态或恢复生态的活动”。对比之前的定义,恢复生态活动对土地复垦提出了新的要求。

对于矿区的生态重建不是单纯地针对受损土地的修复或者恢复,而是以宜林则林,宜农则农,宜渔则渔,宜建则建的原则为前提,突出“生态”目的,兼顾经济和生态平衡,这样才能达到真正意义上的生态重建目标。我国矿区生态重建从最初对采矿场简单的农业复垦到现在的多功能、多目标体系的建立,经历了一个由单一到综合、由幼稚到成熟的过程。这期间对矿区土地复垦、生态重建的理论研究也日渐丰富和完善。这一过程总体上可概括为三个阶段:

(1) 以恢复农业生产为主的土地复垦

自 20 世纪 80 年代以来,国土资源部出台了一系列政策,对矿区土地复垦进行资助,旨在遏制日益严重的矿区土地破坏和农业用地锐减,其中国家农业综合开发土地复垦项目最为成功。所谓国家农业综合开发土地复垦项目是指国家农业综合开发办公室由中央财政资金扶持,由国土资源部组织实施,对因各项生产建设造成挖损、塌陷、压占等破坏的土地进行复垦的项目。复垦以恢复农业生产为主,能有效增加农业用地特别是耕地面积。唐山、淮北、徐州、淮南等矿区通过国家级示范项目的资助,在土地复垦方面取得了较大的成功。

如安徽淮北矿区作为我国大型煤炭生产基地之一,有生产矿井 37 对,年产原煤 3000 万吨,因采煤全市累计塌陷土地达 16000hm²,农业生产基本条件遭到严重破坏,20 多万农民无地可种。淮北市从 1995 年首次被国家农业综合开发办公室和原国家土地管理局列为全国三大土地复垦示范区之一开始,已经连续 10 年获得国家和省土地复垦示范项目称号。根据塌陷区的不同类型探索出土地复垦的五种模式:深层塌陷区水产养殖复垦、浅层塌陷区造地种植复垦、煤矸石充填塌陷坑造地用于基建迁村复垦、粉煤灰充填塌陷区覆土营造人工林复垦、深浅交错的尚未稳定塌陷区鱼鸭混养及果蔬间作复垦。截至日前,淮北市复垦利用塌陷区面积已达 8707hm²,占塌陷总面积 53.9%,安置无地农民就业 4.5 万人。

(2) 人文景观保护和自然景观修复并重的国家矿山公园建设

2004 年 11 月,国土资源部发出关于申报“国家矿山公园”的通知。国家矿山公园的建设是针对全国矿山存在的大量环境问题在短期内难以解决,在体制、法制、资金筹措渠道上又存在许多困难的情况