# ATLAS OF ARSENIC POISONING ENVIRONMENT AND DISEASE OF COAL POLLUTION

# 燃煤污染型砷中毒环境与疾病图谱

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Ming-Liang Cheng(程明亮)

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# 简 Abstract


This atlas collected 300 pictures from the environment where natural coal contains high content of inorganic arsenic. In this mountainous plateau, the arsenic-containing coal is burning inside the home for cooking, food drying, and heating, resulting in arsenic pollution of indoor air, food, and the environment. Exposure to arsenic polluted environment had caused various diseases, including cancers. Most of the pictures are published for the first time and invaluable to introduce the readers to the arsenic-contaminated environment from burning arsenic coal and the route of exposures. Most importantly, various pathological lesions from arsenicosis patients including arsenic-induced skin lesions and cancers were graphically presented. These comprehensive photo pictures will lead readers into the coal arsenic endemic region, and would be of importance for prevention and treatment of arsenicosis through environmental protection.

本图谱作者在燃煤污染型砷中毒病区，收集了因使用高砷煤导致环境污染和危害人体健康所引起的皮肤、内脏器官病变，以及实验染毒动物病理改变的各种照片、图片近300张，98%均未公开发表过，十分珍贵，整理成册以飨读者。本图谱告示人们加强环境保护、治理环境污染的重要性，对从事燃煤污染型砷中毒防治研究的工作者有重要参考价值和指导意义。


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# Preface 序

This "Atlas of Arsenic Poisoning Environment and Disease of Coal Pollution" displays several hundreds of pictures demonstrating the relationship between human beings and the living environment. During the 50's and 60's of the 20th century, there were serious environmental injuries induced by human activities in China. The Southwest region of Guizhou was a beautiful place in China, where a rich environmental support made it suitable for living. Unfortunately, the forest and landscape were seriously damaged mainly due to thousands of small coal mining. One of the consequences is arsenic poisoning from the burning coal pollution.

There were reports in arsenic poisoning throughout of the world, but the severity of the arsenic poisoning in the Southwest region of Guizhou were rarely found in other places in the word. This Atlas uses first-hand pictures obtained from the endemic area to show the link between environmental injuries and severe arsenic poisoning, demonstrating the importance of environmental protection in human health and the incidence of diseases. Every picture directly shows the severity of arsenic poisoning in different organ systems including the skin, hand, foot, and internal organs from necrosis to cancers. It clearly demonstrates that if our living environment were disturbed, our human health and life would be threatened.

This Atlas also shows current conditions of the living environment after the correction action during last 20 years. The arsenic poisoning in the Southwest region of Guizhou province has been stopped. This, from a different angle, further demonstrates the importance of environmental protection.

The publication of this unique Atlas results from the hard work of scientists and physicians who had worked in the first line of prevention and treatment of arsenic poisoning. This Atlas also records the fruitful effort from the government environmental protection action. Finally, this Atlas demonstrates that humans are capable of adjusting their behavior to be mutually beneficial to their own health and the living environment. This unique Atlas would become a valuable reference for our understanding of the relationship between human beings and the living environment.

Y. James Kang, DVM, Ph.D
Fellow of the Academy of Toxicological Science
Professor and Distinguished University Scholar
of University of Louisville, U.S.A.

2008.5.18

"燃煤污染型砷中毒　环境与疾病图谱"是一部独特的教科书，它通过数百张照片和图片生动地阐述了人类与自然环境的相互关系。20世纪五六十年代中国各地出现了自然环境的人为破坏，贵州黔西南地区本是自然环境优美、适于人类居住的和谐家园，但由于森林被砍伐，小煤窑星罗密布，燃煤污染型砷中毒严重地出现在这里居住的各种人群之中。因环境污染而产生的砷中毒在世界各地偶有发生，但像贵州黔西南地区这样的砷中毒涉及广泛人群和对健康的严重影响实属罕见。本图谱通过对自然环境破坏的记录和由此产生的砷中毒各种疾病的展示，深刻阐述了人类的生存与自然环境和谐相处的基本道理。图谱中系统地介绍了由于砷中毒所致的手、足、全身皮肤和有关内脏器官的损伤，从组织坏死到癌症的发生，每一张图片都有震撼人心的效果，它以真实的图片故事警示人们：当人类居住的环境受到破坏或污染，健康就会受到威胁，生命就会受到摧残。有幸的是经过人们20多年的努力，这个地区已恢复到山青水秀、自然环境优美的本来面貌，图谱中所介绍的砷中毒所致的各种疾病在贵州黔西南地区已不再发生，这些治理工作所产生的效果在图谱的最后部分给予简要的介绍，因此，这部图谱从正反两个方面生动地说明了保护自然环境对人类生存与发展的重要意义。

这部图谱整理出版汇集了科研人员在第一线辛勤工作的心血，同时也表现了他们与政府部门之间密切合作的结果，它也同时向人们展示了人类是有觉悟、有能力去认识和纠正与自然相处不和谐的错误。这部图谱不仅是举世独一无二，而且将成为人与自然和谐相处的宝贵教材。

国际毒理科学院院士
美国路易斯威尔大学杰出教授
康裕建
2008.5.18

# 前言

the residents. The Chinese government has paid special attention to the health people in this region, and made every effort to improve the living standards and to protect human health. Through the Foundation from Chinese Science and Technology and National Science Foundation, Guiyang Medical College, Guizhou CDC, Zunyi Medical College, and the US National Cancer Institute at National Institute of Environmental Health Sciences have made significant scientific research on the arsenic polluted environment, the mechanism of arsenic-induced cancer and non-cancer diseases. Approximate 66 manuscripts have been published, including 10 in English journals as an international collaboration. During this long-term research period, the scientific workers have collected 300 pictures, ranging from the endemic environment, arsenic exposure, pathology of arsenic-induced cancers and non-cancerous diseases. Most of these pictures are first published and would be invaluable for both scientific and clinical researchers.

We hope this photography will be of value for environmental health science workers to realize chronic arsenic intoxication and to set appropriate means to protect human health.

We thank Science Press for his support and suggestions and Mrs. Yu-Mei Yao of Guiyang Medical College for her technical help. We would present this book as a gift for the 2008 Olympic Games.

世界卫生组织2006年报告，全球接近1/4的疾病由可以避免的环境暴露引起，每年超过1300万人的超额死亡归因于可预防的环境因素。在我国，每年因城市空气污染和室内空气污染导致的超额死亡分别达到17.8万人和11万人，环境污染对人类健康的危害已成为影响人民生活质量和全面建设小康社会的重大障碍。2007年岁末，联合国在纽约总部举行了2008年国际环境卫生年启动仪式，呼吁国际社会为改善全球环境卫生做出更大努力。

砷是一种严重危害人类健康的环境毒物和已知的人类强致癌物。贵州省兴仁县是我国卫生部首个确定的燃煤污染型砷中毒病区，也是世界上最早被确认的燃煤污染型砷中毒病区，当地局部区域的煤砷含量均值高达417.7～2166.7mg/kg之间，远高出国内外煤砷含量平均水平。当地居民因利用高砷煤取暖、做饭、烘烤食物而导致室内外环境污染并危害人体健康。有关研究证实，病区砷暴露人群，从受污染的食物摄入砷约占50%～80%，从受污染的空气摄入砷约占10%～20%，从受污染的生活饮用水摄入砷约占1%～5%，少数开采煤矿的工人还通过皮肤接触吸收砷。兴仁病区被发现以后，又相继在贵州的兴义、安龙和织金等市、县发现病区。据现场流行病学调查发现：贵州燃煤污染型砷中毒病区涉及9个乡镇、32个行政村，暴露人口数以万计，砷中毒患者约3000余人，病区因肝癌、皮肤癌、肺癌、乳腺癌、肝硬化死亡人数已达240余人，严重危害了当地居民的身体健康，制约了社会经济的协调发展，病区人民群众因病致贫、因病返贫的情况较为突出。我国政府部门高度重视燃煤污染型砷中毒的防治科研工作。近年来，在科技部国际合作司“燃煤型砷中毒致病机理及防治研究”重大项目和国家自然科学基金项目、贵州省科技攻关项目、省长基金项目、国际科技合作等项目的大力资助下，贵阳医学院与美国环境卫生研究院（NIEHS）及有关兄弟单位密切合作，共同攻关，取得了许多重要的科研成果，在国内外发表论文66篇。在科学技术成果的支撑下，国家投入大笔经费开展规模化的防治工作。科研和防治人员在长达20多年的防治研究中，收集了当地的自然环境，开采砷煤造成严重环境污染的情况，当地居民利用高砷煤取暖、做饭、烘烤食物等生活方式，慢性砷中毒引起皮肤及有关内脏器官损害的病变和实验研究染毒动物的病理改变，以及流行病学调查和防治干预等各种照片、图片近300张，98%的均未公开发表过，十分珍贵，整理成册以飨读者。

本图谱出版之时正逢2008年北京奥运会召开之际，谨此向奥运献礼。在本图谱出版的过程中，始终得到了科学出版社的大力支持，并感谢贵阳医学院附属医院姚玉梅同志付出的辛勤劳动。

图谱为首次编写，缺点错误在所难免，敬望读者及有关专业人员提出批评指正。

程明亮　安　冬

2008.5.8

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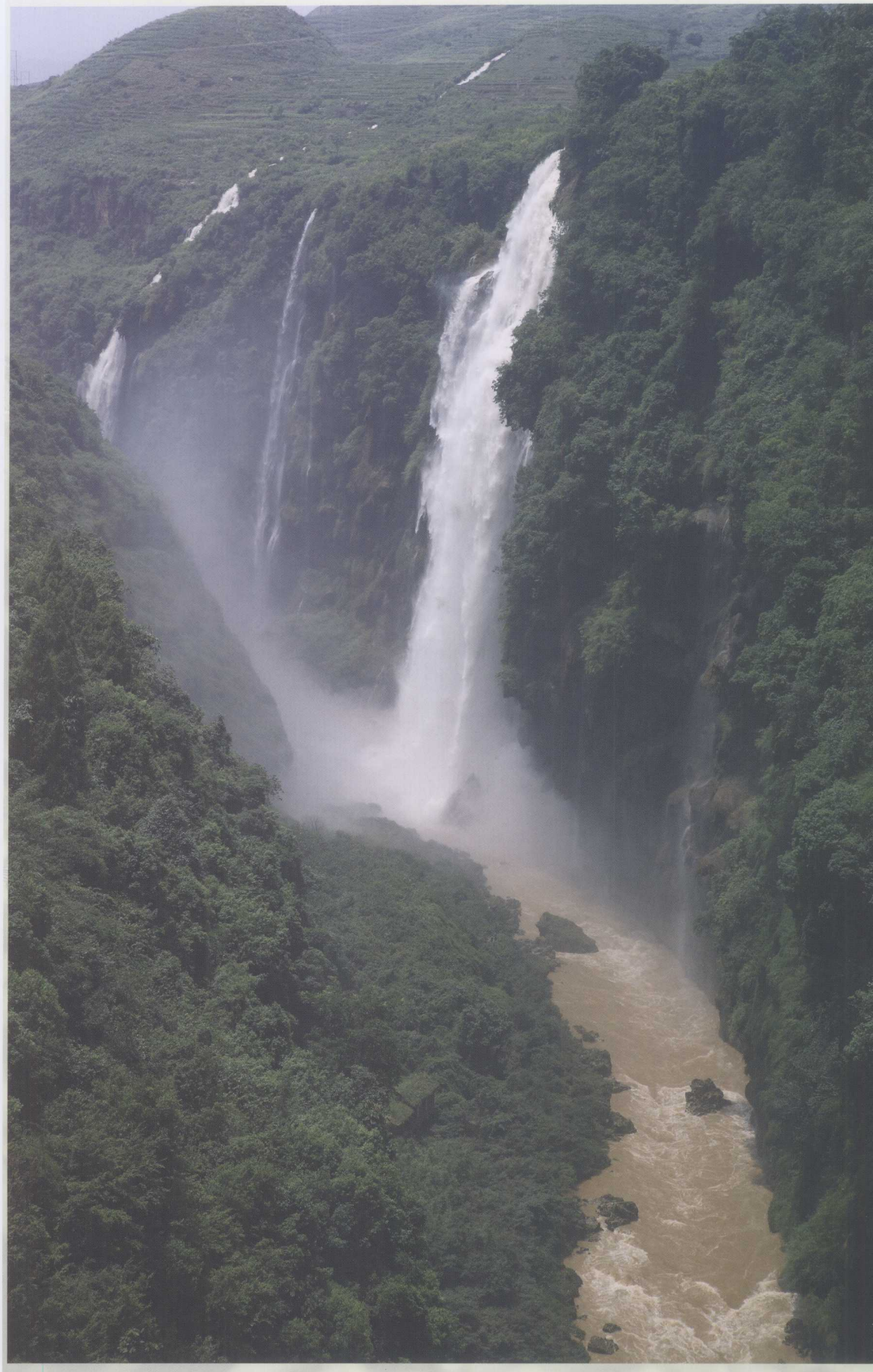
IRONMENT

# 燃煤污染型砷中毒 ARSENIC POISONING ENVIRONMENT AND DISEASE



Ma-Ling River Big Gorge
马岭河大峡谷

Beautiful countryside with river, bridge and house
小桥、流水、人家

High mountain
大山深处

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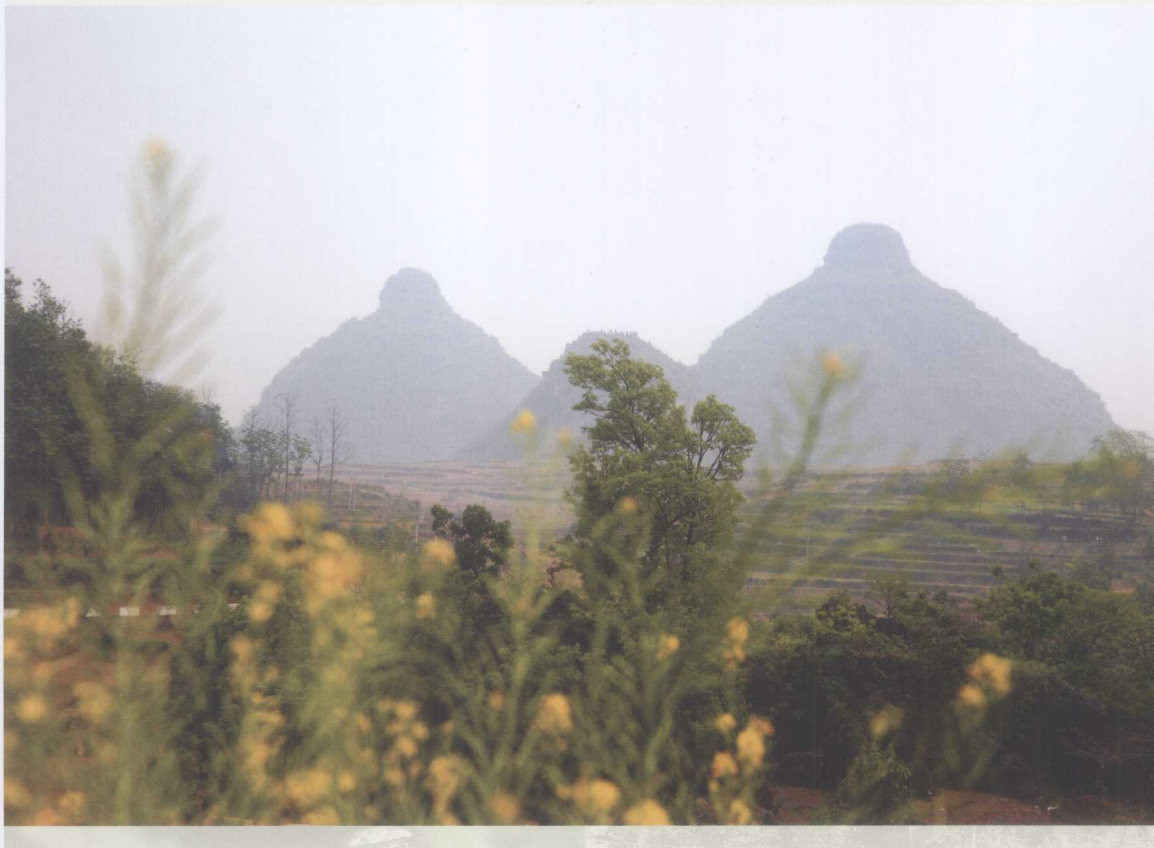
# 燃煤污染型砷中毒 ARSENIC POISONING ENVIRONMENT AND DISEASE

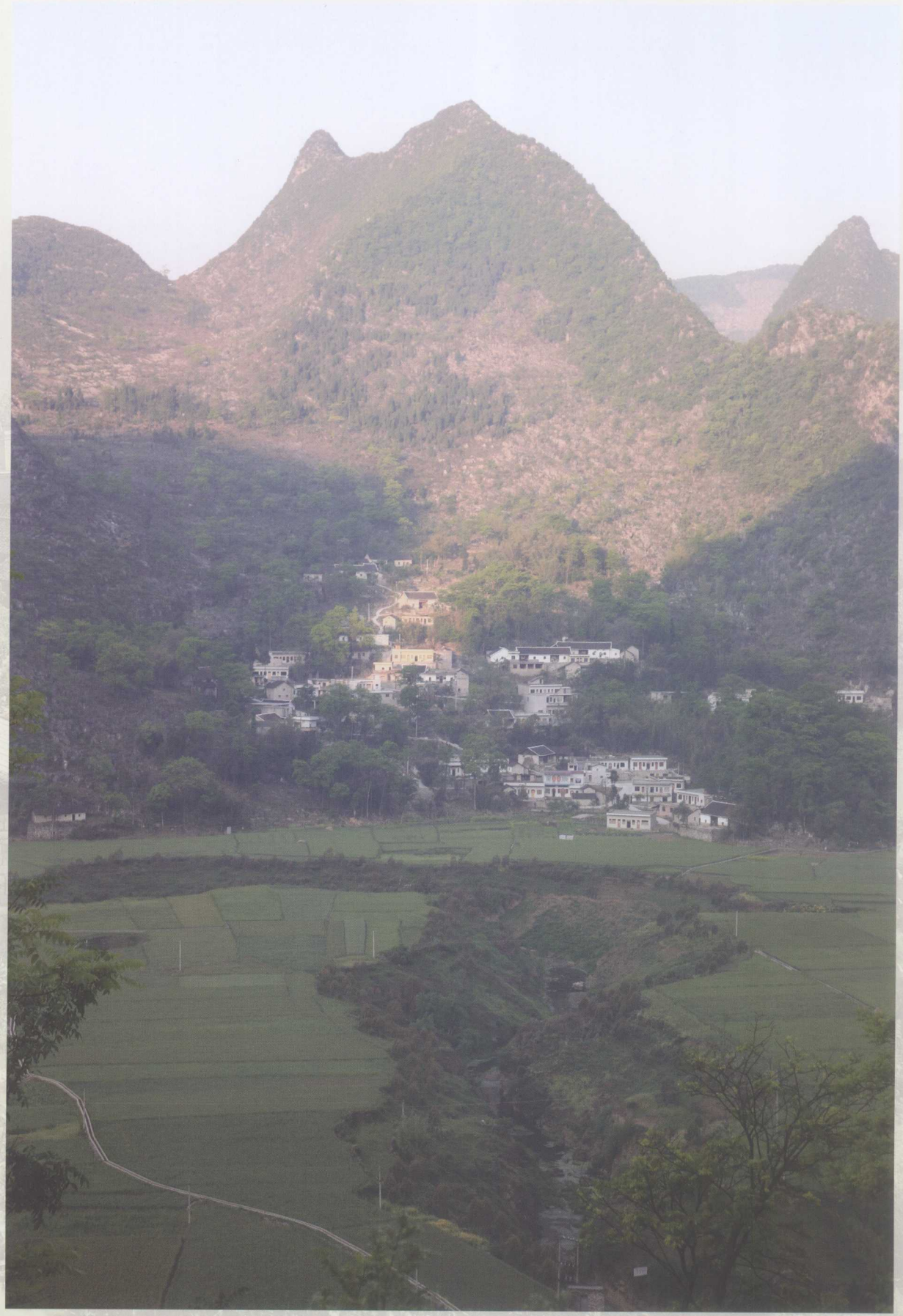
Beautiful homelands
美丽家园

# 燃煤污染型砷中毒 ARSENIC POISONING ENVIRONMENT AND DISEASE



Two breast-shape mountains
双乳峰

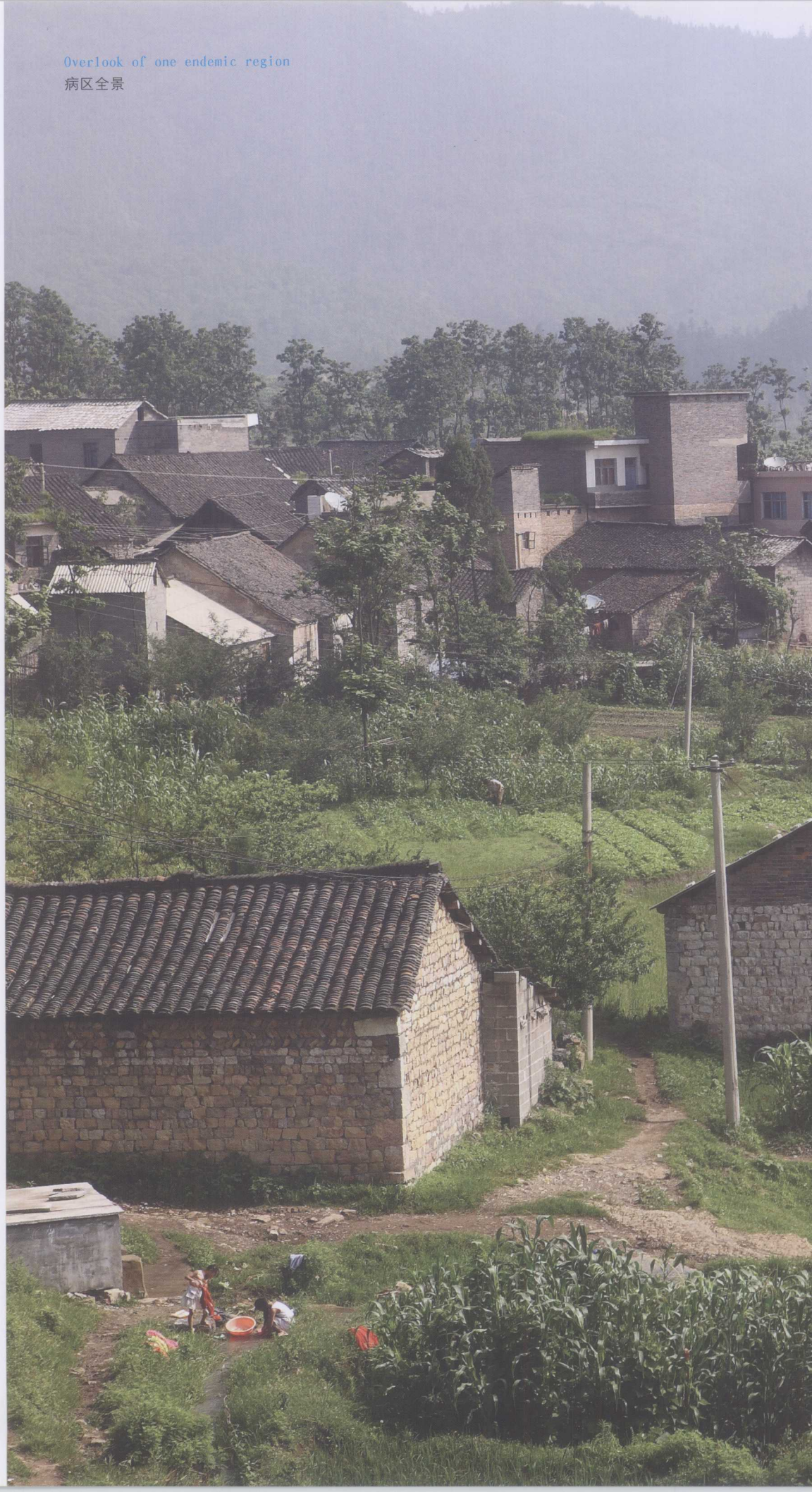
Beautiful scenery
风景如画



Beautiful village
美丽的村寨

# 环境
THE ENVIRONMENT

## 燃煤污染型砷中毒 ARSENIC POISONING ENVIRONMENT AND DISEASE



Overlook of one endemic region
病区全景

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