

**Acid Rain Control in China:  
Total Emission Control  
and Emission Trading**

**中国酸雨控制战略  
二氧化硫排放总量控制  
及排放权交易政策实施示范**

**二氧化硫排放总量控制  
及排放权交易政策实施示范工作组 编著**

中国环境科学出版社

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中国二氧化硫排放总量控制及排放权交易政策实施示范项目组

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中国国家环境保护总局污控司与美国环保协会签订项目合作协议



国家环境保护总局解振华局长在项目举办全国培训班期间接见美国专家

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国家环境保护总局解振华局长与美国环保协会牡丹德博士交谈



中国首例跨市 SO<sub>2</sub> 排放权交易案例



项目组成员在美国进行学习交流期间参观发电厂



国家环境保护总局解振华局长了解项目后期进展情况

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项目总结验收会



(美) 牡丹德博士一家

# 《中国酸雨控制战略——二氧化硫排放总量控制及排放权交易政策实施示范》

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## 序言（一）

中国政府一贯对酸雨问题十分重视。早在 20 世纪 70 年代国家就将“酸沉降控制”列为国家级重点科技攻关项目，由国家集中全国著名研究单位和技术人员投入研究资金集中进行研究，并继续在“七五”、“八五”、“九五”科技攻关项目中列项研究。从 1982 年至 90 年代末，先后完成了“西南”、“华南”及我国东部地区酸雨来源、影响和控制对策研究，国家酸雨控制方案研究等国家重大科研项目，不仅对全国酸沉降现状及发展趋势有了认识，而且对重点地区在酸性污染物排放、致酸过程、环境生态影响，直到区域控制等方面都做过大量深入细致的工作。同时从中国国情出发，开发了若干先进的燃煤技术和脱硫工艺，还为酸雨严重城市制定了治理规划。深入的科学研究，为国家提出正确的方针政策奠定了基础。

1998 年 1 月国务院正式批准了《酸雨控制区和二氧化硫污染控制区划分方案》。2000 年 4 月 29 日第九届全国人民代表大会常务委员会第十五次会议通过的《中华人民共和国大气污染防治法》中规定在大气污染物总量控制区内有关地方人民政府依照国务院规定的条件和程序，按照公开、公平、公正的原则，核定企业事业单位的主要大气污染物排放总量，核发主要大气污染物排放许可证。在《国家环境保护“十五”计划和 2010 年目标纲要》中要求至 2005 年主要污染物排放总量进一步削减，要求全国  $\text{SO}_2$  排放量在 2000 年基础上减少 10%。其附件《“十五”酸雨控制区和二氧化硫控制区规划》中要求至 2005 年“酸雨控制区和二氧化硫污染控制区”二氧化硫排放总量在 2000 年的基础上削减 20%。

中国对经济手段在环境管理中的作用给予了高度重视，环境经济政策已成为中国环境政策中的重要组成部分。为了完成国家“十五”期间二氧化硫排放总量削减目标的艰巨任务，国家环保总局十分重视加快建立市场机制下的中国环境经济政策体系，进行二氧化硫排放总量控制及排放权交易政策的实施示范工作。

为吸收美国在  $\text{SO}_2$  减排中实施的排污权交易等经济鼓励政策方面成功经验，国家环保总局污控司于 2001 年 4 月与美国环保协会签署了《推动中国二氧化硫排放总量控制及排放权交易政策实施的研究》合作项目。在前期工作基础上，国家环保总局决定在山东省、山西省、江苏省、河南省、上海市、天津市、柳州市开展二氧化硫排放总量控制及排放权交易政策实施的示范工作，后又增加了中国

华能集团公司参加示范工作。示范工作的目的，就是寻求一种在社会主义市场经济条件下，运用经济杠杆的作用，调动排污企业的积极性，实现二氧化硫总量削减的办法。同时，在示范地区实践的基础上，解决一些实施排污权交易政策所需要的技术支持问题和管理规范问题，为在我国逐步建立排污权交易制度奠定基础。

二氧化硫排放总量控制及排放权交易政策实施示范工作自 2001 年 4 月开始至今已两年多时间。在两年多的示范工作中，国家环保总局和各示范省、市及中国华能集团公司的领导组、技术组在对排污权交易政策深刻认识、准确把握、达成共识的基础上大胆实践，在注意建立完善的法规体系，建立总量控制和排污权交易政策实施技术支持体系，建立污染源排放连续监测系统、保证污染源排放数据的准确，使示范工作建立在科学的基础上下功夫，使示范工作初见成效，取得良好成绩。这为在我国实现环境资源有偿使用，实现社会经济可持续发展，建立完善的环境政策和管理体系奠定了实践基础，具有深远的影响和重要意义。

我代表中国国家环保总局真诚的感谢在示范工作中勇于克服困难，做了大量艰苦细致工作的中美双方专家、企业界人士和政府官员，感谢美国环保协会和地方环保局对示范工作的大力支持。



2003 年 12 月 30 日

## Foreword-1

Chinese Government has been attaching importance to the acid rain. Early in 1970's, the government listed the Control of Acid Sedimentation into one of the National Key Science and Technological Projects, and organized specialists from famous research institutions nation wide to tackle the issue. Such project was continued in the following Seventh "the National Five-year Plan", "the Eighth Five-year Plan" and "the Ninth Five-year Plan" as well. During 1982 to the end of 1990's, several national key projects in this area have been accomplished, for example, "Study on Sources and Impacts of Acid Rain in South-West Region China, South China and East China and the Countermeasures for Control of Acid Rain", and the "National Acid Rain Control Scheme". Through these studies, the overall status quo of acid sedimentation in China and its development trends have been learnt, and a large quantity of work have been done in depth in the emission of acid pollutants, acidification process, impacts on eco-environment and regional control of acid rain in key regions in China. Meanwhile, based on the real national status of China, several advanced coal burning technologies and desulfurizing technologies have been developed, and a plan for acid rain control and treatment has been formulated for some cities with heavy pollution caused by acid rain. The in-depth scientific studies have laid firm foundations for the formulation of national policies and strategies in right direction.

In January 1998, the State Council of China approved the Scheme for Division of Acid Rain Control Zones and SO<sub>2</sub> Control Zones. On April 29, 2000, the nineteenth meeting of the Standing Committee of the Ninth National Congress passed the Air Pollution Prevention and Control Law of the People's Republic of China. The law stipulates that the local people's governments in the areas of total emission control of air pollutants shall, in line with the requirements and procedures regulated by the State Council and in accordance with the principles of open, justice and equity, inspect and determine the total emission of major air pollutants by enterprises or institutions, and issue the permits for emission of major air pollutants. It also states clearly in the

Tenth Five-year Plan for Environmental Protection and Target Outline for the Year of 2010 that China will advocate a 10% reduction in the overall emission amount of SO<sub>2</sub> from the year 2000's level. Additionally, the Annex of the Plan, "The Tenth Five-year Plan for the Acid Rain Control Zones and SO<sub>2</sub> Control Zones", calls for a reduction of 20% from the year 2000's level in the two highlighted "Control Zones".

Chinese Government pays great attention to the roles of economic incentives in environmental management, and integrates the environmental economic policies into the overall environmental policy framework of China. In order to achieve the ambitious goal in the reduction of total SO<sub>2</sub> emission during "The Tenth Five-year Plan" Period, the State Environmental Protection Administration (SEPA) is attaching great importance to the establishment of environmental economic policy framework under the market-based economic system in China, and launching a pilot program in the Total SO<sub>2</sub> Emission Control Combined with Emission Trading.

In order to borrow the successful experiences in applying economic incentive policies like emission trading to SO<sub>2</sub> emission reduction in the US, the Department of Pollution Control, SEPA reached an agreement with the US Environmental Defense (EDF) to initiate a cooperation project entitled "Promoting the Total SO<sub>2</sub> Emission Control Combined with Emission Trading Policy in China". Based on the work done in the preparation phase, SEPA decided to carry out a pilot program in the Total SO<sub>2</sub> Emission Control Combined with Emission Trading in 7 provinces and cities, including Shandong Province, Shanxi Province, Jiangsu Province, Henan Province, Shanghai City, Tianjin City and Liuzhou City, with China Huaneng Group as an additional pilot. The pilot program aims at finding out a proper approach to mobilize emission enterprises to actively play their roles in reducing the total SO<sub>2</sub> emission by using economic leverage under the socialistic market economy. In the meantime, based on the practices in the total emission control with emission trading in the pilots, shortages of the policy have been discovered in time, and been rectified accordingly. A standard policy framework and a technical supporting system have been established. This provides a basis for making legislation on the total emission control combined with emission trading in China.

The pilot program in the Total SO<sub>2</sub> Emission Control combined with Emission Trading was initiated in April 2001. During the past 2 years, SEPA and the pilot provinces, cities and China Huaneng Group have got clear and correct understanding on the policy,

and practice the policy in real cases. SEPA is putting great efforts in establishing a complete legal system and setting up a technical supporting system for the implementation of the policy. Meanwhile, a continuous emission monitoring system has been built up to ensure the accuracy of emission data. The overall pilot program has been organized on a scientific basis and achieved initial results and success. The program lays firm foundation for realizing the payment-based utilization of environmental resources and the sustainable social and economic development, and establishing a complete environmental policy and management system. Therefore the pilot program has far-reaching effect and great importance to China.

On behalf of SEPA, I would like to sincerely thank to the experts both from China and US, enterprises and governmental officials who have made great efforts in the pilot program, and also thank for the great support from the US EDF and telenvent local environmental protection bureaus.

**Minister: XIE Zhenhua**  
**The State Environmental Protection Administration**  
December 30, 2003

## Foreword-2

In 1996, Environmental Defense had the opportunity to consider developing cooperative work in environmental protection in China. Given the critical importance of China to the world's environment we decided to take this chance to try to develop effective partnerships with environmental organizations in China. At that time, we did not imagine the interest and success that this program would enjoy. However, at the beginning, we were also surprised to discover that in 1995, China had taken the remarkable policy decision to cap SO<sub>2</sub> emissions for the nation. The then little known policy of Total Emissions Control became the primary focus of our work in China.

In the United States, Environmental Defense had long been seeking to bring about a solution to the acid rain problem. One of the key ingredients missing in all proposals was the creation of an annual limit on total emissions of SO<sub>2</sub>. As we formulated our own policy proposals, we recognized that only a firm national cap on emissions coupled with the flexibility of a market for SO<sub>2</sub> reductions could supply the ingredients necessary to solve the problem. Without the cap on emissions, it would be difficult to assure that the necessary levels of environmental protection would be provided. Without the market, we could not be sure that the program wouldn't cause unnecessary cost or political reaction in meeting the cap. Given the successful development and operation of the SO<sub>2</sub> emissions trading market in the U.S. and the development of the TEC policy China, we wondered whether emissions trading could be applied with Chinese characteristics to create some of the substantial environmental and financial benefits we have seen in the U.S.

With this background, we decided to focus our energies on developing a policy infrastructure that would support the TEC, in our view the most critical component to any effective acid rain policy. We began with fairly academic studies, but as this book shows we rapidly progressed to the messy but necessary practical work of learning and testing these new ideas with the local partners actually charged with

protecting the environment. Throughout we have enjoyed a very close working relationship with the State Environmental Protection Administration and its leader Minister Xie Zhenhua. After then Premier Zhu Rongji's visit to the U.S. in 1999, our two great nations decided to cooperate in assessing the feasibility of acid rain emissions trading in China. Environmental Defense was entrusted with the responsibility for developing in cooperation with SEPA, the pilot emissions trading demonstration projects. That bilateral agreement was successfully concluded with a resounding affirmative.

As SEPA moved to more concrete implementation of the new regulations required under the amendments of the Law on Atmospheric Protection, we were again fortunate to be chosen as a partner in the development of the SO<sub>2</sub> permit. As our technical experts began discussing the approach, they realized the importance of developing the SO<sub>2</sub> permit flexibly in order to account for the transboundary emissions of SO<sub>2</sub> that are the primary cause of acid rain. This key insight led to the creation of the "4+3+1" project whose work and results form the main subject of this book.

During premier Wen Jiabao's visit to the U.S., a new environmental bilateral has been signed. This new agreement will continue the focus on acid rain and emissions trading, but this time with a view to developing the national infrastructure necessary for the government to guarantee that the emissions trading market truly serves the purpose of environmental protection. In this new phase of work, Environmental Defense will continue its focus on the elements necessary for an effective market: the permit, emissions monitoring, trading rules, and enforcement. As dramatic as this work has been, it is only the foundation for the next stage of development, one in which we hope to deepen and spread our mutual experience.

We would like to express our pleasure and gratitude for all of the hard work that is represented in these pages. We would like to specially mention the members of the project from provincial and local environmental protection bureaus whose willingness to test and embrace new ideas is the story told here. Without the open minds and spirits of all of the participants, it would not have been possible to produce the results you will read about. Without the willingness of the Chinese government and people to cooperate with a foreign non-governmental environmental organization, we would not have been able to add our experience to these key policy developments. While we have enjoyed close cooperation with the U.S. government from time-to-time, we would

not have imagined that the same intimate cooperation that we enjoyed with President George W. Bush's administration would be found here in China. This very project is a testimonial to how open and dynamic China has become.

Clearly, China has continued to impress the world with its rate of economic development. However, this same growth also produces both a desire for an improved environment as well as new pressures upon Chinese environmental management. It is our hope that this new environmental policy tool known as emissions trading takes deep root in China and that its fruit will be a healthy environment for all Chinese people. While have been crossing the river by feeling the bottom for stones, we can now see the other side.



Fred Krupp  
President  
Environmental Defense  
30/12/2003



## 序言（二）

中国在世界环境保护领域中发挥着举足轻重的作用。美国环境保护协会（Environmental Defense）在 1996 年得到了与中国开展环境保护方面合作的机会，我们决定抓住这一机会与中国的环境组织开展实质性合作。当时，我们并没有想到合作项目能够取得如此成功。在一开始，我们惊讶的发现，中国在 1995 年时就已开始在全国范围内实施二氧化硫排放总量控制政策，这一政策成为我们在中国工作的主要核心。

美国环境保护协会一直在寻求解决酸雨问题的方法。在美国以前提出的解决酸雨问题的提案中，都没有考虑限制年二氧化硫排放总量。当设计我们自己提案的时候，我们发现只有将限制排放总量与发挥市场的灵活性结合到一起，才能够解决酸雨问题。没有污染物排放总量限制，很难保证达到预期的环境保护目标；没有市场，在满足总量控制目标的要求下，可能产生不必要的成本消耗或引起过激的政治反应。美国成功地实施了二氧化硫排放权交易，中国也实施了二氧化硫排放总量控制政策，我们觉得如果将排污权交易与中国的具体情况相结合，应能像美国一样，从中获得巨大的环境和经济效益。

在此背景下，我们决定集中支持建立二氧化硫排放总量控制的政策基础，因为这是酸雨控制最重要的基础。我们首先进行了一些纯理论的研究，但很快我们的工作就进展到复杂但必要的实际操作层面上。在 1999 年朱镕基总理访美后，两国决定评估在中国开展二氧化硫排放权交易项目的可行性。美国环境保护协会被授权承担与国家环境保护总局（SEPA）合作开展排污权交易试点，这些工作共同帮助双边合作得出了可行的结论。在整个合作项目实施过程中，我们与国家环境保护总局和环保总局局长解振华先生进行了密切的合作。

国家环保总局要为新的大气环境保护法的实施制定具体的执行条例，而我们有幸成为制定二氧化硫排放许可证制度实施条例的合作方。在我们的技术专家研究实施方法时认识到，提高二氧化硫许可的灵活性对解决二氧化硫跨区域污染非常有用，而跨区域二氧化硫污染是产生酸雨的主要原因之一。对这一问题的思考引出了“4+3+1”项目，其内容和结果是本书讨论的主要内容。

在温家宝总理访美期间，中美又签订了新的环境双边协议。新协议继续关注酸雨和排污权交易，而其主要目的是建立必要的政策、技术和实施基础以保证排