



URBANIZATION, ENERGY, AND AIR POLLUTION IN CHINA

The Challenges Ahead – Proceedings of a Symposium (2004)

China is home to some of the most polluted cities in the world, as well as hundreds of cities that are not in compliance with World Health Organization (WHO) air quality guidelines. With urbanization and industrial development expected to drastically increase in the near future, Chinese government officials will be challenged to provide basic services to growing urban populations, ensure that economic development continues, and address environmental concerns, particularly air pollution, that result from rapid economic growth.

Chinese planners recognize that the type of energy supply utilized affects not only public health, but land use, the environment, infrastructure, services, and economic growth. Thus, a secure, flexible, and varied energy-supply policy is necessary for continued growth. China will need to weigh the costs and benefits of its abundant coal supply against the costs and benefits of cleaner alternative supplies, including petroleum, natural gas, and renewable energy sources.

A good deal of progress has been made in China since the mid-1990s, with emissions of sulfur dioxide (SO₂) and particulate matter (PM) decreasing as a result of stricter enforcement of standards. However, because of the increase in vehicular emissions and prevalence of fine particles, the government passed an amendment in 2000 to the 1987 Law of Air Pollution Prevention and Control. The new legislation calls for the regulation of transportation, as well as residential and commercial energy use.

In October 2003, the Chinese Academy of Sciences, Chinese Academy of Engineering, and National Academy of Engineering (NAE)/National Research Council (NRC) of the National Academies held a symposium of experts from around the world to discuss China's challenges in developing an energy policy to address these issues, as well as to identify key trends that might influence future energy choices in China. The development of energy policy in China is important not only domestically, but internationally since China is increasingly competing with the United States and others for limited fossil fuel resources. And the resultant air emissions (notably carbon dioxide) from fossil fuel combustion have a global impact.

KEY TRENDS

Several trends were identified that could influence future energy choices in China.

The Presence of Fine Particulates (PM₁₀ and PM_{2.5})

To determine the effectiveness of measures intended to reduce ground-level ozone and particulates, China will need to improve its monitoring of ozone, PM_{2.5} and PM₁₀. A better understanding of the sources and levels of these pollutants (and precursors) will lead to more effective locally based strategies.

Vehicular Emissions of Nitrogen Oxides, Carbon Monoxide, Ozone, and Lead

The growing number of automobiles in China is increasing emissions of nitrogen oxides (NO_x), carbon monoxide (CO), and precursors which form ozone (O₃). If this continues, new regulations will likely be necessary to maintain current air quality levels. The challenge for the government is to develop policies that mitigate negative environmental impacts while promoting their economic benefits. A key intervention in the transportation sector may be improved efficiency, both for personal vehicles but also in terms of public transportation systems.

Pollution in Small Industrial Cities

Perhaps the most challenging problem facing urban China is how smaller, coal-based, industrial cities will manage air pollution. Smaller cities have experienced increases in SO₂, total suspended particulates, and NO_x as the result of their overwhelming reliance on coal for residential and industrial uses.

Reducing Sulfur-Dioxide Emissions and the Long-Term Implications of Acid Rain

Levels of acid deposition in China have decreased slightly since the mid-1990s; acid deposition has been an area of concern for decades and recent research has improved the understanding of acid deposition's impacts on agriculture and ecosystems. The power generation sector has made progress in reducing SO₂ emissions, but there is considerable room for improvement in this and other sectors in order to bring about further reductions.

Need for Improved Monitoring and Regulation

China has limited quality assurance programs to determine the accuracy of measurements or the condition of sampling instruments. There is a need for an in-depth evaluation of equipment and methods, followed by an assessment of methods of data analysis and interpretation. Some of the regulatory techniques used in the United States could be used in China, such as self-reporting, emissions trading, and tax-related incentives, coupled with tough enforcement.

Scale and Financial Impacts of Air Pollution on Public Health

Studies on public health impacts of pollution in China show that the cost to the country and the people is enormous. Chinese authorities are following U.S. progress in assessing exposure, health risks, and associated costs and are expected to adopt new monitoring in the coming years.

Emerging Technologies for Energy Generation and Distribution

There is a trend toward providing electricity, heating, and cooling to commercial and residential buildings via cogeneration and distributed-energy systems. Areas for improvement include the use of advanced power generation, combined heat and power generation, and non-coal fuel sources.

For More Information

For more information on the project, contact staff at (202) 334-2801 or visit the Policy and Global Affairs website at www.nationalacademies.org/pga (see Capacity Building). Copies of *Urbanization, Energy, and Air Pollution in China: The Challenges Ahead – Proceedings of a Symposium* are available from the National Academy Press (NAP); (800) 624-6242 or (202) 334-3313, or visit the NAP Web site at www.nap.edu.