

Preface

Cleaner technologies are expected to play substantial role in solving serious air pollution in China. Previous studies of China's cleaner technologies mostly focused on its technological aspects, but didn't provide the prospects of its diffusion in the market. The purpose of our study is to answer following questions, that is, what level of price makes cleaner technologies competitive in the market, how probable it is diffused in near and middle-long term future, and what institutions, like environmental regulation, are needed to promote its development.

We have proceeded the group research for about a year to finish this report, which is the second outcome of the two years' project "Energy and environmental problems of China in market transition" supported by Institute of Developing Economies (IDE-JETRO). The purposes of this project can be summarized as following.

- 1) Analysis of structural change of energy industries from the micro point of view, that is, based on the enterprises' case studies
- 2) Evaluate the prospects of supply of each energy source in future in consideration of the stage of market transformation, enterprises' performance, technological aspects, capital-labor relationship, resource endowments, and market structure
- 3) Discussion of the possibilities for energy switching from dominant coal to more variety of energy sources, comparing between cost and market price in several regions
- 4) Analysis of environmental problems by use of case studies in several cities
- 5) Evaluate the effects of market transformation on China's environmental issues
- 6) Discussion of the measures to promote diffusion of cleaner technologies in future, as a conclusion of two years' project

In the first year of the project, the research about the fossil fuel energy industries was conducted, whose output was published on March 2001 by IDE-JETRO, titled as "Transformation of China's Energy Industries in Market Transition and its Prospects". For the second year of the project, we have focused our research on environmental problems and cleaner technologies. And research items are as follows.

- 1) Current situation of environment problems: macro analysis and case studies of several cities,
- 2) Energy and environment in rural area,
- 3) Energy conservation technologies,
- 4) Clean coal technologies (coal washing, de-sulfurization, briquette,

clean coal combustion), 5) Renewable energies, 6) Sustainable urban transport, 7) Environmental policy and environmental industry development.

In chapter 1 and chapter 2, as a basement of discussion in the following chapters, historical development (1979-present) of China's environmental problems, especially air pollution is discussed. Both chapters are showing the close correlation between economic development and environmental degradation by the macro statistics and case studies. In chapter 1 (Prof. Li), the environmental problems in the cities are analyzed by use of Input-Output tables and case studies for several cities to supplement analysis based on macro statistics. In chapter 2 (Prof. Gu), rural energy and environmental problems are discussed, summarizing historical development of rural energy system and environmental problems. The analysis is based not only on macro statistical data but also on detailed case studies for several rural areas. As a conclusion, both chapters are estimating the potential of cleaner technologies for reducing the environmental pollution in cities and rural area.

The purpose of the chapter 2, 3, 4 and 5, is to summarize historical development, to describe the present level of technology development and to assess the conditions for market competition with regards to each clean energy technology. During these tens years, there have been many projects to develop cleaner technologies, turning into some fruitful results. So each chapter firstly reviews the development of technological progress mainly from 1979 to present, consequently considering the effects of market transition. Secondly, each chapter discusses the conditions for market competition of each industry, in which such factors should be discussed as cost level, price difference with other competitors (e.g. conventional energy), the numbers and scales of the enterprises participating in the market, financial situation of the enterprises, potential to reduce the environmental pollution with the introduction of the technologies and government's support policies for their deployment. The approach for analysis is based on macro statistics and more importantly, case studies of enterprises. And lastly, as a conclusion, the needed institutions, like environmental regulation, are suggested to promote the diffusion and the commercialization of each energy technology. The topic for each chapter is as follows. Chapter3: energy conservation technologies (Prof. Lu), Chapter 4: Clean coal technologies (Horii), Chapter 5: Renewable energies (Dr. Liu), Chapter 6: Sustainable urban transport (Prof. Zhang).

Lastly, chapter 7 (Prof. Ren) discusses the influence of environmental regulation on the

development of environmental industry and on the diffusion of the cleaner technologies into market. Chapter 7 firstly reviews the related law and regulation for preventing environmental pollution, which strongly affects the development of environmental industry. And secondly, the current situation of Chinese environmental industry is analyzed based upon recent survey data. Thirdly, the direction of China's government promoting policy to develop environmental industry and diffuse cleaner technologies in market is summarized, which is also very useful to consider how to promote the diffusion of cleaner energy technologies, discussed previous chapters, in China's energy market and what institutional framework is needed.

This report is expected to be useful for understanding the effects of market transformation on China's environmental problems and the development of cleaner technologies under academic framework. And more expected to be helpful for using as an informative guidebook of China's clean energy industries itself for students, scholars, business persons, and policy makers outside of China.