International Max Planck Research School on
EARTH SYSTEM MODELLING

"Economic Analysis of Selected Environmental Issues in China"

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Abstract

This thesis investigates several selected environmental issues in China from an economic perspective. It consists of four self-contained papers. Chapters 2-4 address the issues related to water shortage, while Chapter 5 focuses on the cost of air pollution.

Chapter 2 analyses the potential application of desalination in China from an economic perspective. Concerned with water shortage in China, the study aims to assess the potential of desalination as a viable alternate water source through the analysis of the costs of desalination, the water demand and supply situation, as well as water pricing practices in China. The study shows that there is a significant decline in the costs of desalination for two main processes over time. The average unit cost of US\$0.6/m^3 for desalting brackish water and US\$1.0/m^3 for seawater, are suggested to be feasible for China. The future trends and challenges associated with water shortages and water pricing are discussed, leading to conclusions and recommendations regarding the role of desalination as a feasible source of water for the future.

Chapter 3 extends the cost analysis of Chapter 2 from two to five desalination processes and evaluates the cost of water transport. The unit costs of desalinated water are evaluated, followed by multivariable regressions to analyse the main influencing factors to the costs. The results show that the unit costs for all the processes have fallen considerably over the years. The regressions show that the total installed capacity, the year, the raw water quality, and the location of the plant all play a role in determining the unit cost of desalination. Transport costs are estimated to range from a few cents per m^3 to over a dollar. A 100m vertical lift is about as costly as a 100km horizontal transport (0.05-0.06\$/m^3). Therefore, transport makes desalinated water prohibitively expensive in highlands and continental interiors, but not elsewhere.

Chapter 4 focuses on the econometric analyses of domestic, industrial and agricultural water uses in China using province-level panel data. The study shows that the regional disparity in the level and pattern of water uses is considerable. Economically developed or more industrialised areas at the coast consume less water than the agriculture dominated provinces in the west and far south of China. The results suggest that both economic and climatic variables have significant effects on water demands. For the domestic sector, income is the dominant factor influencing the magnitude of water use and shows an income elasticity of 0.42. We find that richer provinces have a higher income elasticity than do poorer provinces.

Chapter 5 values the health impacts from air pollution in Tianjin. Although China has made dramatic economic progress in recent years, air pollution continues to be the most visible environmental problem and imposes significant health and economic costs on society. Using data on pollutant concentrations and population, the study estimates the economic costs of health-related effects due to particulate air pollution in urban areas of Tianjin. The results suggests the total economic cost is about US\$1.1 billion, or 3.7% of Tianjin's GDP in 2003. The findings underscore the importance of urban air pollution control.

Key words: water shortage, air pollution, economic analysis, desalination, water use, MSF, RO, PM_{10}, external cost, China.