



Addressing China's Water Scarcity

For years, water shortages, water pollution, and flooding have constrained growth and affected public health and welfare in many parts of China. Northern China is already a water-scarce region, and the country as a whole will soon join the group of water-stressed countries. The combined impact of increasing demand, available supplies, and deteriorating water quality caused by pollution suggests that a severe water crisis is emerging.

China's leadership is aware of the worsening water situation, and is committed to transforming China into a water-saving society. The 11th Five-Year Plan (2006–10) sets a number of policy goals and priorities for water resource management, such as adopting a more unified and better coordinated management system, shifting from supply-side to demand-side management, integrating river basin management with regional management, and establishing a system of water rights trading.

To date, however, the scarcity of water resources has not been effectively managed. Many national and local water resource management and pollution control plans have not been fully implemented and many investment targets have not been achieved. Water pollution poses a serious threat to public health and causes major economic and environmental losses, estimated by the Chinese government at the amount equivalent to about 1.7 percent of GDP or more in 2004.

The most important costs relate to the health risks associated with polluted drinking water sources. Over 300 million people living in rural China have no access to safe drinking water. The economic cost of disease and premature deaths associated with

the excessive incidence of diarrhea and cancer in rural China has been estimated, based on 2003 data, at 66.2 billion yuan, or 0.49 percent of GDP.

Challenges for China's Water Resource Management

China's water resources are scarce and unevenly distributed. It has the sixth largest amount of renewable resources in the world, but a per capita availability that is only one-fourth the world average and among the lowest for a major country. The country is under serious water stress, and its problems are made more severe by the fact that resources are unevenly distributed, both spatially and temporally. Per capita water availability in northern China is less than one-fourth that in southern China, one-eleventh of the world average, and less than the threshold level that defines *water scarcity*. A monsoonal climate also means that China is subject to frequent droughts and floods, often simultaneously in different regions, as precipitation varies greatly from year to year and season to season. In the Hai and Huai basins, for example, river flows fall to 70 percent of their averages one year in four; dry years tend to come in succession, accentuating the problem.

China's water productivity is low compared to middle and high-income countries, largely due to differences in the sectoral structure and efficiency of water consumption. Productivity in agriculture, which accounts for 65 percent of water usage, is the lowest of all sectors, primarily because of wasteful irrigation systems (more than half the water

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withdrawn never reaches crops) and suboptimal allocation among crops. An inefficient allocation system treats the use of water in paddy fields the same as in vegetable fields, though the latter are twelve times as profitable per unit of water. Industry accounts for 24 percent of water usage, and its recycling level is half that of developed countries. The magnitude of these differences is indicative of a lack of market consciousness.

Over the years water pollution has increased, spreading from the coast to inland areas and from the surface to underground resources. Domestic discharges have become the largest pollution source, which is significant since slightly more than half of municipal sewage is treated, whereas almost all industrial wastewater is treated. Pollution incidents overwhelm the fragile water environment, contaminate downstream drinking water for millions of people, and threaten public health and the quality of life. Water quality of most of China's water bodies has been degraded, with over one quarter deemed unsafe for any use and only one third considered safe for industrial and irrigation applications (see Figure 1). Of 27 major monitored lakes and reservoirs, only 29 percent met standards safe for human consumption after treatment.

Pollution exacerbates scarcity when polluted water cannot be used, resulting in unmet demand and groundwater depletion. Water that does not meet quality standards is nevertheless supplied to

households, industry, and agriculture, with the attendant damage and public health costs.

Finally, it is clear that current growth trends are unsustainable unless they are accompanied by improvements to existing infrastructure and fundamental reform of the country's water resources management. Over the past three decades, the economy has grown at an average of more than nine percent a year. The percentage of the population living in urban centers has gone from less than twenty percent to almost fifty percent; in another decade, well over half the population will live in cities, further stressing municipal water systems that cannot adequately treat wastewater. The population is expected to continue to grow, reaching 1.5 billion sometime around 2030. These three trends pose serious challenges for improving China's water resources management.

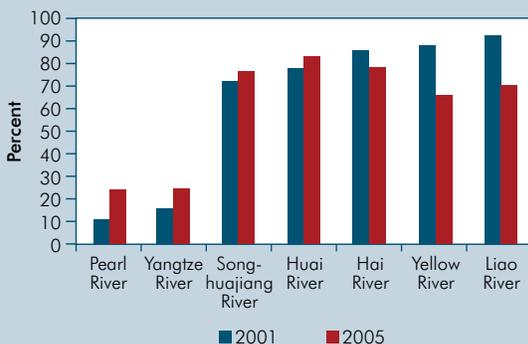
A Plan of Action for Addressing Scarcity

The factors underlying the emerging water crisis point to the need for China to reform and strengthen its water resource management framework. The focus of reform needs to be on improving the efficiency and effectiveness of water management institutions, using market-based instruments as much as possible, and clarifying the roles, responsibilities, and relationships of government, markets, and society.

The complexity of water resource management in China requires a transition from a traditional system with the government as the main decision-making entity toward a modern approach that relies on a sound legal framework, effective institutional arrangements, transparent decision making and information disclosure, and active public participation. This will require that laws are straightforward and not contradictory, with mechanisms and procedures for enforcing them. It also should entail the creation of a new multi-sectoral state agency tasked with overseeing water management policy at the national level.

Another priority is the development of a coherent water rights system, using water resource allocation plans as the basis for assigning rights and making sure rights are assigned in an ecologically sustainable manner. Wherever possible, water rights ought

Figure 1. Percentage of Sections with Water Quality Grade IV to Grade V+, 2001 and 2002



Source: China Environmental Status Bulletins (2001–05).
 Note: Grades I–III refer to water that is safe for human consumption after treatment; grades IV–V refer to water that is safe for industrial and irrigation use; and grade V+ refers to water that is unsafe for any use.

to be based on the rate of evapotranspiration, which spotlights consumption and encourages more efficient use of water, the adoption of water-saving technologies, and increased return flows to the environment.

Water pricing can be an effective means of reducing water usage and increasing efficiency. China has moved to raise the rates charged for water services, but they have yet to reach the point at which providers can recover costs, and prices do not reflect environmental damage or depletion costs. The inevitable result has been that water service providers have failed to adequately maintain their infrastructure, expand service to outlying and poorer areas, and operate in a manner that meets environmental standards. Prices that reflect the full scarcity cost of water would create an incentive for using more efficient technologies to reduce waste and overall consumption.

Social protection measures will be necessary as the price of water rises to reflect its full scarcity value. Subsidizing the price actually does little to help the poor, as most of the benefits from the artificially low price accrue to better-off consumers and industry while discouraging efficient water use in the process. Instead, water must be priced at a level that fully reflects its relative scarcity in China, with programs that utilize vouchers or direct transfers to ensure that the country's poor have access to the water resources they need.

Coping with scarcity requires protecting sources of water, especially the ecosystems in the upper reaches of river basins such as forests, wetlands, and agricultural lands. Central and local governments are increasingly using *ecological compensation mechanisms* (ECMs), which are government transfers from public funds to protect ecosystems. These transfers, however, do not provide a direct link between ecosystem service providers and beneficiaries. A *payment for ecosystem services* (PES) system addresses this weakness by creating a market for environmental services in which money is reallocated from the beneficiaries of environmental services (consumers) to those providing the services (such as watershed land managers). A PES system offers a more market-oriented and self-financing alternative to the government-funded ECMs currently in use.

Pollution reduction and elimination is an important part of the solution to water scarcity. There has

been inadequate investment in pollution control, and much wastewater still goes untreated. Many pollution prevention and control plans have failed to achieve their objectives, and institutional and policy shortcomings have led to insufficient prioritizing of pollution control measures and enforcement of environmental regulations. Efforts must be made to improve pollution control planning, unify and strengthen pollution control monitoring, strengthen the wastewater discharge permit system, increase the reliance on market-based instruments that reflect the true costs of pollution, control rural pollution that impacts users downstream, and use the existing litigation system to hold polluters accountable for despoiling public goods.

A final task is to improve China's emergency response to pollution disasters and to increase the chances that such catastrophes can be avoided in the first place. The high frequency of serious pollution incidents and the costs associated with them suggest the need for reforming and strengthening existing institutions for emergency prevention and response. These reforms should include shifting the emphasis from mitigation to prevention, enhancing disaster preparedness, establishing a disaster relief fund paid for by polluters, and increasing monitoring to detect emerging problems before they worsen.

Further Issues for China's Future

The variations in the economic value of water by sector and by region, low economic efficiency of agricultural water use, and poor cost-effectiveness of underground water withdrawal in North China all can be helped by increasing efficiency and reducing demand. The issue is how to improve the efficiency of water use while reducing rural poverty and securing the nation's food supply at the same time.

Global warming caused by human activities is one of the biggest threats to the natural environment and human well-being. Climate change will have a negative impact on the scarcity and vulnerability of China's water system, and remedial measures must be taken to adapt to and ameliorate these effects.

The effective application of water management measures—such as pricing, allocation and water rights administration, ecological compensation, and water quality management—is dependent upon an

analysis and understanding of the ecosystems and the economic value of competing water uses. In many cases, the important analytical work remains to be done. Developing a sophisticated analytical system using advanced economic, geographic, and ecological tools is required for sound policy making (see Table 1 for a sense of the many elements involved in planning and spending).

There is no doubt that China faces a major challenge in managing its scarce water resources to sustain economic growth in the years ahead. Past experience in China and in other countries provides some lessons for the way ahead. The country is unique in many ways and will have to adapt techniques and policies developed elsewhere to suit its own circumstances. There are grounds for optimism, given China's immense innovative capacity in its program of economic reform. It can and should take another bold move in reforming the institutional and policy framework to make it a world leader in water resource management.

Table 1. Planned Water-Related Investment Shares between the Central Government and Local Sources in Wei River Basin

Spending Items	Ratio of Central Government to Local Investment
Water Saving	2:01
Water Pollution Control	1:04
Water Use	2:01
Flood Control	8:02
Water and Soil Conservation	7:03
Ecosystem and Dry Farming	1:01
Total Investment (billion yuan)	22.6
Share of central/ local government (%)	62.4%/ 37.6%

Source: The Integrated Control Plan of Wei River Basin in Shaanxi Province (Working Group of Weihe River Basin Comprehensive Control Plan 2002).

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