WATER

P-NOTES

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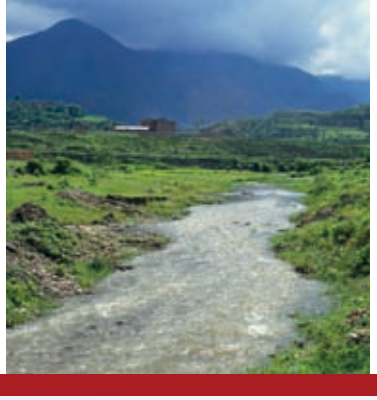

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Sink or Swim—Toward Water Security for All

Harnessing the productive potential of water and limiting its destructive impacts have challenged the human species since its origins. Many of the earliest civilizations, particularly those on the floodplains of the world's major rivers, succeeded by harnessing water, often in nation-building efforts that spawned great civilizations. But water is also a force for destruction—catastrophically through drought, flood, landslides, and epidemic, and progressively through erosion, inundation, desertification, contamination, and disease. Water also has been a source of dispute, particularly where it crosses jurisdictional boundaries.

Today, where water supplies are adequate and reliable, societies are relatively rich. Water security was easily achieved in temperate climates where rainfall is not extremely variable. By contrast, where water is scarce, variable, and uncontrolled, most societies have remained poor, and basic water security has not been achieved. There are other reasons why societies are poor or rich, but the significance of water security is considerable—and little recognized.

Over time, human beings have developed reservoirs of knowledge and experience about how to control and manage water, but, with economic development and population growth, the demands on water have grown apace. This is true in all industrial countries, which invested early and heavily in water infrastructure, institutions, and management capacity. It is equally true in developing countries, where investments in water development and management remain an urgent priority. In some developing countries—often the poorest—the severity of the challenge of managing water is almost without precedent.

Yet in recent years the development of water infrastructure, particularly large-scale water infrastructure, has been stalled by a general perception that it is bad for the environment and for populations affected by water projects. That perception has become a barrier to further extensions of our ability to harness water for good and to control its destructive power. Opposition, particularly to the financing of dams for storage, hydropower, and other purposes, has had significant political impact on the aid policies of donor governments and international organizations. The controversy and criticism that often attend infrastructure investments have left little appetite among aid donors for developing water resources infrastructure in poor countries and tackling the unavoidable tradeoffs that such development entails.

Discussions of the growth and poverty implications of diminished support for water infrastructure in the developing world would benefit greatly from a better understanding of how developed countries have dealt with hydrological vulnerability; how they have used strategic investments in water infrastructure to alleviate poverty and catalyze growth; and how they learned to balance risk and benefit in water development.

Three water-development scenarios

In all *industrialized countries,* the flows of almost all major rivers are regulated and managed, making

This note reports the key messages and findings of "Sink or Swim? Water Security for Growth and Development," by David Grey (dgrey@worldbank.org) and Claudia Sadoff, published by the World Bank in June 2007. Readers may download the complete paper from www.worldbank.org/water.

it possible to store water for multiple uses (figure 1), reduce peak flows, increase low flows, and protect water quality. Early investments were made in bulk water infrastructure and in the human capacity required to operate and maintain it. In most countries, the infrastructure platform is mature, so that policy makers and water practitioners focus on efficient management of water infrastructure and on protecting the environment and the recreational potential of bodies of water.

Water infrastructure in the United States, for example, represents a cumulative investment of trillions of dollars to curb the destructive effects of water, extend agricultural production, and promote growth. Such investments have entailed substantial social and environmental costs, as well. Public debate on the importance of conservation have led to the adoption of environmental standards and social safeguards. Over the next decade, the United States will spend some $200 billion to meet its environmental standards.

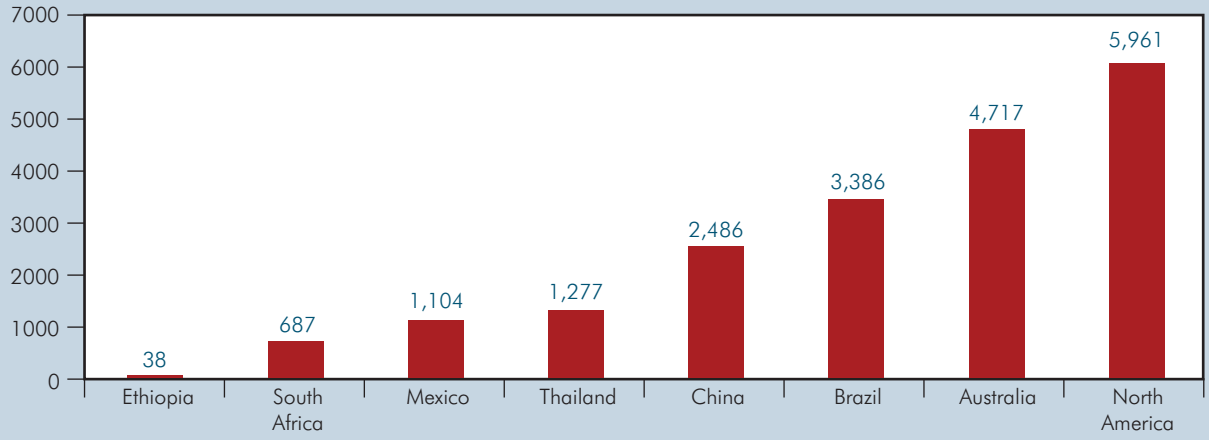
Most *industrializing economies* also have made substantial investments in water infrastructure, often to promote growth—for example, through hydropower and irrigation. But many industrializing economies remain vulnerable to catastrophic events, such as floods and droughts. In other cases, infrastructure has been built, but institutional capacity is inadequate to manage it effectively, underscoring the imperative of balancing and sequencing investments in infrastructure and in related institutions. Getting this balance right in individual countries is crucial for leveraging and sustaining growth that may now be hampered by hydrology.

In India, for example, investments in hydraulic infrastructure and irrigation have contributed significantly to growth. Still, important opportunities remain to extend the benefits of infrastructure for irrigation, drainage, and flood management. The potential benefits of improved institutions are similarly significant. In Tamil Nadu, for example, robust management institutions that would allow a flexible allocation of water between uses could increase the state's agricultural production by 20 percent in 20 years.

In the *least-developed economies*, climate variability is often marked, while the infrastructure and institutions needed to mitigate its effects are generally inadequate. Catastrophic hydrological events regularly exact dramatic costs, with declines in annual GDP often exceeding 10 percent. As a consequence of widespread expectation that unmitigated catastrophes will recur, risk-averse behavior becomes the rule, undermining investment even in years unmarked by catastrophe. Growth is held hostage to hydrology.

In Ethiopia, for example, the current economic cost of hydrological variability is estimated at more than one-third of the nation's average annual growth potential, and these diminished rates are compounded over time. Although its hydrological variability is much greater than that of North America, Ethiopia has less than 1 percent of the artificial water storage capacity per capita to manage that variability.

Figure 1. Reservoir storage per capita, (m^3/cap), 2003



Box 1. Water security defined

Water security is the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems, and production, coupled with an acceptable level of water-related risks to people, environments, and economies.

Implicit in the notion of water security is the idea of a minimum platform of water institutions and infrastructure, below which society and the economy are not resilient to the impact of water shocks, and water is a significant obstacle to growth.

Toward water security

The investments and institutions required for basic water security (defined in box 1) will differ across countries as a consequence of their hydrological endowment and the structure of their economy. International rivers can also significantly affect the potential for managing and developing water, as different countries exert their impact on shared river and lake systems. Climate change, too, will compound the challenge posed by hydrological variability and extremes, particularly in poor countries.

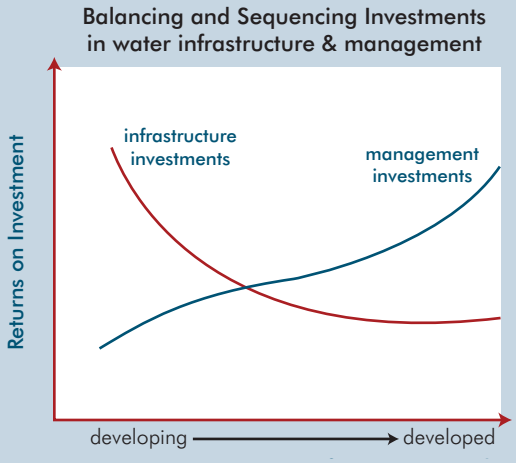
Countries need effective institutions if they are to harness hydrology, but, in much of the developing world, institutions have not keep pace with population growth or technology. This trend is not new. Over the past century, our technical capacity to exploit water resources has grown faster than our ability to manage these advances. One culprit is an explosion in technologies and engineering capabilities. The case of groundwater is illustrative. The customary law of groundwater development was well-adapted to technologies that allowed groundwater abstraction at shallow depths, but motorized drilling rigs and pumps, which allow higher pumping rates from greater depths, have made those customary practices obsolete in many areas, while resulting in massive and sometimes irreversible overabstraction of groundwater.

Technology is not the only test of our institutions. As countries grow and their populations become more secure, they typically place greater value on environmental preservation. That the industrialized countries have already reached this point explains a good deal of their opposition to dams and other large water infrastructure in the developing world. Developing countries chafe under the pressure to adopt the values, priorities, and standards of developed countries—and to forgo investing in the water infrastructure they believe they need to achieve the benefits of good water management.

Drawing on their own experience, and already enjoying the benefits of a mature platform of water infrastructure, most donor nations are more focused on improving the institutional management of existing systems than on investing in new ones. But better management may provide little return where physical infrastructure remains insufficient to meet hydrological demands (figure 2). The donors' clients, meanwhile, may well prefer to invest in more infrastructure, while mitigating the inevitable costs through the pragmatic application of social and environmental safeguards.

Below a minimum platform of water infrastructure a society is highly vulnerable to water-related shocks, making it impossible to guide economic growth reliably and predictably. Once basic water security is achieved, however, societies are sufficiently resilient to the impacts of water so that water underpins, rather than undermines, growth.

Figure 2. Returns on investments in managing water infrastructure rise as the stock of infrastructure grows



Therein lies a challenge. Can the lessons of developed countries, enhanced by local and indigenous knowledge, provide insights into alternative management strategies and infrastructure designs and operations that achieve water security, growth, and poverty alleviation, but at lower environmental and social cost?

The answer is yes. A wide range of experience in water resource management and development, social inclusion, and economic management can be tapped to guide countries as they endeavor to leapfrog over some of the stages passed through by the developed countries, while avoiding some of their mistakes. Water infrastructure *can* be built without penalizing local communities or the environment, while allowing the economy and society at large to benefit from the growth and other benefits that such investments make possible. Through pragmatic application of international good practice, developing countries can achieve water security, reduce poverty, and promote growth without imposing the environmental and social burdens of years past.

The way forward

A great deal of progress has been made in water resource management in recent years, with a broad global consensus emerging from the 1992 Earth Summit in Rio and later expressed in what are now known as the Dublin Principles. International standards and safeguards for reducing the social and environmental costs of investments in water infrastructure are supported by a growing body of tools, such as the recommendations of the World Commission on Dams and the International Hydropower Association, as well as the environmental and social safeguards of the World Bank. These lessons allow us to avoid constraining growth and development unduly as we uphold evolving values about social equity and environmental protection.

Among the important advances are those related to water resource management, economic resilience, and social inclusion and equity.

Managing water resources. Allocation mechanisms in widespread use—such as water rights and regulations, and water pricing and fees—ensure better management of water resources. Important evolving practices include innovations in environmental and social impact analyses (particularly of project-affected populations and environments), in-stream flow management, environmental set-asides, demand management, enhancement of natural water storage and regulation, and benefit sharing with affected populations and transboundary neighbors.

Economic resilience. Steps can be taken to make the economies of water-insecure nations less vulnerable to water shocks. Among those steps are greater investment in water-resilient sectors and areas, water pricing that provides appropriate incentives, trade in "virtual water," and greater economic diversification.

Social inclusion and equity. An enduring challenge in water management is balancing the aspirations of society at large with the protection of groups affected by water projects. Better impact analysis, tighter safeguards, greater transparency, and more extensive participation and communication are important parts of new approaches to the planning and execution of projects.

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Water Sector Board

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