

Water Resources: Managing a Scarce, Shared Resource

Water security is fundamental to poverty alleviation. However, it is expected that by 2025, 3.5 billion people will live in water-scarce or water-stressed areas, up from 1.0 billion in 2005. The world's poorest countries and the poorest communities within these countries are the most vulnerable to inadequate management of water resources.

The International Development Association (IDA), the World Bank's fund for the world's poorest countries, has a unique role to play by working across sectors, institutions and countries involved in water resources management. The Bank has proven to be an "honest broker," bridging sensitive trans-boundary issues, coalescing policy across different parts of an economy, and weaving infrastructure with environmental management, social participation and institutional development. The World Bank's sharpened focus on climate change will primarily assist IDA economies that depend heavily on climate-sensitive sectors such as agriculture, forestry, fisheries, a reliable water supply, and other natural resources. In its role, and in collaboration with other donors, IDA directs critical funding towards countries that would otherwise have a hard time investing in the management of public goods management on a long-term, continuous basis for water security.

At a glance

- While world population tripled in the 20th century, the use of water increased six-fold.
- Irrigated agriculture accounts for about 70 percent of global water use, and more than 90 percent in some water-stressed regions.
- Low-income, IDA countries account for about 80 percent of the most water-poor countries.
- More than 260 rivers in the world run through more than one country, presenting both opportunities and challenges, especially in Africa.
- Total IDA funding for water resource management amounted to about US\$1.3 billion, spanning 107 projects between fiscal years 2000 and 2009.

The impact of water resource management projects is often profound. Evidence from recent lending demonstrates that such support has increased agricultural incomes, reduced the losses from flooding, nurtured regional cooperation, reduced sediment loadings and mitigated water-borne diseases. Several IDA countries are making significant progress in water resources management, having established basic policies and capacity. Ongoing, flexible support will be needed to secure and extend these achievements, and deepen their impacts on poverty alleviation and sustainable development.



SECTORAL CONTEXT

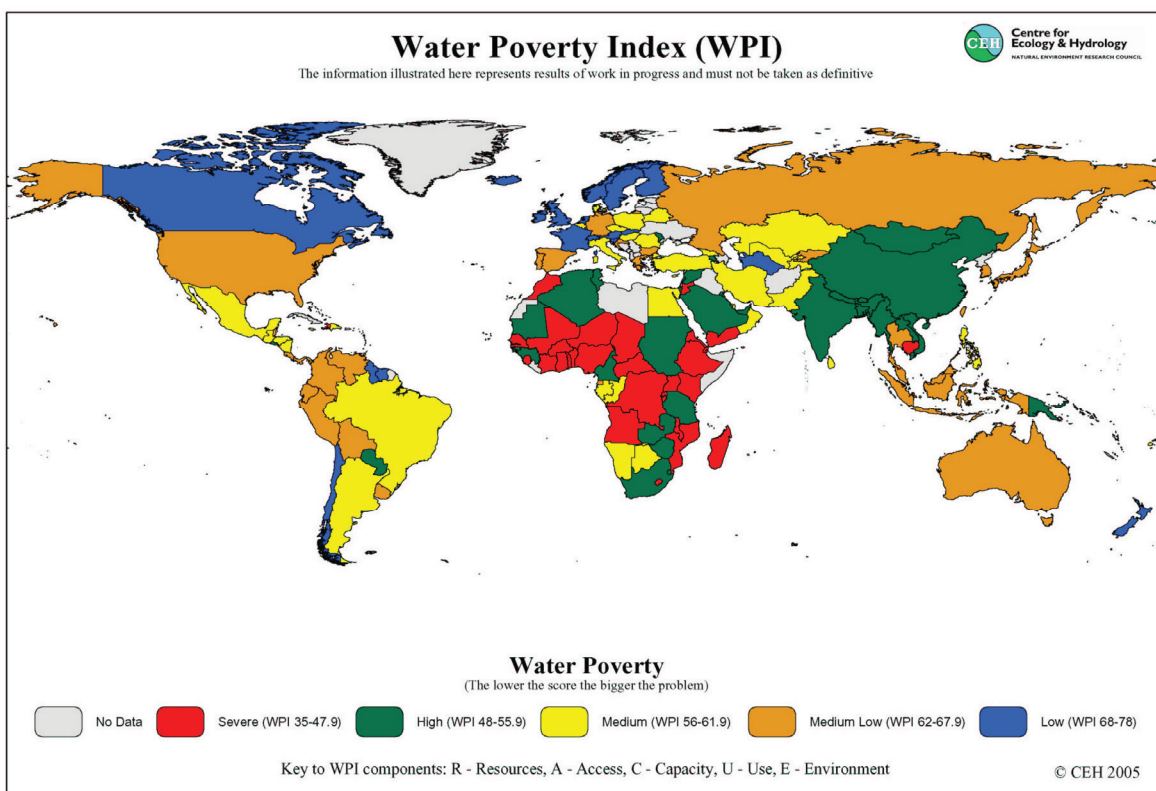
Water: Our Common Link

While world population tripled over the last century, the use of water increased six fold. Irrigated agriculture accounts for about 70 percent of water use, and about 90 percent

in some water-stressed regions. Low-income IDA borrowing countries account for about 80 percent of countries with the worst water poverty ratings (see map).

Analytical work has demonstrated connections between water and almost all types of economic activity—including farming, manu-

The Water Poverty Index illustrates the degree to which water scarcity impacts on human populations.



facturing, energy and transport—as well as the business climate.

Climate change is projected to alter the amount, intensity and frequency of precipitation, directly affecting the magnitude and timing of runoff, floods and droughts. For regions that are already highly vulnerable to climate variability, the potential impacts on all sectors that depend on water—from domestic water supply and agriculture to health and the environment—could wreak havoc on economies and livelihoods.

Tensions over water allocation and rights are increasing at the local, national and regional levels.

Climate change poses risks to World Bank investments in the water sector. The Bank reviewed its water portfolio to understand its exposure to climate change. From FY06-08, the water portfolio comprised 191 projects in 83 countries with a total commitment of US\$8.8 billion, as well as a pipeline for FY09-10 of 220 projects with projected commitments of US\$11.3 billion. The resulting projections indicate that about half of the Bank's water portfolio would potentially be at high to medium risk of exposure to climate change impacts in the year 2030.

The review also illustrates that the World Bank is already responding to this challenge. Out of the 191 projects approved during FY06-08, 35 percent considered strategies to reduce the impacts of climate variability and change, including adaptation and/or mitigation measures. For the total active portfolio, however, only 20 percent of the projects address climate variability and change.

Key trends

Water resources management is a complex and relatively new area of focus for many countries. It requires action at the policy, legal and institutional levels while addressing direct impacts at the community level. It is further complicated by impacts and influences from other sectors, such as industrial pollution, agricultural intensification or hydropower generation. Some of the key trends and priorities in water resources management include:

- Developing a better understanding of water-related linkages across economic sectors at the country level.
- Strengthening institutions for effective local and basin-level management.
- Creating and implementing innovative mechanisms for sharing economic, social and environmental benefits of water.
- Managing water resources across national boundaries.
- Contributing to the development of environmentally sustainable water infrastructure for storage and other uses.
- Identifying and implementing measures for increasing the efficiency of water use.
- Addressing water management challenges associated with rapid urbanization and changes in water use patterns as tension between urban and rural water use grows.
- Mitigating water pollution for protecting the environment and facilitating water reuse.
- Accelerating efforts to examine and develop hydropower as a climate-friendly renewable source of energy.
- Developing an appropriate menu of adaptation and mitigation options for addressing hydrologic variability and climate change in water management.

Building the intellectual and financial capital to improve water security requires concerted and long-term support from an array of players, including international financial institutions, bilateral aid agencies and non-governmental and civil society groups.

Challenges

Water resources management cuts across sectors, skills, institutions and sometimes countries. Water resources have multiple uses, and can be a private or public good depending on the use, which contributes to the potential for contention around ownership and stewardship. Water resource management initiatives frequently lack revenue streams, placing an additional burden on already over-taxed public finances. Because they reach across land areas and economic and social sectors, many water management reforms and initiatives require a high level of coordination. There needs to be collaboration by players at the community, national, and international levels, across sectors as diverse as agriculture and hydropower. Furthermore, the range of tools required to address water resources issues extends from analysis to participatory processes, to investments in structures, and civil works. Not surprisingly, this sector requires a long-term commitment.

IDA CONTRIBUTIONS

IDA's work in the water resources sector is guided by the 2003 Water Resources Sector Strategy.

The strategy emphasizes the need to address both management and development issues; tackling institutional reforms along with infrastructure upgrades.

To better integrate water management into country programs and development plans, the strategy recommends preparation of Country Water Resources Assistance Strategies in consultation with client governments. Eighteen such plans have been produced to date for IDA countries.

Total IDA funding for water resources management amounted to US\$1.3 billion, across 107 projects during FY00-09. IDA funding for this area reached an unprecedented amount of US\$334 million in FY08. But in the following fiscal year, IDA funding for water resources management amounted to US\$145 million, less than half of the previous year. All commitments in FY09 were split between three regions—South Asia (35 percent), Africa (33 percent), and the Middle East and North Africa (32 percent)—and was concentrated in the rural sector (58 percent) and water sector (32 percent).

Given the nature of water resources management, aggregate impact measures are not available. However, on-the-ground results related to IDA activities can be highlighted in six critical areas.

Policy and legal framework

In most countries, and particularly in IDA countries that struggle with low capacity and poorly-developed institutions, the Bank pays considerable attention to the foundational components of water resources management, namely development of policy and legal frameworks. A large percent of IDA-funded water resources management projects include institutional and/or policy components. In Tanzania, for example, IDA funding supported the development of a National Water Policy, which was adopted by the Cabinet in 2002

and which subsequently formed the basis for a National Water Sector Development Strategy. As a result, water and water resources management are now firmly entrenched as key priorities in the National Development Vision. Similarly, IDA funding has supported the development of water laws in Senegal and Yemen. In both cases, policy reform was accompanied by sector-specific actions.

Institutions and capacity-building

In the case of water resources management, relevant institutions span the range of local, basin, national and international levels.

Yemen's water law enacted in August 2002 led to the establishment of the Ministry of Water and Environment to consolidate public management and support an integrated approach to water resources management. From this platform emerged the Sana'a Basin Commission that has demonstrated an ability to make substantive decisions, taking into account the range of associated sectors. The IDA-financed Sana'a Basin Water Management Project (2003-2009) was the first initiative in Yemen to address the crisis in groundwater depletion.

At the local level, IDA funding has expanded the involvement of local stakeholders in water management through the creation of water user associations. In Yemen, 34 irrigation water user associations were established over a three-year period in the Sana'a Basin, along with 15 recharge water user groups.

In China, the Tarim Basin Projects (1991-1997 and 1998-2004) resulted in the first fully functional integrated river basin management system in the country.

In India, new participatory micro-watershed planning approaches resulted in highly-integrated micro-watershed plans being prepared by communities, which have greater ownership and commitment. Between 2001 and 2007, one project, financed with \$100.4 million from IDA, created 4,300 area groups of farmers and 738 micro-watershed user groups to support project implementation and longer-term operations. Recent evaluations indicate that more than 70 percent of these groups are operating effectively, allowing the voices of all social groups in the communities to be heard in watershed development.

Little recognition or significance is given to the vital function of groundwater in the global water cycle or to the immense benefits resulting from proper management of groundwater as an integral part of the overall management of the resource. The need for a strategy to promote good governance of groundwater and to build a broad coalition for change is being addressed by the World Bank at the global level. The initiative will promote alternative approaches to current groundwater use. Good governance of groundwater is identified as a high priority issue in the water sector in many IDA countries and was also highlighted as an emerging global priority issue at the Fourth World Water Forum in Mexico in 2006. This will be addressed through a consultative process at the Fifth World Water Forum in 2009 in Turkey.

Trans-boundary river management

More than 260 of the world's rivers run through multiple countries, presenting unique opportunities and challenges, predominantly in Africa.

IDA funding produced power, environmental and agricultural benefits for Senegal, Mali, and Mauritania through investments in infrastructure, equipment and trans-boundary management institutions in the Senegal River Basin.

In Mozambique, an International Rivers Office was established within the Water Resources Department, providing improved technical capacity to assess water resources and basin plans, and stronger technical ability to engage in dialogue with other countries on riparian rights and basin management issues. Increasingly, water resources management is emerging as a vehicle for regional peace and stability as well as more effective water management and allocation.

Hydropower

Hydropower is a major contributor to the growth of renewable energy, outpacing capacity growth in wind, biological sources, geothermal and solar. Much of this growth has come in developed and emerging economies. In FY09, IDA contributed additional financing for the hydropower rehabilitation components in the Pamir Supplemental Financing Project in Tajikistan, and the component for village electrification through micro-hydropower in the Power Development Project in Nepal. IDA also continues to support lending for hydropower rehabilitation in Africa as part of the Niger Basin Water Resources Development and Sustainable Ecosystems Management Project, and the Renewable Energy Project in Armenia.

Agriculture

In many low-income countries, agriculture employs the largest share of people and is

therefore a critical sector for achieving targets for global poverty reduction. IDA lending to agriculture increased steadily during the past years. Yet agriculture's share of total IDA lending remained static at about 9 percent over FY04-08 before shooting up to 16 percent, or US\$2.2 billion, in FY09. The largest share of resources for agriculture has gone to Sub-Saharan Africa, followed by South Asia as the second largest beneficiary. Irrigation and drainage has tied with general agriculture as the leading sub-sectors of IDA annual commitments to agriculture.

Due to a number of factors, global food prices more than doubled from 2006 to mid-2008. In late 2008 they declined by 30-40 percent, and then rose again until June 2009. The price spikes in early 2008 led to sharp increases in staple food costs in many developing countries, and contributed to civil unrest in nearly 40 countries in 2008. At the same time, the price of inputs to agricultural production such as fuel and fertilizers tripled, undercutting the profitability of smallholder farmers. It was estimated that without adequate collective response, the rise in global food prices could result in an additional 100 million people in low-income countries falling below the poverty line.

The *World Development Report 2008: Agriculture for Development* led to a broad, renewed consensus on the importance of agriculture for development. It called for greater investment and more donor support for agriculture, for leveraging global partnerships, and for a more strategic approach and improvements to encourage the development and functioning of markets. In 2008, in response to rising food prices, a strategic and coordinated approach was adopted with partners, under the coordination of the United Nations Sec-

retary-General. In May 2008 the World Bank initiated the Global Food Crisis Response Program. Supported by other donors, the US\$1.2 billion rapid financing facility helped to speed up assistance to the neediest countries, most of which receive IDA financing. In response to high demand, the program ceiling was increased to US\$2.0 billion by the World Bank Board of Directors in April 2009. IDA also provided support for agricultural productivity interventions through the Global Food Crisis Response Program. In Nepal, for example, small-scale irrigation through community grants is being supported, together with the distribution of seeds and fertilizers. To implement the advice contained in the 2008 World Development Report and significantly expand support for agriculture, the World Bank is now preparing an Agriculture Action Plan for the 2010-12 fiscal years. Among the strategic priorities is the need to raise agricultural productivity, including through improved agricultural water management in irrigated and rain-fed areas.

A number of IDA-funded operations related to water management and the agricultural sector have been successful. Some also had significant environmental benefits. Three completed projects are highlighted here.

The On-Farm Irrigation Projects in the Kyrgyz Republic (2000-2013) set out to achieve increased crop production through reliable and sustainable water distribution in formerly state and collective farms across seven administrative regions. A core activity has been strengthening services to about 450 water users associations, including training and support. The project focused also on rehabilitating on-farm infrastructure under the management of user associations that had met certain milestones, and improving opera-

tion and maintenance. Considerable success was achieved in establishing and improving water user associations. Dedicated support units earned the respect and trust of water users and played a key role in the establishment and effectiveness of the user associations. Over 50,000 people were trained, and approximately 450 user associations, with 166,000 members, were formally registered to manage irrigation areas covering 710,000 hectares, or about 70 percent of the country's irrigated land.

Infrastructure on 121,000 hectares managed by 63 water user associations was rehabilitated. Water delivery to farmers in 80 percent of the rehabilitated schemes now closely matches irrigation water demands. Irrigation service fees have doubled on average, and collection rates by the user associations amount to close to 100 percent of total assessed fees. A follow-up project now focuses on continued assistance to associations and additional rehabilitation works.

The Tanzania River Basin Management and Smallholder Irrigation Project (1996-2004) focused on water-related environmental concerns at the national level and the particular problems in the two largest basins. It provided support to improving water access and use by low-income smallholder farmers in 15 irrigation schemes through better agricultural water management, infrastructure, and stakeholder participation. More than 1,500 farmers were trained in water management, crop production techniques, agro-business, and financial management and leadership skills. Through a combination of activities, including policies on water rights and fees, crop yields for more than 5,000 households doubled, and agricultural incomes tripled.

The Second Loess Plateau Watershed Rehabilitation Project (1999-2005) in China supported one of the world's largest erosion control programs in the heavily degraded Loess Plateau, with the aim of returning this poor part of the country to an area of sustainable agricultural production. The project substantially raised agricultural productivity, increased and diversified farm incomes, improved the environment, and created conditions for sustainable water and social conservation. Over the project period, the yearly per capita income of project households, comprising 1.9 million people, more than doubled. Per capita grain production increased by 78 percent. Vegetation cover in the project area increased from 17.3 percent to 33.5 percent. A grazing ban introduced through the project and implemented in most of the Loess Plateau has dramatically changed the landscape of a whole region of China. Increased income and the prospect of a sustainable natural resource base have allowed farmers to invest in a wide range of enterprises and social programs which benefited communities as a whole.

Environmental and social benefits

In the Senegal Basin, pilot activities indicated that activities such as improving sanitation and the distribution of medications and bed-nets, could directly reduce infant mortality due to diarrheal diseases by 40 percent, and due to bilharzia and intestinal parasites by 50 percent. These trial projects provided the basis for a basin-wide strategy for water-borne disease reduction that is currently being implemented as part of an IDA-funded multi-purpose water resources management project.

In Pakistan, watercourse improvements have led to water savings of approximately 85,000

acre-feet and reduced water logging and flood threats in numerous villages. In other IDA projects, improvements in water use efficiency freed up water for regeneration of the environment downstream.

IDA-funded flood projects in Uganda, Kyrgyz Republic, and Bangladesh enhanced protection of populations, infrastructure and property. In the Lake Victoria Environmental Management Project, water hyacinth was reduced to non-nuisance levels and fish species—thought to be extinct—were discovered in satellite lakes.

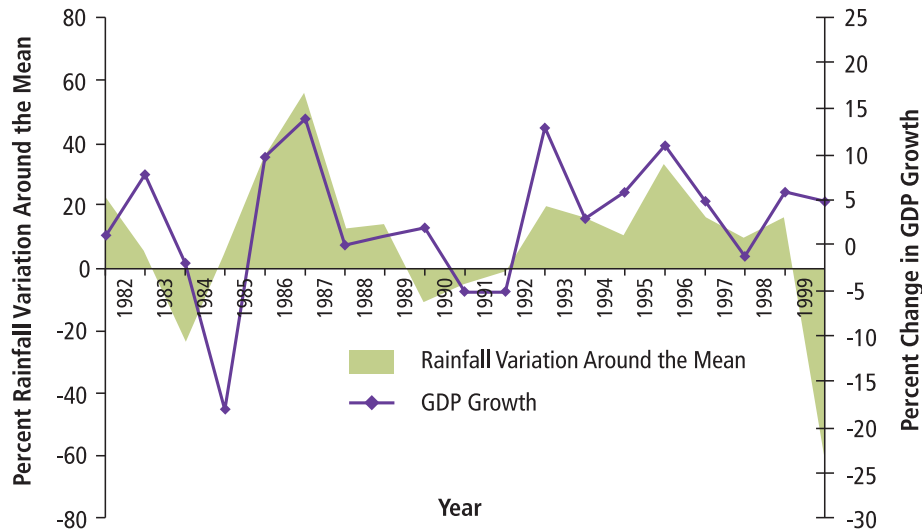
Management across sectors

Frequently, water resources management projects involve more than one sector and combine investment initiatives entailing both institutional development and capacity building. Expertise ranges from analytical work to public administration, legal frameworks, participatory methodologies and environmental safeguards.

IDA can bring diverse tools for water resources management together in coherent and coordinated programs. The analytical work carried out by IDA has increased governments' understanding of the role of water in development and poverty alleviation and has created a new structure for management and investments.

For example, research for the Ethiopia Country Water Resources Assistance Strategy (2006) generated economy-wide models for Ethiopia that show projections of average annual GDP growth rates can be significantly impacted when rainfall variability is taken into consideration. The correlation between rainfall and overall GDP is illustrated in the figure below. This highlights the importance of considering the variability in water flows—

Ethiopia: Rainfall and GDP Growth



Source: World Bank, 2006.

whether rainfall, river flows, or even the flow of water underneath the Earth's surface—when assessing economic performance.

Global and regional partnerships

The Bank also convenes partners to support innovation in integrated water resources management. Given the broad reach of water resources management needs and initiatives, this type of collaboration has been significant.

- The Bank/Netherlands Water Partnership Program, funded by The Netherlands, is a US\$11 million trust fund specifically for innovation in water resources management, with particular emphasis on Africa, the quality of lending operations, downstream operational impacts, as well as gender equality, and poverty reduction. This trust fund has now evolved into the new Water Partnership Program—a multi-donor program—with additional participation

from Denmark and the United Kingdom. The Water Partnership Program focuses on both water resources management and water and sanitation services. The Program will be implemented during fiscal years 2009-2010, and amounts to US\$20 million.

- The World Bank is one of the three implementing agencies of another important partnership, the Global Environment Facility. This multi-donor, multi-billion dollar fund addresses critical threats to the global environment including the degradation of international waters and persistent organic pollutants.

In 1997, the World Bank was invited to coordinate international support for cooperation in managing the Nile's water resources, and since 1999 it has been promoting dialogue, and supporting joint actions, with a major focus on attitudes toward the shared usage of Nile waters. The Bank now coordinates the involvement of 17 multilateral and bilateral development partners of the Nile Basin Initia-

tive, which involves nine African countries. This initiative has helped articulate common benefits of river basin management through analytical work, country dialogue, and communications.

OUTLOOK

IDA projects under preparation suggest a strong upward trend of water resources management lending in the near future as the World Bank's water strategy, Country Water Resources Assistance Strategies, and renewed IDA commitment to infrastructure translate into country programs.

There remains a strong need for interest-free credits and grants to help low-income countries finance water resources management activities including policy, institutional and analytical work.

Water resources management is emerging as a basic challenge to development. Important foundational steps have been taken, which are leading to projects to broaden and deepen impacts. In Senegal and Tanzania, initial work on legislation and capacity building—supported by IDA—has evolved into more extensive river basin management structures and consideration of significant infrastructure investments in hydropower and water regulation.

In IDA countries, the challenge of achieving water security will last for decades. It will require continued support in building institutions, capacity, management programs and infrastructure. Specific challenges include:

- creating an adequate platform of water infrastructure so that growth varies less with water availability;
- ensuring equitable sharing of benefits of water resources management across local and indigenous, urban and rural populations;
- building trans-boundary coalitions and mechanisms for regional river management and development;
- increasing the role of hydropower as a climate-friendly source of energy;
- putting groundwater governance, as an integral part of water management, on the global agenda;
- addressing climate change and variability in practical ways, including mitigation, adaptation and “smart” design of programs, institutions and infrastructure.

Support to date has been modest but catalytic. Continuous IDA support will be critical to securing these achievements and increasing the benefits to poverty alleviation and sustainable development.

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<http://www.worldbank.org/ida>