

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 billion in 2005. The world's poorest countries and the poorest communities within them are the most vulnerable to inadequate management of water resources.

The International Development Association, the World Bank fund for the World's poorest countries, has a unique role to play, 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. In this role, and in collaboration with other donors, the IDA directs critical funding towards countries that would otherwise have a hard time investing in the management of public goods on a long-term, continuous basis.

At a glance

- While world population tripled in the 20th century, the use of water increased six-fold.
- Irrigated agriculture, in the drive for food security, accounts for 70 percent of water withdrawals in water stressed regions.
- Low-income, IDA countries account for about 80 percent of the most water-poor countries.
- Over 260 rivers in the world run through more than one country, thus presenting unique opportunities and challenges, especially in Africa.
- Total IDA funding for 56 projects with water resources management components amounted to about US\$2.5 billion between Fiscal Years 2000–06.
- Although aggregate outcome measures are hard to come by, IDA projects have produced results affecting millions of people from Senegal, to Yemen and China.

The impact of water resource management projects is often profound. Evidence from recent lending demonstrates 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.

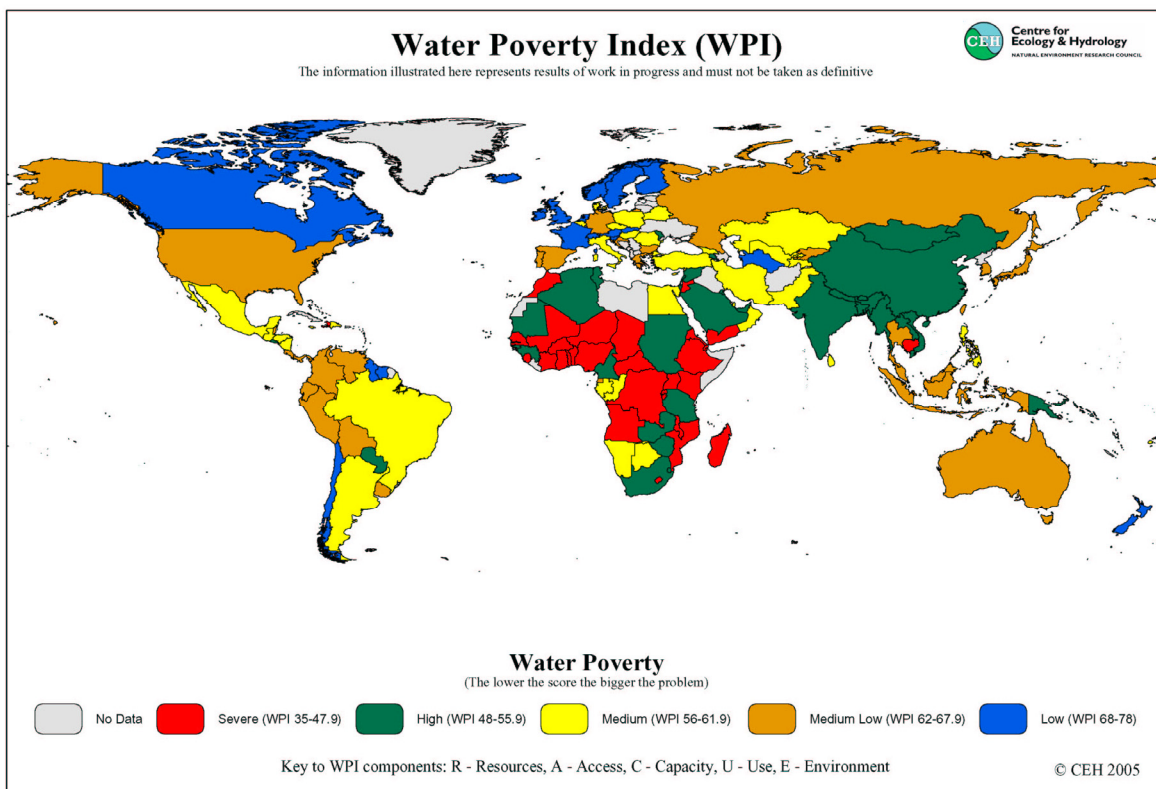


SECTORAL CONTEXT

While world population tripled in the last century, the use of water increased six-fold. Irrigated agriculture, in the drive for food

security, accounts for 70 percent of water withdrawals in water stressed regions. And low-income IDA borrowing countries account for about 80 percent of countries with the worst water poverty ratings (see map).

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



Analytical work has demonstrated linkages between water and almost all types of economic activity—including farming, manufacturing, energy and transport—as well as the business climate.

Shifting patterns of precipitation and runoff associated with climate change compound the challenge of managing scarcity, as do the destructive forces of water through drought, flood and water-borne contamination.

Tensions over water rights are increasing at the level of the village, the nation and across boundaries.

Key trends

Water resources management (WRM) is a complex and relatively new area of focus for many countries. It requires actions at the policy, legal and institutional levels while addressing direct impacts at the community level. It is further complicated by the impacts and influences of 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 (versus physical entitlements).
- Managing water resources across national boundaries.

- Contributing to the development of environmentally sustainable water infrastructure for storage and multiple uses (storage capacity in some developing countries is as low as 38 m³/capita compared with North American statistics of 5,961 m³/capita, notwithstanding potential variability).
- Identifying and implementing water efficiency measures.

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. A public good, water resources usually have multiple users, thus leading to potential contentious issues of ownership and stewardship.

WRM initiatives frequently lack a revenue stream, thus placing additional burden on already over-taxed public finances. Because of their sector and geographic reach, many reforms and initiatives in WRM require a high level of coordination across players, from community level to national and international level of management processes, or across sectors as diverse as agriculture and hydropower. Furthermore, the range of tools required to address water resources issues extends from analytical work to participatory processes to investments in structures and civil works. Not surprisingly, this sector demands 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 for IDA countries so far.

Total IDA funding for 56 projects with WRM components amounted to about US\$2.5 billion between Fiscal Years 2000-06. The funding specifically to the water resources management components of these projects totaled US\$640 million. Most spending occurred in Africa (34 percent) and South Asia (31 percent), and was concentrated in the rural sector (80 percent).

Because of water resources management's nature, 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 WRM, namely development

of policy and legal frameworks. About 75 percent of IDA-funded WRM projects include institutions 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 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 Yemen and Senegal. In both cases, policy reform was accompanied by sector-specific actions.

Institutions and capacity-building

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

The water law in Yemen 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 which has demonstrated an ability to make substantive decisions, considered from a multi-sectoral base. The Sana'a Basin Water Management Project 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 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, who have greater ownership and commitment. One project 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.

Trans-boundary river management

Over 260 rivers in the world run through more than one country, thus presenting unique opportunities and challenges, especially 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, thus 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, WRM is emerging as a vehicle for regional peace and stability as well as more effective water management and allocation.

Agriculture

IDA's water resource management projects in agriculture have simultaneously increased water efficiency and agricultural yields.

In the Loess Plateau Watershed Rehabilitation Project in China, 1 million farmers directly benefited from increased yields (annual grain output increased from 427,000 to over 698,000 tons) and diversification into higher value produce (from 80,000 to 347,000 tons in fruit production), with corresponding increases in farmers' per capita incomes (from Y360 to Y1263 per year). A second project co-financed by IDA and the Bank's commercial lending arm, the International Bank for Reconstruction and Development (IBRD) further contributed to the plateau's sustainable development, benefiting an estimated 1.5 million people.

In Tanzania, through a combination of policies on water rights and fees, training of irrigators' organizations, and enhanced irrigation efficiency, agricultural yields doubled and household income tripled for more than 5,000 families.

In China's Tarim Basin, lining canals to prevent leakage increased water-conveyance efficiency from 60 percent to 95 percent and saved an estimated 600-800 million cubic meters of water every year. This water was reallocated to environmental, municipal and industrial uses and enabled the reclamation of land and the expansion of irrigation to more than 41,000 hectares of new farmland. From 1998 to 2003, an additional 41,460 hectares of land were reclaimed as irrigation land, while the productivity of more than 123,000 hectares of low-yield irrigated land was substantially increased.

This contributed to an increase in production of 220,000 tons per year of wheat, 82,000 tons of cotton and 116,000 tons of maize. Higher value crops such as orchards (apples, apricots pears and grapes), oil seeds, melons, vegetables and alfalfa were planted on about 148,000 hectares of land.

Environmental and social benefits

In the Loess Plateau (China), better management of agricultural land and improved soil conservation reduced sediment loading to the Yellow river by more than 57 million tons per year; a post-project review concluded that the project was one of the most successful erosion control programs in the world.

In the Tarim Basin (China), IDA support helped to restore 300 kilometers of the lower reaches of the watercourse that had run dry. Forests in the region increased by more than 30 percent; the grassland areas grew by 15 percent. This contributed to halving the socio-economic costs of wind and sandstorms.

In the Senegal Basin, the high incidence of water borne disease was tackled by several pilot interventions (such as distribution of medications and bed-nets, as well as sanitation programs) that resulted in direct reductions in disease and estimated potential reductions in the order of 40 percent for infant mortality due to diarrheal diseases, and 50 percent for bilharzia (caused by parasitic worms) and intestinal parasitosis. These pilots 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 environmental assets downstream.

IDA-funded flood projects (both infrastructure and management) in Uganda, Kyrgyz Republic and Bangladesh enhanced protection of populations, infrastructure and property. An IDA-supported Lake Victoria environmental management project helped reduce water hyacinth to non-nuisance levels and revive fish species—thought to be extinct—in satellite lakes.

Cross-sectoral management

Frequently, water resources management projects involve more than one sector and combine investment initiatives entailing both institutional development and capacity-building.

In a proposed project in Kenya, for example, WRM lies at the heart of community-driven development with investments in agriculture, forestry, catchments management, and infrastructure for flood and sediment management.

Beyond investment lending, IDA provides the expertise and convening power needed to take the sector forward.

Analysis and technical assistance

Expertise ranges from analytical work to public administration, legal frameworks, public participation and environmental safeguards.

This enables IDA to bring diverse tools for WRM together in coherent and coordinated programs. IDA carried out 42 analytical studies (economic and sector work) and 40 non-lending technical assistance activities in 2000-06.

The analytical work has significantly changed countries' understanding of the role of water in development and poverty alleviation and created a new paradigm for management and investments.

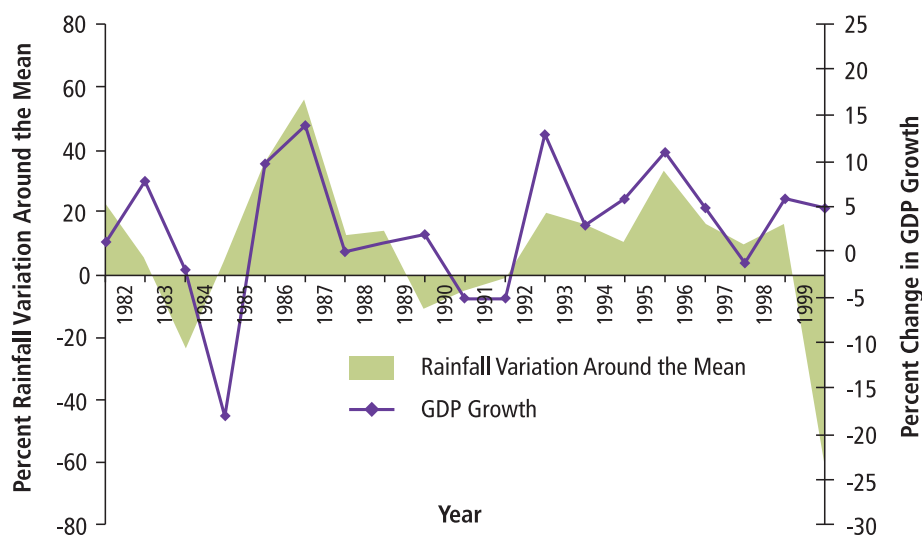
For example, research for the Ethiopia Country Water Resources Assistance Strategy (2006) generated economy-wide models for Ethiopia that show projections of average annual GDP growth rates drop by as much as 38 percent when rainfall variability is taken into consideration. The correlation between rainfall and overall GDP is illustrated below. This empirical work highlights the importance of considering hydrology and hydrologic variability when diagnosing economic performance.

Global and regional partnerships

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

- The Netherlands finance a US\$20 million trust fund specifically for innovation in WRM, with a priority focus on Africa, downstream operational impacts, as well as the gender/poverty nexus.
- The World Bank is one of the three implementing agencies of another important partnership, the Global Environment Facility. This multi-donor, multi-billion fund addresses critical threats to the global environment including the degradation of international waters and persistent organic pollutants.
- The Bank was invited to coordinate international support to Nile cooperation in 1997, and since 1999, the Bank has been

Ethiopia: Rainfall and GDP Growth



Source: World Bank, 2006.

promoting dialogue, and supporting joint actions, with a major focus on 'changing hearts and minds' over the shared usage of Nile waters. The Bank now coordinates the involvement of about 17 multilateral and bilateral development partners of the Nile Basin Initiative (NBI). The multi-country NBI, which involves nine African countries, has helped articulate common benefits of river basin management through analytical work, country dialogue and communications.

The NBI has also provided the political environment and institutional capacity to move forward and pave the way for IDA financing demand from these countries. It is anticipated that IDA investments will reach US\$200 million in FY 2007-08, US\$500 million in FY 2009-10, and US\$2 to US\$3 billion in FY 2011-12, with development benefits reaching far beyond the river to regional economic cooperation and stability. IDA projects related to and facilitated by the Nile Basin Initiative, will cover all of the NBI countries between 2007-12.

OUTLOOK

Overall, 81 percent of IDA's water resources management projects completed between 2000 and 2006 were found to have satisfactory outcomes by the Bank's Independent Evaluation Group (IEG) and 77 percent of projects were deemed likely to be sustainable.

Although relatively small in magnitude, the pipeline of upcoming IDA projects suggests a strong upward trend of WRM lending in the near future as the Bank's water strategy, Country Water Resources Assistance Strate-

gies, and renewed IDA commitment to infrastructure translate into country programs.

There remains a strong need for interest-free credits and grants to help poor countries finance WRM activities including policy, institutional and analytical work.

WRM is emerging as a basic challenge to development. Important foundational steps have been taken, which are leading to projects to scale up and deepen impacts. In Tanzania and Senegal, initial work on legislation and capacity building has evolved into more extensive river basin management structures and consideration of significant infrastructure investments in hydropower and water regulation. These projects would not have been viable without the foundations of previous IDA support.

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 WRM across local and indigenous, urban and rural populations.
- Building trans-boundary coalitions and mechanisms for regional river management and development.
- 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. Water resources management in Africa and other regions is emerging as a success story, with important public benefits. 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>