

The amount of available water has been constant for millennia, but over time the planet has added 6 billion people. Water is essential to human life and enterprise, and the increasing strains on available water resources threaten the mission of institutions dedicated to economic development. The ultimate goal is to achieve a sustainable balance between the resources available and the societal requirement for water.

In this evaluation the Independent Evaluation Group (IEG) examines all the water-related projects financed by the World Bank between fiscal 1997 and the end of calendar 2007. Bank activities related to water are large, growing, and integrated. They include water resources management, water supply and sanitation, and activities related to agricultural water, industrial water, energy generation, and water in the environment.

Changes over the decade in the Bank's portfolio of water projects have been broadly positive. In 1997 only 47 countries borrowed for water, but by 2007 there were 79 borrowers, and lending for water had increased by over 50 percent. Water projects have had good success rates relative to their goals, and this performance improved in the latter half of the evaluation period—with a particularly notable 23-percentage-point improvement in Africa. Within the Bank, water-related activities have been supported by institutional changes, and there has been progress in integrating water into the work of other sectors.

At the same time, against emerging problems and pressures, crucial needs remain unmet. In the complex area of water resources management, it has often been easier to underemphasize the most difficult problems, such as fighting pollution or restoring the environment, compared with such tasks as purchasing equipment or building infrastructure. Limited success with full cost recovery for water services has caused the Bank to moderate its approach, but the question of who will pay for uncovered costs remains to be resolved.

With borrowers facing increasingly difficult challenges in water management, business as usual is not an option. The evaluation suggests that the Bank and its partners should find ways to support systematically the countries that face the most water stress. It recommends that more attention be given to critical concerns of groundwater conservation, pollution reduction, and coastal management and that the

Bank work with clients to shift more attention to sanitation. Demand management must be a theme of Bank support if the challenges of increasingly scarce water are to be tackled successfully, and the Bank and its borrowers need to take a clear stand on cost recovery. Finally, data collection and use need to be enhanced in a number of areas. In all of these activities, strong partnerships and knowledge creation and sharing will continue to be essential.

Only 3 percent of the world's water supply is freshwater, and two-thirds of that is locked in glacier ice or buried in deep underground aquifers, leaving only 1 percent readily available for human use. Water is not only limited, but unevenly distributed. In more arid regions, water shortages are always a threat. Moreover, the scientific consensus is that climate change will worsen these water-related challenges in the coming years. These changes are already disrupting rainfall patterns, feeding ever more powerful windstorms, and creating droughts of unprecedented severity and frequency. About 700 million people in 43 countries are under water stress.

Development patterns, increasing population pressure, and the demand for better livelihoods in many parts of the globe all contribute to a steadily deepening global water crisis. Development redirects, consumes, and pollutes water. It also causes changes in the state of natural water reservoirs—directly, by draining aquifers, and indirectly, by melting glaciers and the polar ice caps. Maintaining a sustainable relationship between water and development requires that current needs be balanced against the needs of future generations.

The development community has transformed and broadened its approach to water since the 1980s. As stresses on the quality and availability of water have increased, donors have begun to move toward more comprehensive approaches that seek to integrate water into development in other sectors.

Through both lending and grants, the World Bank (the International Development Association and the International Bank for Reconstruction and Development) has supported countries in many water-related sectors. This evaluation examines the full scope of that support over the period from fiscal 1997 to the end of calendar 2007. More than 30 background studies prepared for the evaluation have analyzed Bank lending by thematic area and by activity type.

The evaluation is by definition retrospective, but it identifies changes that will be necessary going forward, including those related to strengthening country-level institutions and increasing financial sustainability.

## Water and the World Bank

The Bank's 1993 Water Resources Management Policy Paper moved the institution away from its previous focus on infrastructure development for the water sector. The paper also shifted the Bank's planning process from one based on discrete investments within the sector to a multisectoral approach, embracing the concept of integrated water resources management (IWRM). IWRM promotes the coordinated development and management of water, land, and related resources in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. Under IWRM, each water-related activity in a project or program is considered carefully in light of other competing uses and its social, economic, and environmental consequences.

In 2003 the Bank adopted a new water resources strategy (World Bank 2003b) that looked more closely at water management and the connections between resource use and service delivery. It also reintroduced infrastructure investments as an important aspect of Bank support in the sector. The 1993 and 2003 strategy papers are complementary, and together with the Bank's mandate to reduce poverty, they have helped inform issues of supply and improve the performance of utilities and user associations. The 2003 strategy committed the institution to facing the most pressing challenges that were constraining the achievement of goals set in 1993.

## The Water Portfolio

A large part of what the Bank finances has something to do with water: 31 percent of all Bank projects approved since 1997 are related to water. Between fiscal 1997 and the end of calendar 2007 the Bank approved or completed 1,864 projects with at least one water-related activity. Together, these projects represented Bank financing of about \$118.5 billion, of which \$54.3 billion was directed to water. The average loan was for \$67 million (exclusive of grants and nonlending activities).

Many of the Bank's water-related activities are integrated into projects doing other things, such as developing water supply in an urban services project or drafting water policy within a larger environmental policy framework. The largest activity categories by number of projects are those dealing with wastewater treatment and irrigation. The largest amounts of money have gone to projects that involve irrigation and hydropower or dam activities.

The Bank engaged 142 countries in lending for water during the evaluation period. Of these, the top 10 accounted for 579 projects (31 percent) covering 56 percent of total Bank commitments for projects with water-related activities (nearly 5 percentage points more than those countries' share of Bank lending as a whole). China, the single largest borrower for water projects, accounted for 16 percent of water-related lending, but only 7 percent of total Bank lending.

## Main Findings

### ***Increased Lending and Improving Project Performance***

*The Bank increased its lending for water and the number of countries served during the period evaluated.* Although the number of countries that borrow for water projects has varied from year to year, 79 countries were served in 2007, compared with 47 in 1997. Lending for water increased by over 50 percent during the period.

*The integration of water practice across Bank sectors appears to be well under way.* Integration of the Bank's water practice was an important goal of the 2003 water strategy, and during the period evaluated, the majority of water-focused projects were overseen by sector boards other than the Water Supply and Sanitation Sector Board.

*Water projects in the aggregate have good success rates when measured against objectives.* IEG performance ratings show steady improvement in the sector's performance measured against project objectives. During the most recent five-year period, water was the most improved major sector by this criterion, with a particularly noteworthy 23-percentage-point improvement in the share of satisfactory projects undertaken by the Africa Region. Within the portfolio, 77 percent of the 857 completed projects had an aggregate outcome rating of moderately satisfactory or better, slightly above the Bank-wide average of 75 percent. The trend continued in 2008, in which year water sector projects attained a 90 percent satisfactory rate.

*The focus of Bank activity within the water sector has shifted over time.* The Bank has lent heavily for irrigation and water supply, and dams and hydropower have become more important in the last few years. But some activities that are of growing importance as water stress increases have become less prominent in the Bank's portfolio; notably, these include coastal zone management, pollution control, and to a lesser degree groundwater conservation. Although the portfolio has performed well when measured against projects' stated objectives, the Bank and the borrowing countries have not yet sufficiently tackled several tough but vital issues, among them broadening access to sanitation, fighting pollution, restoring degraded aquatic

environments, monitoring and data collection, and cost recovery. Where it has lent for hydrological and meteorological monitoring, the Bank has focused on providing technology for data collection and relatively less on gathering and interpreting information for which there is an identified demand. Such aggregate findings, however, mask Regional and country-specific variations and needs. For example, the East Asia and Pacific and Africa Regions have responded more actively than other Regions to the sanitation challenge. These issues are covered in greater detail below.

### **Water Resources Management**

*Effective demand management is one of several critical challenges worldwide in the face of increasing water scarcity.* Demand for water can be affected by three broad sets of measures: pricing, quotas, and measures to improve water use efficiency.

Efforts to improve the efficiency of water use and limit demand in the agriculture sector, the largest consumer of water, have had limited success. Efficiency-enhancing technologies alone do not necessarily reduce the use of water on farms, and efforts to manage demand by charging agricultural users for water have had limited success, partly because of the low price elasticity of that demand. Fixing and enforcing quotas for water use is a relatively recent approach and deserves careful evaluation after more projects featuring this approach have been completed. Cost recovery in Bank-supported projects has rarely been successful: only 15 percent of projects that attempted cost recovery achieved their goal. Those that have succeeded have generally improved the efficiency of water institutions at collecting fees. This limited success has caused the Bank to moderate its approach, but as it has yet to clearly identify alternative sources to finance the recovery shortfall, the sustainability of investments is threatened.

In the area of water supply, reducing unaccounted-for water (UfW) has been the main activity directed at improving water use efficiency. About half of projects that attempted to address UfW managed to reduce it by at least 1 percent.

Finding effective ways to improve water use efficiency and manage demand for water will be critical if the Bank wants to maintain a leading role in this area.

*Integrated water resources management, the focus of two consecutive water strategies, has gained traction within the Bank, but has made limited progress in most client countries.* Within the Bank there has been considerable progress in integrating water into the work of other sectors and in consolidating institutional structures to carry out water-related activities. However, outside the Bank, even in countries where IWRM is now well integrated into the legal framework, it is known mainly in the water sector. The information necessary to inform decision making

is not easily available, and, perhaps more important, the economic implications of water constraints are not widely appreciated. Meanwhile, there are indications that the Bank is paying less attention to data collection—an essential prerequisite for successful IWRM implementation, because countries have less motivation to confront a situation with unknown parameters.

*Where IWRM has been successful, it has most often been in a particular location at a time of necessity.* Some countries have made progress with water resources management after natural disasters, for example. Such shocks often do not affect entire countries, however, nor are they a desirable route to IWRM. The way to open the window of opportunity without waiting for a calamity is to support monitoring processes that deliver information to relevant public and private stakeholders. The example of Brazil shows that making water data publicly available over the Internet helps increase stakeholder concern, which in turn helps to mobilize the political will necessary to confront entrenched water problems.

*The number of projects dealing with groundwater issues has been declining, although within that problematic trend the portfolio has also witnessed a positive shift away from a focus on extraction.* This shift is important given falling water levels in critical aquifers in many Bank borrowers.

Within the groundwater portfolio, activities aiming to increase water supply were, as a group, the most successful, whereas activities related to reducing pressure on groundwater, and to conservation, generally proved more challenging. Yet such activities will need to become more prominent in the portfolio, if the Bank is to effectively help the growing number of water-stressed countries address increasing groundwater scarcity. In the Republic of Yemen, for example, improved tube well technology and generous subsidies on diesel fuel have led to rapidly rising consumption of water for irrigation, with the result that irrigation now extracts over 150 percent of the country's renewable water resources.

*Watershed management projects that take a livelihood-focused approach perform better than those that do not.* Projects combining livelihood interventions (that is, the creation of income-generating opportunities) with environmental restoration enjoyed high success rates, but the effects on downstream communities (such as reduced flooding and improved water availability) and the social benefits in both upstream and downstream communities were often not measured. Hydrological monitoring (with or without remote sensing) and watershed modeling could help improve impact assessment and thus make it easier to estimate the cost-benefit ratio of such interventions.

## **Environment and Water**

*Environmental restoration has been underemphasized in the Bank's water portfolio, possibly because its immediate and long-term financial importance is unclear.* More attention to cost-benefit calculations could help the Bank and its clients evaluate trade-offs and get better results.

*Most Bank water projects focus on infrastructure, even though in some cases environmental restoration is more strategically important.* It is not always necessary to restore the water-related environment to a pristine state in order to obtain major social, economic, and environmental benefits and reduce vulnerability. Priority improvements to degraded environments, even when small, can have big impacts. A coastal wetlands protection project in Vietnam, for example, successfully balanced reforestation with livelihood needs. The project successfully reforested critical areas and led to a substantial reduction in coastal zone erosion.

*Countries and donors will need to focus more on coastal management, because some 75 percent of the world's population will soon be living near the coast, putting them at heightened risk from the consequences of climate change.* Approvals of Bank projects in this area have dwindled over time, and the reasons for this should be considered in the Mid-Cycle Implementation Progress Report.

*Many projects contain funding for water quality management, but few countries measure water quality.* The number of projects that actually measure water quality is declining. Evidence of improved water quality is rare, as are indications of the improved health of project beneficiaries. The data that are generated need better quality control. Water quality in the top five borrowing countries is declining, and fewer than half of projects that set out to monitor water quality were able to show any improvement.

### **Water Use and Service Delivery**

*The Bank has increasingly focused on water service delivery, but there has been a declining emphasis on monitoring economic returns, water quality, and health outcomes.* Only a third of wastewater treatment and sanitation projects calculated economic benefits.

*Sanitation needs greater attention.* Population growth in developing countries has been rapid, as has urbanization. An expansion of piped water services and increased household water use will accelerate demand for adequate sanitation. The evaluation recognizes that even if the Millennium Development Goals (MDGs) for clean water supply are achieved, 800 million people will still lack access to safe drinking water in 2015, but many more—1.8 billion—will still lack access to basic sanitation. Within sanitation projects, more emphasis is needed on household connections. Connection targets in

projects are generally not met, and IEG has seen a number of treatment plants functioning below design capacity because households have not connected to the systems, in part because willingness to pay has been overestimated and facilities have been oversized. This report highlights the particular weakness of sanitation institutions, which will continue to constrain progress until their capacities improve.



Photo courtesy of Curt Carnemark/World Bank

*Hydropower projects have performed well, and significant untapped potential remains for appropriate development, particularly in Africa.* After a peak in the mid-1990s, dam construction in the developing world slowed. The Bank has recently increased its financing for dam construction, in many cases for multipurpose dams that provide hydropower and often also support irrigation, flood protection, or industrial use. Almost a third (66) of the 211 Bank-financed dam and hydropower projects covered in the evaluation rightly focused on dam rehabilitation, as many dams have experienced gradual deterioration brought about by lack of maintenance, and a number have been shut down because of salinity, sedimentation, and other problems. A new hydropower development business plan, “Directions in Hydropower” (World Bank 2009), was completed in 2009 and supports feasibility studies so that projects will be technically, economically, and environmentally appropriate. Indeed, it will be vital to take on board the experience with hydropower projects, including their scale, socioeconomic, and environmental impacts.

### **Institutions and Water**

*Water services are delivered by public providers in most countries, although private sector participation has made some progress.* Where international private firms have been successful at providing water services in urban areas, they have contributed significant investments to infrastructure and in some cities have managed to increase

the efficiency of water utilities' operations. In some Bank-financed projects in rural areas, in contrast, the local private sector manages the operation of water systems but has invested little and shared little of the financial risk. Where governments want private involvement, a well-functioning, well-maintained regulatory system is necessary for its sustainable participation in utility operations. In many cases such a system has remained elusive, and this has limited private sector involvement.

*Water projects operating in a decentralized environment have had difficulty meeting expectations, but when the budget and authority accorded to the lower level of government have matched the responsibility assigned to it, projects have had positive achievements.* Half of projects that aimed to strengthen local capacity and two-fifths of projects that supported institutional reforms were successful. Other positive outcomes usually associated with decentralization—increased accountability, ownership, empowerment, and social cohesion—were achieved in a minority of cases.

*Support for institutional reform and capacity building has had limited success in the water sector.* Institutional reform, institutional strengthening, and capacity building have been the activities most frequently funded by Bank water-related lending. Yet these interventions have often been less than fully effective, and weak institutions have often been responsible for project shortcomings.

*The Bank has been actively engaged in addressing transboundary water issues.* Priority has been given to projects serving waterways shared by a large number of countries. Here the Bank has been more successful in helping to address disputes than in strengthening transboundary institutions. Its work with borrowers on transboundary aquifers is in its early stages.

### **Strategic Issues**

*The Bank's complementary strategies for the water sector have been broadly appropriate.* However, their application thus far has underemphasized some of the most difficult challenges set by the 2003 strategy, and this has left some needs unmet. The Bank's approach to water will face heightened challenges brought about by climate change, migration to coastal zones, and the declining quality of the water resources available to most major cities and industry in the coming decades. These will require some shifts in emphasis.

*Water stress needs to be confronted systematically.* At present there is no statistical relationship between Bank water-related lending to countries and the degree of water stress in those countries. The issue for the Bank is how to find an entry point and help the most water-stressed countries put the pieces together so that water needs can become more central to their development strategy. This is not to say that the Bank should stop providing support to water-

rich countries, nor is increasing lending to water-stressed countries the only or even necessarily the best solution. The failure to meet human needs for water and sanitation has its roots in political, economic, social, and environmental issues. These are becoming more entwined and cannot be solved unless a broader range of actors gets involved.

The most water-stressed group consists of 45 countries (35 of them in Africa) that are not only water poor but also economically poor. Country Water Resource Assistance Strategies have helped to place water resource discussions more firmly in the context of economic development in the countries where they have been done. Including ministries of planning and finance in the dialogue is another critical step, as is expanding the calculation of economic benefits to increase countries' understanding of the economic importance of water.

*Collaboration with other partners is particularly important, and it is likely to increase in importance as the Bank helps countries tackle water crises.* This is true not only for water supply and sanitation but also for water resources management in national and transboundary basins. Many of the problems described in this report are far too big for the Bank to tackle on its own.

*Successful implementation of the Bank's Water Resources Sector Strategy will require a great deal of data on water resources, and therefore data gathering must become a higher priority.* Data on all aspects of water and on relevant socioeconomic conditions need to be more systematically collected and monitored. Data need to be used better within projects. For example, the collection and analysis of up-to-date groundwater data are more important now than ever and need to be taken on board more commonly than they have been.

### **Recommendations**

- Work with clients and partners to ensure that critical water issues are adequately addressed.
  - Seek ways to support the countries that face the greatest water stress. The Mid-Cycle Implementation Progress Report should suggest a way to package tailored measures to help the Bank and other donors work with these clients to address the most urgent needs, which will be far more challenging as water supply becomes increasingly constrained in arid areas.
  - Ensure that projects pay adequate attention to conserving groundwater and ensuring that the quantity extracted is sustainable.
  - Find effective ways to help countries address coastal management issues.

- Help countries strengthen attention to sanitation.
- Strengthen the supply and use of data on water to better understand the linkages among water, economic development, and project achievement.
  - In project appraisal documents, routinely quantify the benefits of wastewater treatment, health improvements, and environmental restoration.
  - Support more frequent and more thorough water monitoring of all sorts in client countries, particularly the most vulnerable ones, and help ensure that countries treat monitoring data as a public good and make them broadly available.
  - In the design of water resources management projects that support hydrological and meteorological monitoring systems, pay close attention to stakeholder participation, maintenance, and the appropriate choice of monitoring equipment and facilities.
- Systematically analyze whether environmental restoration will be essential for water-related objectives to be met in a particular setting.
- Monitor demand-management approaches to identify which aspects are working or not working, and build on these lessons of experience.
  - Clarify how to cover the cost of water service delivery in the absence of full cost recovery. To the extent that borrowers must cover the cost of water services out of general revenue, share the lessons of international experience with them so they can allocate costs most effectively.
  - Identify ways to more effectively use fees and tariffs to reduce water consumption.
  - Carefully monitor and evaluate the experience with quotas as a means to moderate agricultural water use.