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INDEPENDENT EVALUATION GROUP

AN EVALUATION OF WORLD BANK SUPPORT, 1997–2007

Water and Development

Volume 2

IEG Study Series

The World Bank Group

WORKING FOR A WORLD FREE OF POVERTY

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Water and Development

Volume 2: Appendixes

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Abbreviations

BOT	Build-operate-transfer
CAS	Country Assistance Strategy
CDD	Community-driven development
COM	Nile Basin Council of Ministers
CRED	Center for Research on Environmental Decisions
EA	Environmental assessment
EFA	Environmental Flow Assessment
EIA	Environmental Impact Assessment
FAO	Food and Agricultural Organization of the United Nations
GEF	Global Environment Facility
GIS	Global Information System
IBRD	International Bank for Reconstruction and Development
ICR	Implementation Completion Report
IDA	International Development Association
IEG	Independent Evaluation Group
IFC	International Finance Corporation
IMF	International Monetary Fund
IWRM	Integrated Water Resources Management
lcd	Liters per capita per day
MARPOL	International Convention for the Prevention of Pollution from Ships
MDG	Millennium Development Goal
NBI	Nile Basin Initiative
NGO	Nongovernmental organization
O&M	Operation and maintenance
OFDA	Office of Foreign Disaster Assistance
PPAR	Project Performance Assessment Report
PPIAF	Public-Private Infrastructure Advisory Facility
PRSP	Poverty Reduction Strategy Paper
PSP	Private sector participation
RBO	River basin organization
RWSS	Rural water supply and sanitation
SA	Social Assessment
SDN	Sustainable Development Network
SIA	Social impact analysis
TA	Technical assistance
TDA	Transboundary Diagnostic Analysis
TEA	Transboundary Environmental Analysis
UfW	Unaccounted-for water
UN	United Nations
UNDP	United Nations Development Program
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WPI	Water Poverty Index
WQM	Water quality management
WRM	Water resources management
WSP	Water and Sanitation Program
WSS	Water supply and sanitation
WSSS	Water supply, sanitation, and sewerage
WUA	Water-user association
WWF	World Wildlife Fund for Nature
WWT	Wastewater treatment
WWTP	Wastewater treatment plant

Appendix A: Glossary

Term	Definition
Aquaculture	Farming with aquatic plants or animals—for example, fish farming or algal cultures.
Aquatic weed	A plant dependent on an aquatic habitat, with emergent, submerged, or floating leaves, that causes harm or is a nuisance to the natural environment or to people and their environment; that is, an undesirable aquatic plant, usually introduced and invasive.
Aquifers	Porous layers of sand, gravel, or bedrock able to store groundwater.
Basin	Drainage area of a stream, river, or lake.
Biological diversity	The variability within species, between species, and of ecosystems.
Borehole	A hole drilled vertically or at an inclination into the ground and usually fitted with a mechanical or motorized pump to draw water from the ground.
Catchment area	An area that receives or "catches" the rain that flows into a particular river.
Cost recovery	Fee structures that cover the cost of providing the service. Cost recovery is indicated by annual operating revenue as a percentage of annual operating costs.
Decentralization	A process of transferring responsibility, authority, and accountability for specific or broad management functions to lower levels within an organization, system, or program.
Deforestation	The permanent clearing of forestland for all agricultural uses and for settlements. It does not include other alterations, such as selective logging.
Demand-side management	Any attempt to encourage water users to reduce their water use. Pricing water at or near its true delivery cost can help to conserve water and encourage use of the resource in a manner commensurate with its scarcity. Another aspect of demand-side management is simply increasing the efficiency of current users (such as the promotion of water-efficient toilets).
Desertification	Land degradation processes occurring in dry sub-humid areas as a result of various factors, including climatic variations and human activities.
Drainage basin	Area with a common outlet for its surface runoff.
Drip irrigation	A method of irrigation that applies water not to the land but to the plants in the root zone, in small but frequent quantities, in such a way as to maintain the most active part of the soil at a quasi-optimum moisture.
Effluent	Liquid waste material that is a byproduct of human activities, such as liquid industrial discharge or sewage.
Environmental degradation	Depletion or destruction of potentially renewable resources such as soil, grassland, forest, or wildlife by using them at a faster rate than they are naturally replenished.
Environmental flow assessment	The process of determining water that should purposefully be left in a river or released from an impoundment to maintain a river in desired condition.
Environmental flow requirements	The water that is deliberately left in the river or released from a reservoir to maintain the structure and function of aquatic ecosystems downstream.
Environmental Impact Assessment	Critical appraisal of the likely ecological effects of a proposed project, activity, or policy, both positive and negative.
Eutrophication	Process of over-fertilization of a body of water by nutrients that produce more organic matter than the self-purification reactions can overcome.
Evapotranspiration	The loss of water to the atmosphere from an area through a combination of evaporation from the soil and transpiration from plants.
Freshwater	Water containing less than 1 milligram per liter of dissolved solids of any type.
Groundwater recharge	Replenishment of groundwater supply in the zone of saturation, or addition of water to the groundwater storage by natural processes or artificial methods for subsequent withdrawal for beneficial use or to check saltwater intrusion in coastal areas.
Hydrology	Science dealing with the properties of water and its occurrence in space and time.
Hygiene education	An element of hygiene promotion concerned with teaching people about how diseases spread; for example, through the unsafe disposal of excreta or by not washing hands with soap after defecation. Although this type of awareness-raising may be part of a larger hygiene promotion program, it should not be the sole focus of the program.
Integrated Coastal Zone Management	A dynamic, multidisciplinary, and iterative process to promote sustainable management of coastal zones.

Term	Definition
Integrated Water Resources Management	Land and water management activities as well as issues of quantity and quality need to be integrated within basins or watersheds so that upstream and downstream linkages are recognized and activities in one part of the river basin take into account their impact on other parts.
International watercourse	A river, stream, or canal that is shared by two or more countries.
Non-point-source	Source of pollution in which pollutants originate from over a wide area or from a number of small inputs rather than from distinct, identifiable sources.
Non-revenue water	The difference between water supplied and water sold expressed as a percentage of net water supplied. It represents the water that has been produced but is lost before it reaches the customer.
Point-source	A pollution source that is distinct and identifiable; for example, smokestacks and outflow pipes from industrial plants and municipal sewage treatment plants.
Pollution	The contamination of land, air, or water with any substance that reduces their ability to support life.
Private sector participation	A private company or investor that bears a share of the project's operating risk. Investors may range from private water supply and sanitation utilities, to operators, to street vendors selling water.
Protected area	An area set aside by law for the preservation of given aspects of cultural and natural heritage.
Ramsar Convention	The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
Reservoir	A large natural or artificial collection of water forming a small lake used as a source of water supply.
Riparian	Of or on a river bank; sharing a river basin.
Sanitation	Improvement of environmental conditions in households that affect human health by means of drainage and disposal of sewage and refuse.
Sedimentation	Deposition of river-borne sediments in a lake or dam.
Sewage	Liquid waste that contains some solids produced by humans. It typically consists of washing water, feces, urine, laundry waste, and other material that goes down drains and toilets of households and industry.
Sewerage	A system of sewer pipes, manholes, pumps, and the like for the transport of sewage.
Siltation	The deposition of sediments by water in a river channel or reservoir.
Soil degradation	Declining productivity of soils resulting from a combination of physical factors such as drought, management factors such as cultivation, and socioeconomic factors such as inequitable distribution of land.
Swamp	Area of waterlogged ground and the plants that grow on it.
Turbidity	The degree to which water is opaque or muddy.
Unaccounted-for water	The difference between the volume of water delivered to a supply system and the volume of water accounted for by legitimate consumption, whether metered or not.
Upstream	The direction opposite to the flow of a river, toward the source.
Wastewater	Spent or used water from homes, communities, farms, or industries that contains dissolved or suspended matter.
Wastewater treatment plant	Process to render wastewater fit to meet applicable environmental standards or other quality norms for recycling or reuse.
Water resource management (WRM)	WRM includes the development of surface and groundwater resources for urban, rural, agriculture, energy, mining, and industrial uses, as well as the protection of surface and groundwater sources, pollution control, watershed management, control of water weeds, and restoration of degraded ecosystems such as lakes and wetlands.
Water users association	An association of water users combining both governance and management functions (they are not the owners of the infrastructure).
Waterlogging	Natural flooding and over-irrigation that brings groundwater levels to the surface, displacing the air in the soil, with corresponding changes in soil processes and an accumulation of toxic substances that impede plant growth.
Watershed	An area from which all surface runoff flows through a common point.
Wetland	Land that has the water table at, near, or above the land surface.

Sources: *Human Development Reports: Glossary.* Retrieved on October 9, 2009 from: http://hdr.undp.org/en/humandev/glossary/.

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Appendix B: Methodology

This evaluation uses the IEG–World Bank objectives-based evaluation methodology, evaluating performance by measuring the Bank's progress toward its stated objectives. In a broad sense these objectives include the Bank's Mission Statement as well as the relevant strategies governing the water sector (see appendix C). In a more restricted sense, it concerns how well water-related projects attain project-level objectives. The evaluation draws heavily on completed and ongoing independent and self-evaluations, especially IEG Project Performance Assessment Reports (PPARs). The evaluation did not conduct a comprehensive review of the Bank's analytic and advisory activities. The Water Sector Board has conducted a self-evaluation of its economic and sector work in parallel with this evaluation. IEG did examine all available environmental flow assessments as part of its evaluation, and selected analytic and advisory activities were examined in individual issue and case studies.

Evaluative Methods and Instruments

The evaluation examined the Bank's experience from several angles. The basic approach taken was to avoid sampling by identifying a full universe of projects. Where the evaluation examined particular themes or activity types, it used all the relevant projects in the analysis. The evaluation used the following instruments.

Review of the Portfolio

The evaluation conducted an issues-based portfolio review that started with identification of all projects from July 1, 1996 (the start of fiscal year 1997), to December 31, 2007. IEG identified 1,864 projects approved or completed over the 11.5-year period (including those of the Global Environment Facility, or GEF) with at least one water-related activity. The portfolio includes projects with Bank interventions involving water supply, sanitation, sewerage, coastal areas, rivers, floods and tropical storms, fisheries, water pollution, aquatic biodiversity, watersheds, irrigation and drainage, hydropower, drought and water scarcity, and groundwater. It also includes projects that affect water quality, watersheds, rivers, coastal waters, and water supply. Projects were retrieved from the Bank's project database using the following codes: AI (irrigation and drainage), TP (ports, waterways, and shipping), WD (flood protection), WA (sanitation), WS (sewerage), WC (water supply), WZ (general water, sanitation, and flood protection), and 85 (water resources management). Projects with the following codes were also reviewed for inclusion: AZ (general agriculture, fishing, and forestry), 52 (natural disaster management), 81 (climate change), and 84 (pollution management). Projects were added from the Water Anchor portfolio and previous IEG studies on agricultural water management, natural disasters, an existing China case study, and health. Projects on the GEF Web site were also reviewed and included as appropriate. Research for the individual issue studies added further projects through specific searches for relevant projects.

Project documents and files were also reviewed, as was the data collected for recent and ongoing IEG evaluations (see the meta-evaluation section below for a list). Team members also extracted relevant material from the Bank's internal electronic resources, including the project database, ImageBank, and the Web site for the Water Anchor, among others.

The amount of World Bank financing that has gone solely to water activities was calculated as follows.

The whole evaluation portfolio of 1,864 projects was sorted into four categories:

1. For projects totally focused on water, the actual loan amount was used.
2. In projects where at least half of the project objectives were focused on water, half the total loan amount was used.
3. For projects with water components for which project documents give a dollar value for the component, the actual amounts were used.
4. Amounts for projects with water components for which the actual water activity amounts were not found in documents or through the Bank's database were calculated using the average component amount from #3 above for each relevant component.

The amounts for each of these categories are totaled (in millions of U.S. dollars) in table B.1.

Interactive Project Database

The evaluation developed a Microsoft Access database that drew on all the available quantitative and qualitative information for water-related projects. The database was capable of responding to queries regarding the results of all completed projects and comparing those results with project characteristics. It was used to determine the degree to which objec-

TABLE B.1 World Bank Financing in the Water Sector

Category	Amount (US$ millions)
1. Projects focused on water	26,517.30
2. Projects with at least half objectives, half of total lending	7,348.77
3. Projects with actual component amounts	6,651.16
4. Projects with estimated component amounts[a]	13,771.62
Total estimate	54,288.85

a. Averages of those with actual component amounts were extrapolated to estimate this number.

tives were attained, identify factors associated with success and failure, and compare highly successful and highly unsuccessful projects to assess whether the strategic approaches taken are different in discernable ways. For ongoing projects it was used to analyze the evolution in the nature of project activities down to the component level. Water-relevant lessons learned as identified by Bank self-evaluations and IEG independent evaluations (PPARs) were disaggregated and recategorized to determine areas of strength and weakness, and whether practice needs to be modified in certain activity areas. The relationship of the active portfolio with the identified success factors was also analyzed.

Review of Other Donors' Experience

The evaluation identified impact evaluations dealing with water, including work on the health impacts of water supply and sanitation and other evaluative work in the public domain, to see if the lessons from other donors' experiences are qualitatively different from those of the Bank. The evaluation examined how far other donors have moved toward an integrated approach to water resources management and water services issues. And donors were asked about their perceptions of the Bank's water-related work and its strategic and intellectual approach. Donor project results also were reviewed to identify the ways in which more integrated coverage of water resource management issues enhance and constrain results.

Individual Interviews and Surveys

Throughout the course of the evaluation, open-ended interviews were conducted within the Bank and with key informants on the outside. Previous surveys of water users groups and their findings were incorporated.

Meta-Evaluation

This evaluation is in part a meta-evaluation that makes use of previous evaluations by IEG and self-evaluations by World Bank Operations.

Previous IEG studies of water-related topics have been more narrowly focused than this evaluation. Those evaluations include *Rural Water Projects* (2000), *Rural Water Projects: Lessons from OED Evaluations* (Parker and Skytta 2000), *Bridging Troubled Waters: Assessing the Water Resources Strategy Since 1993* (IEG 2002), *Efficient, Sustainable Service for All: An OED Review of the World Bank's Assistance to Water Supply and Sanitation* (IEG 2003), and *Water Management in Agriculture: Ten Years of World Bank Assistance, 1994–2004* (IEG 2006). In addition, an IEG evaluation of regional programs covers the Bank's regional approach to water management (IEG 2007).

Significant self-evaluation and policy research activities have accompanied the renewed Bank commitment to water. In recent years, the Bank produced important papers in all water-related subsectors. In the Water Supply and Sanitation subsector, the Bank published *IDA at Work: Sanitation and Water Supply* (World Bank 2007d), as well as *Utilities Reforms and Corruption in Developing Countries* (Estache, Goicoechea, and Trujillo 2006). In the Water for Food subsector, the Bank published *Reengaging in Agricultural Water Management: Challenges and Options* (World Bank 2006b). With respect to Water Resources Management, the Bank published the reports *Watershed Management Approaches, Policies and Operations: Lessons for Scaling-Up* (World Bank 2008e) and *Comparison of Institutional Arrangements for River Basin Management in Eight Basins* (Blomquist, Dinar, and Kemper 2005). Other studies covered topics such as sea-level rise (2007), fisheries and aquaculture (2005), water and electricity subsidies (2005), the forest-hydrology-poverty nexus (2004), the human right to water (2004), groundwater quality (2002), sanitation and hygiene (2005), economic regulation of urban services (2007), water and sanitation impact evaluations (2006), international water and sanitation cooperation (1998), on-site sanitation (1999), World Bank lending for large dams (1996), large-scale rural water and sanitation (1997), small-scale water supply and sanitation services providers in Latin America (2007), and directions in hydropower (2009), among others.

Issue Research and Case Studies

The evaluation launched research into 35 issues that sifted through the relevant experience to answer the major thematic/strategic questions facing the Bank (see table B.2 for a list). To ensure that the evaluation findings are relevant to current concerns and that the lessons identified will be used, the issues to be analyzed were determined in consultation with the Water Anchor and shared with the Water Sector Board. All the research looked at the same universe

of 1,864 projects. In thematic areas where there is little strategic guidance, the evaluation analyzed what was being done to distill the institution's revealed and evolving preferences. The more operationally relevant issue work will be made available as freestanding evaluations or shared with sector colleagues as presentations.

Seven case studies were generated by fieldwork and desk reviews. These had a dual purpose: first, to compare work (both Bank-financed and conducted by other agencies) that is adequately integrated with earlier, more narrowly focused approaches. The field research looked at factors associated with success and failure at the project level and assessed the overall contribution of the totality of Bank work in light of country needs and priorities. The second purpose of the case studies was to "reality test" the results of the evaluation's desk review of nearly 1,900 projects.

Case study subjects were selected using the following criteria:

- Countries identified as major borrowers for water in the portfolio review
- Countries with projects that cover innovative approaches or that deal with water issues in a particularly comprehensive way
- Countries with projects that cover issues deemed likely to be of increasing importance to borrowers. These might include country ownership, water scarcity, transboundary issues, flood control, climate change adaptation, multicountry watershed treatment, public-private partnerships, water infrastructure, water trade, and complementarities with transport infrastructure
- Representation of a broad array of regions and environmental conditions
- Countries with projects or programs that involve cofinancing and coordination with other donors in global and/or regional arrangements
- Ease and access during season of visit and reasonable travel time.

On this basis, Brazil, Morocco, Tanzania, Vietnam, and the Aral Sea area were selected for evaluation. In addition to these, desk cases were prepared on China and the Republic of Yemen using data collected by 2006 IEG missions to those countries.

Advisory Panel

A group of external advisers was established to advise the evaluation team during the evaluative process. The panel consisted of internationally recognized water experts and practitioners. The panel reviewed drafts at several stages in the process and commented on the ongoing research and various intermediate outputs. The panel members were:

TABLE B.2 In-Depth Issue Research and Case Studies

Managing water resources	
1.	Watershed management
2.	Groundwater
3.	Demand management / water use efficiency
4.	River and lake basin organizations
5.	Hydrological and meteorological monitoring
6.	Floods and intense rains
7.	Droughts
8.	Dams and reservoirs
Environmental sustainability	
9.	Environmental flow assessments
10.	Water quality management
11.	Water quality monitoring Rivers and lakes management
12.	Coastal zone management
Water use and service delivery	
13.	Dedicated and nondedicated water supply and sanitation projects
14.	World Bank support for water users associations (WUAs) in client countries
15.	Urban water
16.	Wastewater treatment and sewerage
17.	Subsidies for basic sanitation
18.	Cost recovery and water pricing in water supply and sanitation
19.	What works in water supply and sanitation? Lessons from impact evaluations
20.	The health benefits of water supply and sanitation projects
21.	Hygiene education
22.	Hydropower
Water management institutions	
23.	Challenges of water policy
24.	Water in Bank strategies
25.	Coverage of water issues in CASs
26.	Portfolio of water-related activities
27.	Global Program Review of the Global Water Partnership
28.	Highly satisfactory and highly unsatisfactory projects
29.	Private sector participation in urban WSS
30.	Private sector participation in rural WSS
31.	Decentralization in the Water Sector
32.	Integrated Water Resources Management (IWRM)
33.	International/ transboundary water institutions
34.	Inland water transport
35.	Conflict and water
Case studies	
1.	Aral Sea
2.	Brazil
3.	China
4.	Morocco
5.	Tanzania
6.	Vietnam
7.	Yemen, Rep.

Mohamed Ait Kadi, Chair of the Global Water Program Technical Committee, President of the General Council of Agricultural Development, Ministry of Agriculture, Rural Development and Fisheries, Morocco; Mary B. Anderson, President of the Collaborative for Development Action, Executive Director of CDA Collaborative Learning Projects; Judith Rees, Professor of Environmental and Resources Management, Director of the Grantham Research Institute on Climate Change and the Environment, London School of Economics; and Peter Rogers, Gordon McKay Professor of Environmental Engineering in the School of Engineering and Applied Sciences at Harvard University, Senior Adviser to the Global Water Partnership, Fellow of the American Association for the Advancement of Science, Member of the Third World Academy of Sciences.

Appendix C: Strategies

Bank Strategy in the Water Sector

The 1993 Water Resources Management Policy Paper (World Bank 1993) moved the institution away from infrastructure development. The paper also shifted the Bank from a sector-based investment planning process to a multisectoral approach to planning. The paper focuses the attention of Bank and borrower staff on three inputs: projects that will help to develop a stock of infrastructure for multiple water uses; establishing or strengthening institutions for the management of rivers and lake basins; and policies for the rational use of transboundary water to more effectively manage water resources. Regional water teams were created with water specialists and advisers, although these teams never really incorporated water supply and sanitation (WSS) staff, who maintained their close relationship with urban development and never fully took water resources management on board. Under pressure from environmental and social nongovernmental organizations, the Bank backed away from major investments in water storage infrastructure. In addition, the private sector was expected to become a major financier in water supply and sanitation. Lending for water decreased.

In 2003, the Bank adopted a new water resources sector strategy (World Bank 2003c) that focuses on putting the 1993 principles into practice. Both the 1993 and 2003 strategic papers documented the same three entry points as key elements for successful management of water resources. These strategies move toward an integrated approach that focuses on both infrastructure development and management for water resources and water services. In recent years, the Bank's approach has also expanded to include regional and subnational lending.

The main messages of the 2003 strategy have a strong focus on large infrastructure:

- The management and development of water resources are central to sustainable growth and poverty reduction.
- Being an effective partner requires attention to both management *and* development of infrastructure—neither alone will solve all problems.
- Take a pragmatic approach to integrated water resources management.
- Support countries in developing and maintaining "appropriate stocks of well-performing hydraulic infrastructure and in mobilizing public and private financing, while meeting environmental and social standards" (World Bank 2003c, summary, page 3).
- Counteract the Bank's reluctance to engage with "high-reward–high-risk hydraulic infrastructure, using a more effective business model."
- The Bank is perceived to have a comparative advantage in water, which has created strong demand for its services. Hence, the Bank must continue to engage if it is to remain a credible knowledge institution.
- The Bank's water support must be "tailored to country circumstances and be consistent with the overarching Country Assistance Strategies and Poverty Reduction Strategy Papers." The Country Water Resources Assistance Strategy concept was developed in the strategy.

The 1993 and 2003 strategy papers have helped inform issues related to supply, institutions, economic use, the environment, and broad-based water service interventions (aimed at improving the performance of utilities, user associations, and irrigation departments (see box C.1).

The strategy says much less about water services, which are addressed in the 2003 Infrastructure Action Plan and the 2003 WSS Business Strategy as well as in Bank strategies for energy, environment, rural development, and irrigation and drainage. The Water Resources Management Sector Strategy Paper (World Bank 2003c) was instrumental in paving the way for Bank re-engagement in infrastructure, and the process it set in motion culminated in the Infrastructure Action Plan.

As can be seen in table C.1, the objectives outlined in the various strategic documents are highly consistent. For instance, poverty alleviation and promotion of private sector participation objectives are found in every one of the strategic documents reviewed. Furthermore, this Bank consensus on poverty and private sector participation resonates with the objectives of the broader development community (notably the Dublin Principles—see box C.2—and the Millennium Development Goals), and thus reflects the views of the Bank's authorizing environment. Aside from the coherence in certain messages across the board, a number of documents address different priorities based on their main focus, and the importance of a given theme for the Bank's more focused development agenda. The matrix shows that, even though the Bank receives strategic guidance from a number of documents, it is nevertheless following broadly accepted water management goals.

BOX C.1

BANK STRATEGY AND INTEGRATED WATER RESOURCES MANAGEMENT

The Bank's 2003 strategy acknowledged the central importance of water resources management to the mission of the Bank. A main message of the strategy emphasized that the Bank needed to continue its efforts toward integrated water resources management (IWRM).

IWRM calls for integration of actions that affect drinking water and sanitation supply, agriculture, irrigation, hydropower and other energy production, and maintenance of environmental water flows to protect habitats and sustain groundwater supplies. Under IWRM, the results of water management programs are monitored to permit ongoing adjustments to strategies and practices. IWRM leads toward the recognition that water policy is bound together with government policies on security, economic development and food production, public health, and other essential governance missions.

According to the 2003 strategy, IWRM is not to be treated in a utilitarian manner:

"The main management challenge is not a vision of integrated water resources management but a 'pragmatic but principled' approach that respects principles of efficiency, equity and sustainability while recognizing that water resources management is intensely political and that reform requires the articulation of prioritized, sequenced, practical and patient interventions."

Hence, IWRM was to be considered not for its own sake but as an adjunct to development.

Source: World Bank (2003c).

The main message from table C.1 is that there is a notable interconnectedness among the various strategic documents on nearly every subject. The review shows that many of the individual strategic objectives in the guiding documents were closely related. For instance, the 2003 Water Resources Sector Strategy objective to "assist countries in developing and maintaining appropriate stocks of well-performing hydraulic infrastructure and in mobilizing public and private financing, while meeting environmental and social standards," is consistent not only with objectives in the development of hydraulic infrastructure, but also with promotion of private sector involvement and improvement of the environment.

Connections with Other Strategic Influences

Country Water Resource Strategies

The Bank has developed Country Water Resources Assistance Strategies in selected countries. These are free-standing strategies described and implemented through the 2003 strategy. They thoroughly analyze countries' economic, environmental, and resource constraints with regard to water. They aim to bring the finance and planning ministries into the water dialogue, reveal countries' problems, and guide the Bank/borrower dialogue. Ten of these are in the Bank's systems as having been approved by the Board for countries with serious water problems and where there is a demand for Bank engagement (Bangladesh, Brazil, China, Ethiopia, India, Pakistan, Philippines, Tanzania, Vietnam, and the Republic of Yemen). The Country Water Resources Assistance Strategies describe how the Bank can and will help improve water resources management in a given country, and they are linked upward to the Bank's CASs and Poverty Reduction Strategy Papers (PRSPs),[1] and downward to investment, bringing coherence to the Bank's support for water across the resource and service spectrum. They complement and help to shape the CASs and PRSPs. Each seeks to respond to country-specific challenges and priorities.

BOX C.2

DUBLIN PRINCIPLES

Principle No. 1 - Freshwater is a finite and vulnerable resource, essential to sustain life, development, and the environment.

Principle No. 2 - Water development and management should be based on a participatory approach, involving users, planners, and policy makers at all levels.

Principle No. 3 - Women play a central part in the provision, management, and safeguarding of water.

Principle No. 4 - Water has an economic value in all its competing uses and should be recognized as an economic good.

Source: International Conference on Water and the Environment in Dublin, Ireland, on 26 to 31 January 1992. The Dublin Statement on Water and Sustainable Development.

TABLE C.1 Coverage of Water Resources Management Objectives by World Bank Strategic Documents

Water management objective	Number documents covering	1992 Dublin Principles	1993 WRM Policy Paper	2001 Environment Strategy	2003 WR Sector Strategy	2003 Infrastructure Action Plan	2003 WSS Business Strategy	MDGs
Alleviate poverty	7/7	X	X	X	X	X	X	X
Promote private sector participation	7	X	X	X	X	X	X	X
Encourage women to participate in water resources management	5	X	X	X	X			X
Restore ecosystems (wetlands, swamps, coastal zones, marinas, estuaries)	5	X	X	X	X			X
Support basin-level institutions	5	X	X	X	X		X	
Enhance stakeholder participation	5	X	X	X	X		X	
Employ demand management practices (promote incentives to water conservation and establish "polluter-pays" principle)	5	X	X		X		X	X
Strengthen policies and develop economic and sector work	5		X	X	X	X	X	
Improve water institutions	4	X	X	X			X	
Coordinate water resources activities across sectors (cross-sectoral)	4		X	X		X	X	
Support for international waterways	4	X	X	X	X			
Promote improved water resources management	3	X	X		X			
Commit to environmental improvements	3	X		X				X
Create effective monitoring and evaluation units to measure results	3			X		X	X	
Protect groundwater resources	3	X	X		X			
Develop hydraulic infrastructure (dams, hydropower)	2				X		X	
Reduce natural disaster risks	2	X		X				
Prepare high-risk/high-reward projects	2				X	X		
Promote decentralization	2		X				X	
Improve low-cost technologies	2		X					X
Address political economy of reforms	1				X			
Enhance donor coordination	1		X					
Develop water CASs	1				X			
Themes covered		13/23	16	13	15	6	11	7

Country Assistance Strategies

Insofar as the CASs[2] reveal the Bank's strategic approach to water activities, it is commensurate with the scale of its borrowers' problems. However, critical issues such as groundwater, wetland protection, coastal zone management, and water marketing have not figured in the list of the Bank's top priorities in recent CASs. In contrast, the review found that community participation, stakeholder involvement, and beneficiary-related activities in water management were mentioned more frequently in recent CASs.

With respect to irrigation and drainage, the older CASs focused on water charges (thus covering basic operation and maintenance costs), while recent strategic documents address rehabilitation, upgrading, and expansion of existing irrigation and drainage systems, presumably because the funds still have not been gathered to cover this expense.

In the water resources management category, improved water resources management and watershed protection were the most common activity in recent strategic documents (see table C.2). In addition, the Bank urged client countries to seek further assistance in preventing natural disasters (such as floods and droughts); this activity was highlighted as a core challenge in most recent CASs. Moreover, the analysis found that the more recent strategic documents do not prioritize water quality improvement activity as often as the earlier CASs did. The findings from water quality monitor-

TABLE C.2 CAS Analysis—Critical Issues Have Been Left Behind	
Old focus of CASs	**New focus of CASs**
Urban/rural WSS services	Urban/rural WSS services
Water charges	Reduction of unaccounted-for water
Water quality improvement	Decentralization of WSS services
Groundwater	Cost recovery (utilities)
Coastal zone management	Improving water resources management
Water marketing	Watershed protection
Maintenance	Natural disaster mitigation
	Community participation
	Stakeholder involvement
	Beneficiary-related activities
	Maintenance

Source: IEG water database.

ing and river and lake management issue work (produced for this evaluation) uncovered the same pattern of practice.

Few CASs (10 percent) addressed water quality improvement, even when a country highlighted poor water quality as an issue. To address water quality, behavioral change and environmental restoration are needed, and these are difficult topics, even when such activities are clearly the only way forward.

The Bank's Organizational Structure for Water

The Water Sector Board is responsible for all freshwater activities. The Sector Board was formed in 2007 as part of a major Bank-wide restructuring of staff with similar professional backgrounds (groupings known in the Bank as networks). Before 2007, there was a WSS Sector Board as well as a separate and more informal Water Resources Management Group.

While the sector strategy calls for one water sector manager per Region, this has not yet happened. The membership of the board includes managers from the Regions, as well as representatives from other relevant corporate units.

The Water Anchor, a unit within the Energy, Transport, and Water Department, helps to integrate the various practices. It supports the Regions on strategy formulation and implementation and serves as the secretariat of the sector board. As part of its work program, the Water Anchor is responsible for Water Sector Strategy formulation, implementation, and coordination.

Staff with a range of infrastructure specializations were folded into the massive Sustainable Development Network (SDN) within the SDN Vice Presidency. About half of the Bank's water sector staff are employees of the independent Water and Sanitation Program (WSP). [3]

It is worth mentioning that other donors and nongovernmental organizations (NGOs) visited during the preparation of this report had Bank water publications close at hand and demonstrated familiarity with their contents. Water sector professionals in partner organizations were knowledgeable about what is on the water Web site and commented that they often used the materials. The Bank's Water Week has become an event that draws participants from all over the world. In terms of knowledge management, the Water Anchor's Web site receives 270,000 page views per year,[4] and in 2008 it published 28 titles for international distribution.

Appendix D: Taxonomy of Water Activities in the Portfolio

A. WATER SUPPLY	
A01	Construction of new potable water systems
A02	Reservoirs (water resource mobilization)
A03	Rural water supply and sanitation
A04	Urban water supply and sanitation (when further detail not available)
A05	New pipes
A06	Wells
A07	Boreholes
A08	Installation of hand pumps
A09	Pumping stations
A10	Water transmission line
A11	Kiosks
A12	Rehabilitation of water systems
A13	Rehab water supply (when further detail not available)
A14	Rehab wells, boreholes, or reservoirs
A15	Leakage detection
A16	Water conservation
A17	Reduction of unaccounted for water
A18	Springs
A19	Installation of pipes and household connections
A20	Construction of water treatment facilities
A21	Protection of the drinking water supply
A22	Expansion of existing water systems
A23	Installation of water filters for surface water, rain harvesting
A24	Dam expansion or strengthening
A25	Rehabilitation of hand pumps
A26	Private sector participation (PSP) involved in rehabilitating community water systems
A27	PSP involvement in WSS design
A28	Continuous water services improve
A29	Increased access to safe, potable water
A30	Increase potable water supply / bulk water supply
A31	Water supply only
A32	Both water supply and sanitation

B. SANITATION	
B01	Construction of new sanitary systems
B02	New sanitation (when further detail not available)
B03	Provision of in-household installations
B04	Household sanitation
B05	Latrines
B06	Installing water or sanitation in public facilities
B07	Public sanitation (for schools and the like)
B08	PSP involved in manufacturing latrines
B09	Supply-driven approach to sanitation
B10	Low-cost sanitation facilities
B11	Sanitation only

C. SEWERAGE	
C01	New sewers (sewer system)
C02	Water/wastewater treatment plants
C03	Wastewater treatment
C04	Sewage treatment
C05	Solid waste collection
C06	Sanitary landfills constructed
C07	Rehabilitation of sewage or sanitation systems
C08	Rehab sewers
C09	Maintenance of sewerage systems
C10	Connecting households
C11	Expansion/augmentation of existing systems
C12	Installation of sewage flow meters
C13	Establish submarine outfalls to discharge treated wastewater
C14	Construction of sewage collection and treatment facilities
C15	Replacement of sewage pipelines
C16	Rehabilitation of existing wastewater treatment plant
C17	Improvements in septic tank systems
C18	Increased access to sewerage services

D. WATER QUALITY / POLLUTION MANAGEMENT	
D01	Control or treatment of polluted water
D02	Closing facilities that pollute
D03	Water quality
D04	Pollution abatement
D05	Industrial pollution abatement
D06	Monitoring ocean/coastal/wetland pollution
D07	Preventing ocean/coastal/wetland pollution
D08	Treatment ocean/coastal/wetland pollution
D09	International transboundary protection ocean/coastal/wetland pollution
D10	Restoration ocean/coastal/wetland pollution
D11	Control or treatment of leachate from solid waste sites
D12	Control or treatment of industrial runoff or wastewater
D13	Control or treatment of agricultural drainage water or runoff

D14	Control of the quality of water provided to croplands
D15	Measuring or limiting use of fertilizers
D16	Relocation of water-borne pollutants
D17	Cleanup of marine oil spills
D18	Construction of road microcatchments to prevent erosion
D19	Improved manure management practices
D20	Promotion of aqua-friendly agriculture
D21	Reuse of treated water (except for agriculture)
D22	Dewatering
D23	Construction of sludge treatment or disposal facility
D24	Roadside soil erosion prevention
D25	Promotion of cleaner industrial practices
D26	Stabilization of waste ponds containing pollutants
D27	Invasive species control (hyacinths)
D28	Planting of forests
D29	Water recycling in agriculture
D30	Water recycling other uses, domestic uses (toilets, for example)
D31	Water recycling, industrial uses
D32	Chemical treatment to control water-borne diseases
D33	Protection of the food supply
D34	Decontaminating fruits and vegetables
D35	Floating plants as indicator of water quality
D36	Non-chemical alternatives for pest management
D37	Prevent seawater intrusion into aquifer by constructing a water barrier
D38	Salinity/waterlogging prevention and mitigation
D29	Eutrophication
D30	Reduce groundwater contamination

E. IRRIGATION	
E01	Water resource mobilization
E02	Irrigation
E03	Drainage for irrigation
E04	Water for agriculture
E05	Promotion of irrigation efficiency
E06	Rehabilitation of irrigation schemes
E07	Use of tube wells to extract groundwater
E08	Reuse of treated water for irrigation
E09	Microcatchment system development /management
E10	Construction of small irrigation schemes
E11	Conversion of irrigation schemes, pump to gravity
E12	Hill dams construction for irrigation
E13	Construction of pressurized irrigation
E14	Pumping station rehabilitation/expansion
E15	Promotion of improved techniques for rain-fed farming
E16	Built or rehabilitated irrigation infrastructure
E17	Groundwater use for irrigation
E18	Improve efficiency of groundwater use for irrigation
E19	Dam / reservoir for irrigation
E20	Supply and installation of sprinkler and drip irrigation systems
E21	Use of monitoring for agriculture

F. STORM AND FLOOD CONTROL AND DRAINAGE	
F01	Storm and flood control
F02	Construction of general drainage
F03	Construction of flood control
F04	Flood mitigation activities
F05	Construction of storm water drainage
F06	Drought mitigation
F07	Dredging
F08	Lining of watercourses
F09	Construction of retaining walls
F10	Construction for flood prevention dikes
F11	Rehabilitation of existing drainage systems
F12	Construction of new drainage systems or components
F13	Desalting basin construction/improvements
F14	Prepared for or recovered from natural disasters
F15	Early warning system
F16	Flood control and drainage improvement
F17	Check dams, flood and erosion control

G. ENERGY	
G01	Water for energy
G02	New dam construction
G03	Rehabilitate dams
G04	Dam safety
G05	Sediment control/removal from rivers
G06	Oil distribution/equipment acquisition
G07	Monitoring hydrocarbons in water
G08	Construction of combined heat and power generation/ steam facilities
G09	Oil distribution/equipment acquisition
G10	Monitoring hydrocarbons in water
G11	Construction of combined heat and power generation/ steam facilities
G12	Built or rehabilitated energy infrastructure
G13	Large dam
G14	Dam raising
G15	New hydro
G16	Small hydro
G17	Hydro rehabilitation/upgrade
G18	Run of river
G19	Expand existing hydro
G20	Multipurpose dam

H. LOCATION	
H01	Urban
H02	Rural
H03	Small town
H04	Peri-urban areas
H05	Health centers
H06	Schools
H07	Coastal areas
H08	River

H09	Catchment area
H10	Flood plains
H11	Local
H12	Regional
H13	National
H14	Transboundary
H15	Ministries
H16	Local government
H17	Basin

I. BIODIVERSITY

I01	Fisheries rehabilitation
I02	Protection of coastal spawning grounds
I03	Promotion of dry land biodiversity to protect wetlands or water
I04	Marine protected areas (MPAs)
I05	Rehabilitation and management of coral reefs
I06	Protection of sea turtles
I07	Rehabilitation and protection of mangroves
I08	Management of coastal wetlands (Ramsar sites)
I09	Biodiversity conservation and species protection
I10	Wetland restauration
I11	Wetland protection
I12	Fish studies
I13	Nature reserve
I14	Marshland management

J. WATERSHED MANAGEMENT (IWRM)

J01	Watershed protection and management
J02	Environmental management
J03	Land use
J04	Erosion reduction or prevention
J05	Natural resources management
J06	Water management technology
J07	Integrated water resources management (IWRM)
J08	Water resources management
J09	Climate change
J10	Forest management/reforestation
J11	Rangeland
J12	Nurseries
J13	Vegetative cover restoration
J14	Agricultural pollution management mechanisms with manure, improved practices to prevent nitrates going into waters
J15	Transboundary cooperation
J16	Small earth dams construction
J17	Improved soil management practices to prevent loss in grasslands and biodiversity
J18	Coastal zone management
J19	Management of catchment area
J20	Environmental assessment
J21	Environmental impact assessment
J22	Environmental flow assessment (EFA)
J23	Hydrological assessment
J24	Ecological flow assessment
J25	River basin study
J26	Environmental flows discussed
J27	Groundwater recharge
J28	Reduce pressure on groundwater
J29	Informal environmental flow assessment
J30	Environmental flow component
J31	Environmental mitigation
J32	Environmental protection assessment and monitoring
J33	Use of monitoring for water resources management
J34	Reversing natural resources degradation
J35	Water transfers
J36	Soil conservation research
J37	Groundwater management
J38	Runoff control
J39	Improving the management of international waters
J40	Basin modeling

K. PLANS, POLICIES, AND REGULATIONS

K01	Development of plans, policies, and regulations
K02	Enforcement
K03	Plans
K04	Policy
K05	Water use rights
K06	Support for scientific and economic research/ studies for project preparation or to develop policies
K07	Support for professional education
K08	Master plan development
K09	Development of standards and methodologies
K10	Definition of procedures and standards
K11	Development of monitoring methods
K12	Hygiene education strategy of plan
K13	Law
K14	Land registration
K15	Land development and improvement
K16	Water rights

L. INSTITUTIONAL DEVELOPMENT (REFORM, TECHNICAL ASSISTANCE, AND CAPACITY BUILDING)

L01	Private sector participation
L02	Regional cooperation
L03	Institutional strengthening/capacity building
L04	New institutions (+ oversight for private sector participation)
L05	Studies
L07	Equipment purchase
L08	Operation and maintenance (O&M)
L09	Decentralization of services
L10	Institutional reform

L11	Demand management
L12	TA – Technical assistance and training
L13	Project management and coordination
L14	For project preparation (experts, best practices) consulting services
L15	For project management (monitoring equipment)/ to manage studies, to set up labs
L16	Capacity building, training for government officials
L17	Exploring possibilities for more private sector participation (PSP) in the future
L18	Local government has oversight role with PSP
L19	Private sector development
L20	PSP capacity building
L21	Preparing contracts and management models for PSP
L22	PSP provision of O&M
L23	Studies undertaken on PSP
L24	Local government involved PSP
L25	Central government involved in PSP
L26	Studies to evaluate health impact
L27	Assessment of baseline hygiene behavior
L28	Training of trainers
L29	International operator for urban water supply and sanitation
L30	Local operator for urban water supply and sanitation
L31	Number of staff in public utilities to be reduced
L32	Bidding documents prepared for PSP
L33	Reformed water utility
L34	Created regional management process
L35	Created or developed institutions, government and non-government
L36	Decentralization
L37	Transboundary diagnostic analysis (TDA)
L38	Transboundary environmental analysis
L39	Institutional development for groundwater
L40	Institutional development for hydro
L41	O&M for dams
L42	Technical assistance for dams
L43	Dam studies
L43	Surveys
L44	Feasibility studies for sanitation subsidies
L45	Interagency coordination

M. FINANCIAL MANAGEMENT	
M01	Financial capacity building
M02	Cost recovery
M03	Procurement
M04	Water tariffs, pricing
M05	Water meters
M06	(Financing) River basin agencies
M07	Increase efficiency in water delivery
M08	Financial reform
M09	Subsidies
M10	Local credits/grants
M11	Imposition/planning of tariffs, fees, funds, cost recovery strategies, improved billing collection, financial management, financial planning, creation of revolving funds
M12	Fees collected
M13	Risk
M14	Water marketing
M15	Wastewater treatment and sewerage technology financed
M16	Ex ante sensitivity analysis undertaken for wastewater treatment plants (WWTPs)
M17	Ex ante economic internal rate of return calculated for WWTPs
M18	Ex ante cost-benefit analysis undertaken for WWTPs
M19	Ex ante financial rate of return for WWTPs calculated
M20	Ex post sensitivity analysis undertaken for WWTPs
M21	Ex post economic internal rate of return calculated for WWTPs
M22	Ex post cost-benefit analysis undertaken for WWTPs
M23	Ex post financial rate of return for WWTPs calculated
M24	Sewerage tariff was increased to continue operation
M25	Water utility savings
M25	Financial and policy incentives to promote conservation
M26	Carbon finance
M27	Land management incentives
M28	Farm credits
M29	Water tariffs increased
M30	Improved billing efficiency
M31	Improved service increased beneficiaries' willingness to pay
M32	Stakeholder responsibilities for cost recovery established
M33	Full cost recovery (O&M and infrastructure)
M34	Cost recovery for O&M (infrastructure subsidized)
M35	Cost recovery for infrastructure (O&M subsidized)
M36	Increase tariffs or charges
M37	Establish tariffs or charges where there have been none before
M38	Reduce non-revenue water
M39	Cost recovery for irrigation
M40	Payments for environmental services

N. PUBLIC AWARENESS	
N01	Public awareness
N02	Hygiene education and training
N03	Educational campaigns
N04	Dissemination
N05	Health
N06	Schools, education, environmental-related curriculum
N07	PSP in hygiene promotion
N08	PSP in information dissemination
N09	Safe water practices
N10	Handwashing with soap

N11	Hygiene messages (communication strategy) prepared
N12	Hygiene training materials prepared
N13	Integrated approach (WSS plus hygiene in one project)
N14	Behavior changes with respect to hygiene expected
N15	Safe excreata disposal
N16	Health outcomes expected to improve
N17	Mass media used for hygiene promotion
N18	Public consultations for PSP
N19	Environmental improvement through sanitation and WWT
N20	Public awareness regarding quality and quantity

O. INFORMATION MANAGEMENT AND MONITORING

O01	Monitoring and evaluation (M&E)
O02	Information management
O03	Data collection
O04	Management information system
O05	Groundwater monitoring quality of aquifer water
O06	Groundwater monitoring aquifer depth
O07	Groundwater monitoring, preventing or studying salinity
O08	Groundwater monitoring transboundary aquifers
O09	Geographic information systems, database (design, data-entry, and use), environmental monitoring
O10	Laboratory data/monitoring
O11	Other (monitoring specific activities)
O12	The project was supposed to monitor water quality
O13	Water quality data was collected
O14	Data/parameters appropriate given nature of objectives
O15	The project improved water quality
O16	Monitoring continued (at least) until project closing
O17	Monitoring sampling and analysis methods
O10	PSP involved in monitoring
O11	Monitoring for behavioral change with hygiene
O12	Monitoring of marine species and coastal zone management
O13	Water quality monitoring
O14	Gauging stations
O15	Environmental monitoring

P. BENEFICIARY PARTICIPATION

P01	Participation by beneficiaries
P02	Community-driven development
P03	Community or beneficiary participation
P04	Gender (activities specific to women)
P05	Poverty-targeted intervention
P06	Water user associations (farmers' groups)
P07	Demand-driven approach to water development
P08	Employment creation
P09	Communities responsible for O&M
P10	Community organizations responsible for WSS delivery
P11	Created community-based infrastructure management process
P12	Enhanced welfare of the local people
P13	Social impact assessment, social assessment
P14	Demand-driven approach to sanitation
P15	Delegate O&M roles to beneficiaries

Q. OTHER

Q01	Commercial development of water-related business
Q02	Fisheries and aquaculture
Q03	Budget support
Q04	Ports rehabilitation
Q05	Donor coordination / other donors involved
Q06	NGOs / community-based organizations
Q07	Desalinization
Q08	International waters
Q09	Support for fishermen
Q10	Commercialization (fish and seafood)
Q11	Support for disadvantaged stakeholders
Q12	Roads and highways construction / rehabilitation
Q13	Rural roads/small-scale road construction/ improvements
Q14	River / water transportation
Q15	PSP for spare-part distribution
Q16	Public-private infrastructure facility involved
Q17	PSP provision of goods and services
Q18	Small and medium enterprise development
Q19	Social marketing used for hygiene promotion
Q20	Berth facilities
Q21	Improve navigation
Q22	Improve land access to the port
Q23	Coastal/marine tourism
Q24	Bridge construction
Q25	Making water available for industrial uses
Q26	Transport
Q27	Resettlement
Q28	Develop beneficiaries' productive capacity
Q29	Improve living conditions
Q30	Fish marketing
Q32	Increased agricultural production and incomes
Q33	Agricultural extension services

Appendix E: Highly Satisfactory and Highly Unsatisfactory Projects

Of the 1,042 completed projects in the IEG water evaluation database, 44 were rated highly satisfactory for outcome (4.2 percent), and 17 were rated highly unsatisfactory (1.6 percent).

While highly satisfactory projects focused on the "software," including institutional development, the environment, and social issues, the highly unsatisfactory projects focused primarily on what has generally been the Bank's strength—building the "hardware," or infrastructure.

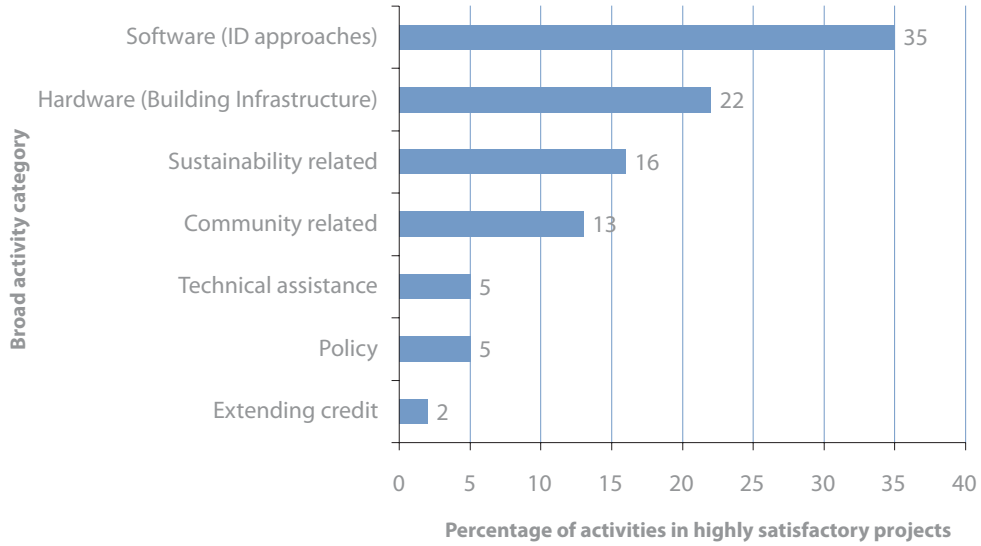
The projects were then analyzed to determine what success factors and broad lessons they shared. While activities and processes can vary greatly from project to project, some overarching approaches that were common to the highly satisfactory projects and lacking in the highly unsatisfactory projects emerged.

Highly satisfactory projects emphasized getting things right at the start—41 lessons pointed to this. Project design was obviously integral to this approach. It was important to design a project that could speak for itself, and therefore encourage more widespread buy-in. Highly satisfactory project design was completely fleshed out and detailed by the time projects commenced disbursement, and it was geared to create the correct environment for success and clear communications. Works to be executed first included those with high demonstration value to sway opinions and garner support from the start. Project design often included long-term planning.

In contrast, lessons from highly unsatisfactory projects indicate that those projects should have had things running well before the project started—but did not. Many of these projects were behind from the beginning or ran into serious issues along the way. They should have been reappraised, but were not (8). Several suffered from a security collapse and conflict issues, which hampered supervision (5). A pilot could have helped to avoid the failure of one of the projects, and another emphasized that the project team should have put effort into making things run smoothly before project start.

In 35 instances, highly satisfactory projects reported the

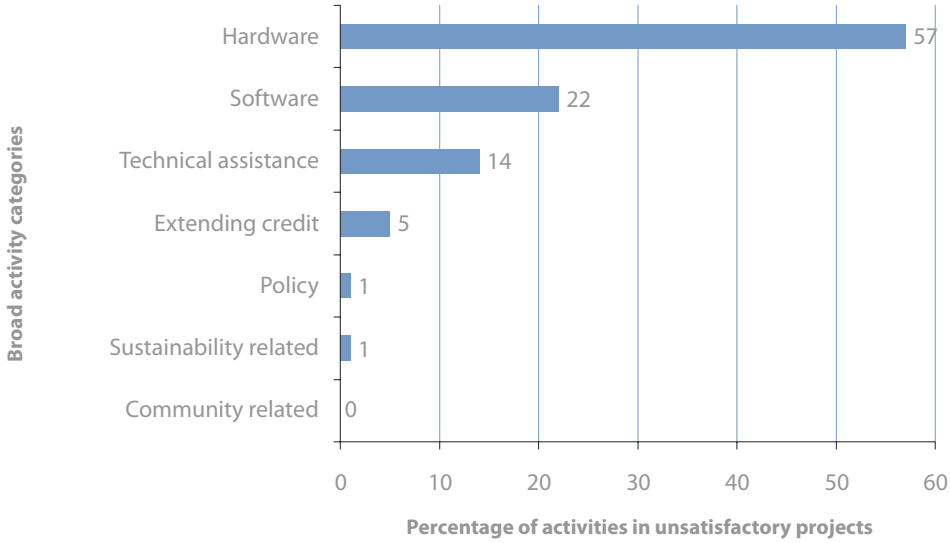
FIGURE E.1 Activities in Highly Satisfactory Projects



Source: IEG water database.

Note: ID = institutional development.

FIGURE E.2 Activities in Highly Unsatisfactory Projects



Source: IEG water database.

importance of involving stakeholders. This involvement was broken down into several types of participation. For instance, stakeholder participation and community involvement were important enough to the success of the project to be singled out in 17 cases. Two projects mentioned that it was important to offer participation training where skills were taught. Active local government and private sector participation were also noted as important. Participation, as it relates to ownership, was critical to the success of the highly satisfactory projects. The participation of an international panel of experts was mentioned in three projects as having a significant effect.

Highly satisfactory projects possessed a high degree of clarity—clear objectives, clear communication, clear design, and clear procurement procedures (10). Clear objectives were used to continually focus implementation efforts. Excellent communication among participants and clearly defined roles resulted in faster implementation. The continuity of staff members working on these projects was important to their success (5 projects). Responding rapidly to problems as they arose was credited for project success in 7 of the projects. Other factors included flexibility (3); simple procurement (1); and effective, decentralized, supervision (1).

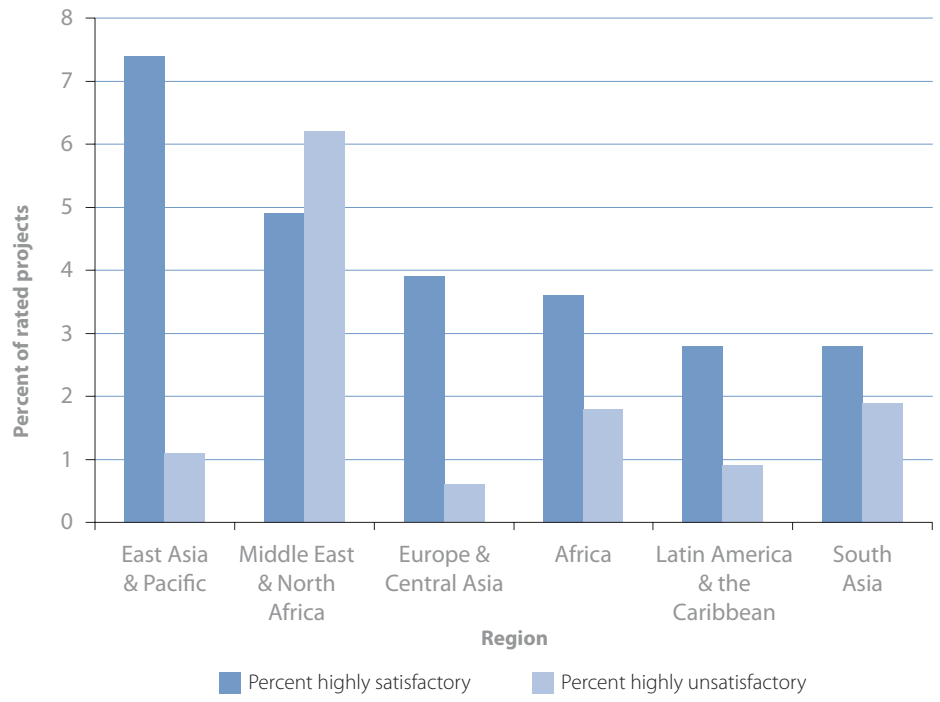
In 18 instances the lessons from highly unsatisfactory projects indicated that commitment, communication, continuity, and quick correction were *missing*. Projects lacked government and donor commitment before project start (5), and communication among the various actors was insufficient (3). Making matters worse, staff did not act fast enough to correct issues, respond to new circumstances, or mitigate the effects of external shocks (5).[1] These difficulties were aggravated by a staffing discontinuity issue in two projects and lack of incentives for straightforward supervision reporting (1).

Looking at highly satisfactory projects from the Regional perspective, the East Asia and Pacific Region had the highest percentage of its projects performing at this level. Eleven of those projects were in China, a top performer. The Middle East and North Africa Region projects had an interesting performance profile, with both the second-highest percentage of highly satisfactory projects and the highest percentage of highly unsatisfactory projects. The Latin America and Caribbean and South Asia Regions shared the status of having the lowest percentages of highly satisfactory projects.

After the Middle East and North Africa, the Region with the second-largest percentage of highly unsatisfactory projects was South Asia. The Region with the lowest percentage of highly unsatisfactory projects was Europe and Central Asia.

Among countries, China had the highest number of highly satisfactory water projects, and Brazil the second highest.

FIGURE E.3 Regional Distribution of Highly Satisfactory and Highly Unsatisfactory Projects



Source: IEG water database.

This is to be expected, given the overall strong performance of those two countries in the Bank portfolio as a whole. More surprising, however, is that Senegal and The Republic of Yemen are listed next.

The Rural Sector Board oversaw the largest number of the highly satisfactory projects (13). These are primarily irrigation and drainage projects. The Energy and Mining Sector Board recorded the next-highest total, with 7 highly satisfactory projects (hydropower and dams) and no highly unsatisfactory projects. Four WSS projects were rated highly satisfactory.

The Rural and the WSS Sector Boards oversaw the largest number of the highly unsatisfactory projects, WSS stands out as one of the two sector boards with the most highly unsatisfactory projects, and as having fewer highly satisfactory projects than four of the other sector boards.

Appendix F: Water in Country Assistance Strategies

To obtain this information, the study reviewed all available country strategy documents approved by the Board between fiscal years 1997 and 2009. This universe consists of 294 Country Assistance Strategies (CASs) or Country Partnership Strategies (CPSs) from 122 countries. For the purpose of this report, only the CASs for 40 countries (98 documents) were analyzed in detail to get an overall sense of activities. The selection criteria were as follows: Of the 40 countries reviewed, 20 countries were selected from a list of "highly water-stressed" countries (representing the top 20 highly water-stressed countries), and the remaining 20 countries were chosen from a list of "least water-stressed" countries (representing the least water-stressed countries, FAO AQUASTAT). Some countries had only one CAS during the period studied, some had two, a few had three, and two had four.

The review cataloged the water-related activities the country strategy papers committed the Bank to pursue.[1] The activities fell under three broad headings: (1) water supply and sanitation, (2) irrigation and drainage, and (3) comprehensive water resources management. The analysis found that of the 98 CASs from 40 countries, 55 assigned top priority to water supply and sanitation services (see table F.1).

TABLE F.1 The Three Main Water Priorities of Country Assistance Strategies

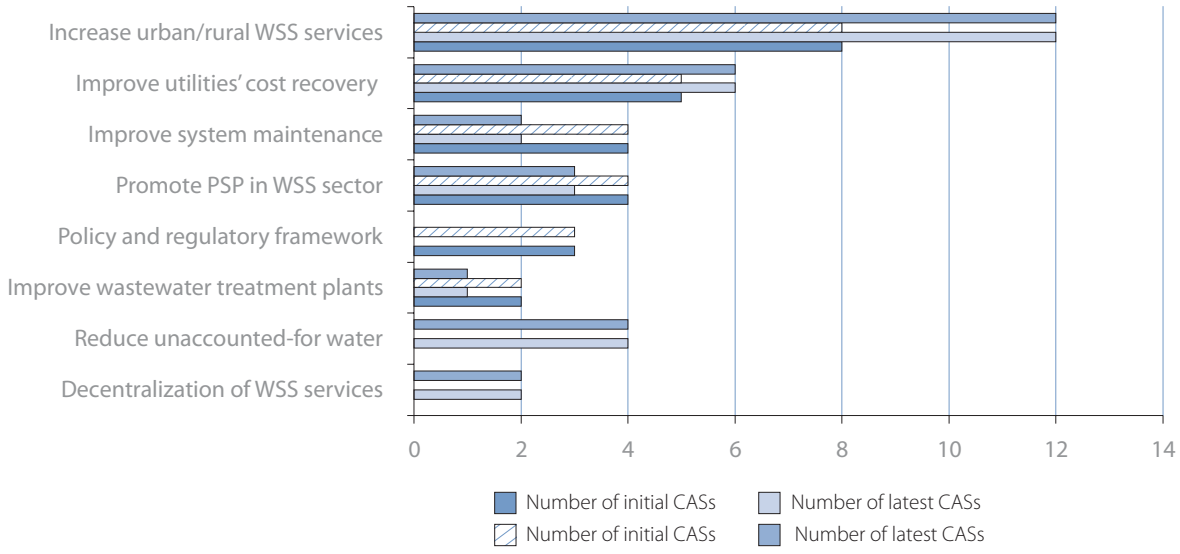
Priority	Number of CASs/CPSs that discuss this activity
Water supply and sanitation	55
Irrigation and drainage	29
Comprehensive water management	36

Source: World Bank country strategy documents.

This is at least partly because countries are concerned with achieving the Millennium Development Goals (MDGs), which set targets for water supply and sanitation (WSS). The next most commonly occurring activity was comprehensive water resources management, found in 36 CASs. This likely reflects the 2003 World Bank Water Resources Strategy, which calls for countries to adopt an integrated water resources management approach. Twenty-nine strategic documents call for the improvement of irrigation and drainage infrastructure.

Figure F.1 compares the activities called for in the earliest and the latest CASs. In the 20 highly water-stressed

FIGURE F.1 WSS in Highly Water-Stressed Countries



Source: World Bank country assistance strategy documents.

countries, under the WSS heading, 8 countries prioritize increasing the coverage of urban/rural WSS services in their earliest CAS. The most recent CAS documents, however, show a 50 percent increase in the pursuit of this goal. Twelve countries discussed the lack of basic services and planned to address this issue in the work guided by the strategic documents.

In addition, reducing the level of unaccounted-for water through installation and expansion of water metering systems is often mentioned in the recent CASs, along with decentralization of WSS services. Although these two activities were mentioned in the earlier documents, they did not appear as often, and thus were not prioritized as highly. Table F.2 compares the highest priority activities in the subject CASs.

TABLE F.2 The 2003 Strategy Focuses on Class 2 Challenges

Strategy does not focus on Class 1 Challenges	Instead, it focuses on Class 2 Challenges
Water quality	Water resources management and development Major interventions—dams, interbasin transfers Improvement of catchment quality Improvement of utility performance Poverty-targeted water services
Water conservation	Management and infrastructure, combined
Groundwater management	IWRM and political constraints Efficiency, equity, and sustainability
Watershed management	Respond to climate change—build dams, canals, dikes, and interbasin transfer schemes that meet environmental and social standards
Institutional reform	Build dams/hydropower Use a more effective business model Tailor to country circumstances Be consistent with the CAS

Appendix G: Environmental Health

Environmental health risks include hazards related to poverty and lack of infrastructure, such as water-related diseases caused by inadequate water supply and sanitation and respiratory diseases caused by poor indoor air quality. But they also include modern hazards, such as urban air pollution and exposure to agro-industrial chemicals and waste. About 80 percent of illnesses in developing countries are water-related. Millions are blinded, disabled, or malnourished because of water-borne illness or pollutants. Cholera, typhoid, Guinea-worm disease, dengue fever, river blindness, polio, malaria, and diarrhea are all directly or indirectly associated with water, and often affect the poor disproportionately.

Recognition of the potential contribution of water supply and sanitation (WSS) to health outcomes in the Bank's WSS sector dates back to the 1993 strategy for water resources, although the concept appeared in project documents much earlier. The strategy emphasized the potential health benefits of clean water supply and better hygiene, with an emphasis on their role in reducing the incidence of diarrheal diseases. It also advocated public health education, particularly on the safe handling of water, to change hygiene behaviors and improve health outcomes, particularly among the poor.

The 2003 sector strategy included health objectives and priorities similar to those of the water strategy issued 10 years earlier. The strategy acknowledged the critical relationship between better sanitation and hygiene and improved health outcomes, noting that gaining health benefits from WSS investments depends on a "three-pronged strategy: (i) access to sufficient quantities of water; (ii) sanitary disposal of excreta; and (iii) sound hygiene practices." Improving health outcomes is recognized as one of five "cross-cutting operational, policy, and institutional priorities," requiring both investment in WSS infrastructure and behavior change. The creation of the Sanitation, Hygiene, and Wastewater Advisory Service (SWAT) in 2004 and the hiring of a health specialist for the WSS program in 2005 are evidence of the heightened commitment to improving health outcomes in the 2003 strategy (Overbey 2008).

IEG identified health-relevant projects—largely water supply, sanitation, and sewerage projects—and looked at the activities that were actually carried out, including training and outreach, and what could be learned about the results and effectiveness of that work.

With respect to environmental health improvements, sewerage projects are often not meeting appraisal expectations. Most projects intend to achieve critically important environmental impacts, which makes it striking that ex post evaluations too often report suboptimal results:

- The amount of infrastructure built or repaired is commonly less than what was planned at appraisal.
- The numbers of beneficiaries served have consistently been less than promised.
- And most sewerage projects did not deliver the intended service to the targeted population, and wastewater treatment often did not improve downstream water quality.

Hygiene Education

The MDGs aim to cut in half the number of households without access to safe drinking water and basic sanitation and to reduce child mortality by two-thirds. These two goals are interrelated: clean water and access to sanitation are critical to containing the spread of infectious diseases (Jalan and Ravallion 2003, among others). For instance, diarrhea (see box G.1) is a water-borne disease with huge impacts on children.

With respect to the relationship between better sanitation and hygiene and improved health outcomes, a 2008 IEG background paper (IEG 2008d) that reviewed the evidence from impact evaluations on water and health found overwhelming evidence that hand washing, sanitation, and household and point-of-use water treatment can improve health outcomes. In the current IEG water evaluation, 26 projects focused on hand washing with soap. In addition to national hand washing campaigns, programs focused on schools, health centers, and individual households. As with other hygiene practices, ensuring that hand washing facilities and soap are available at an affordable price is a precondition for hand washing campaigns to be effective.

Few impact evaluations reviewed by the IEG 2008 discussion paper focused on sanitation interventions. But of the seven that did, six (86 percent) show positive impact on health outcomes, and the Fewtrell and others (2005) meta-study (based on two cases) shows that an overall positive effect is created by installing latrines. Three studies—Walker and others (1999), Root (2001), and Moraes and others(2003)—

BOX G.1

DIARRHEA, A MAJOR KILLER

Diarrhea claims the lives of 1.8 million children under the age of five each year (UNDP 2006). Diarrheal diseases remain among the top five preventable killers of children under five in developing countries; in many, it is one of the top two (Keutsch and others 2006).

According to the World Health Organization, poor sanitation, lack of access to clean water, and inadequate hygiene account for approximately 90 percent of childhood diarrhea (WHO 2004). The incidence of diarrhea is highest in Sub-Saharan Africa and Latin America, and among children below the age of five, with incidence rates peaking in infants between 6 and 11 months. There is, however, a strong correlation between the unhygienic conditions of poor households and communities and the frequency and severity of diarrheal episodes. Improvements in water supply and sanitation infrastructure and behavior change activities have been shown to improve health outcomes, particularly the incidence of diarrheal and other water-related diseases in developing countries (WHO 2004).

Sources: Keutsch and others (2006); WHO (2004).

find reductions in diarrhea incidence of over 60 percent in areas that have built sanitation systems.

The positive impacts of sanitation interventions are greater when spillover effects—that is, their environmental health benefits—are considered. One impact evaluation that does so is Root's (2001) analysis of latrines in Zimbabwe. Households without latrines had lower diarrhea rates if their neighbors had a latrine than if they did not.

Recent estimates suggest that easily achievable improvements in water, sanitation, and hygiene could reduce the total burden of disease in Africa and Southeast Asia by 4–5 percent.[1] Still, the health benefits of the World Bank's WSS investments remain obscure. While half of the 117 WSS projects evaluated for the 2009 IEG health evaluation cited potential health benefits and 89 percent financed infrastructure that plausibly could have improved health, only 1 in 10 had an objective to improve health. Projects approved more recently (fiscal 2002–06) are even less likely to have been justified by health benefits, to have explicit health objectives, or to plan to collect health indicators. And only 14 water projects included health benefits in their economic analysis.

Hygiene education is important, since providing safe water and sanitation alone is never enough to ensure health benefits. Unless beneficiaries understand health and hygiene behavior they will not reap the health benefits of having cleaner water in their environment. In addition, there is no point in constructing sanitation facilities that will not be used (the evaluation found ample instances of such cases): beneficiaries need to change their behavior and actually use the facilities.

Looking specifically at hygiene education in the context of water projects and water-related behavior reveals that, at the beginning of the period studied, Bank projects did little about it (IEG 2002). Initiatives specifically related to sanitation, hygiene, and health became more common after 2000, following the World Water Forum and the adoption of the MDGs.

About 15 percent of the 637 water supply projects in the water portfolio were found to include hygiene education. Sanitation projects, in contrast, do a much better job of routinely promoting hygiene—41 percent of the 181 projects with sanitation activities included hygiene education. To integrate water supply, sanitation, and hygiene education, projects have to break down institutional silos and bring together staff from different disciplines. In addition, water professionals need to team up with health educators and those involved in social marketing. With the establishment of a single sector board, some staff claim that their links to other sectors such as health, nutrition, and population and human development have suffered.

Looking at what worked in hygiene education reveals that, first, hygiene education has to be coordinated with the provision of physical infrastructure to be effective. Training and awareness activities have little impact when water is provided at a later date. The evaluation team analyzed 132 hygiene projects and found that roughly half (63 projects) implemented water supply, sanitation, and hygiene activities together in one project.

With respect to what worked and what did not in hygiene education, conducting ex-ante assessments to determine preproject hygiene behaviors and social and cultural norms is critical to increasing the effectiveness of hygiene education messages (see box G.2). Targeting women and children proved to be particularly effective in promoting better hygiene practices. Finally, in more recent projects, the use of mass media, such as radio, television programs, and street theater, allowed hygiene messages to reach a large audience and reinforced messages over time, an approach that may hold promise for the future.

BOX G.2

SUCCESS FACTORS IN HYGIENE EDUCATION: SOME PROJECT EXAMPLES

In the Ghana Community Water and Sanitation Project, completed in 2001, hygiene education was front-loaded into the process of mobilizing and training communities to manage their water supply and sanitation facilities to ensure that the health aspects of water and sanitation were captured as fully as possible.

The 2002 Second Karnataka Rural Water Supply and Sanitation Project in India is being implemented as a social marketing program by developing and disseminating information, education, and communication materials. The materials will be of two types: interpersonal, such as brochures, flip charts, manuals, stickers, and the like, and mass media materials. The latter will be in three categories: folk program campaigns, wall paintings/posters, audio cassettes disseminated chiefly through radio and audio/video spots/movies, to be disseminated chiefly through television.

Source: IEG water database.

When project activities required the coordination of ministries (notably those responsible for water, health, and education), it proved a major challenge (see table G.1). For that reason, in complex projects, providing technical assistance to the ministries dealing with hygiene education (be they water, health, or education) may help to encourage lasting institutional reform. Special attention needs to be given to projects with a complex institutional framework so that the necessary coordination among different ministries actually favors the effective implementation of hygiene education along with the installation of water and sanitation facilities. In this respect, sustainability is particularly dependent on the involvement of the ministry of health, which is the only grouping with a mandate to continue to support hygiene activities once the civil works are completed.

TABLE G.1 Communities Receiving Hygiene Education

Beneficiaries	Completed projects	Ongoing projects
Hygiene promotion addresses women and children	18	17
Hygiene promotion addresses schools	17	16
Hygiene promotion addresses the poorest households	1	11
Health centers addressed	1	5

Source: IEG water database.
Note: Total number of projects in the hygiene portfolio: 132. Total number of projects for which communities were identified: 27 for completed projects and 29 for ongoing projects.

TABLE G.2 Activities in Hygiene Education Projects

Activity	Completed projects	Ongoing projects
Hygiene education and training provided	58	42
Hygiene messages and communication strategies developed	12	17
Hygiene training materials developed	10	15
Hand washing with soap promoted	13	13
Equipment for hygiene promotion purchased	2	0
Mass media involved for dissemination	1	17
Hygiene promotion undertaken	0	32
Strategic hygiene campaign organized	0	17

Source: IEG water database.
Note: Total number of projects: 132.

TABLE G.3 Partners Providing Hygiene Education

Actors	Completed projects	Ongoing projects
Communities participate in hygiene promotion	23	17
NGOs involved in hygiene promotion	8	12
Other donors involved in hygiene promotion	7	7
PSP promotes hygiene practices	3	13
WUAs involved in hygiene promotion	0	9

Source: IEG water database.
Note: Total number of projects: 132.

TABLE G.4 Difficulties with Coordinating Hygiene Education Activities

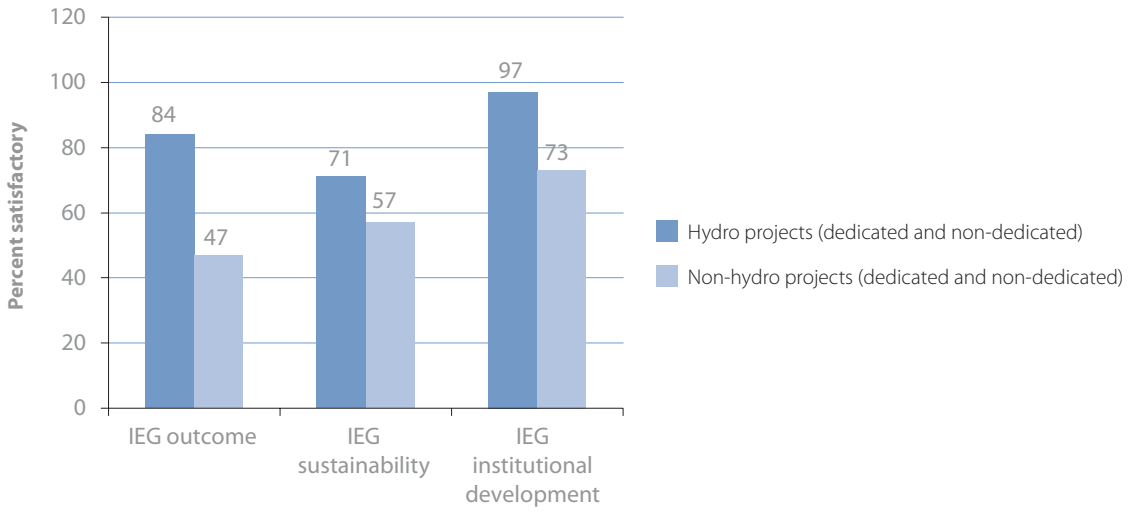
Project ID	Country	Project year	Approval fiscal year
P000297	Burkina Faso	BF-Urb Env (fiscal 1995)	1995
P049924	Ecuador	EC Rural Water Supply & Sanitation	2001
P010369	India	Maharashtra Rural Water Supply & Environmental Sanitation	1991
P040566	Morocco	Rural Water Supply & Sanitation Project	1998
P041303	Morocco	Emergency Drought Recovery	1996
P010478	Pakistan	NWFP- Community Infrastructure Project	1996
P010366	Pakistan	Rural Water Project	1991
P004561	Philippines	First Water Supply, Sewerage & Sanitation Sector Project	1990
P008867	Turkmenistan	Water Supply & Sanitation Project	1997
P002981	Uganda	Northern Uganda Social Action Fund	1992

	Coordinating hygiene education activities
	Regarding the school sanitation component, the hygiene education component to be financed by the European Union did not materialize and this hampered the consolidation of the outcomes in schools.
	Insufficient attention was given by water boards and users to water quality. In many systems, proper disinfection procedure was not followed, resulting in insufficient chlorine residuals in the network. In a few cases, a poor choice of surface water source (prone to contamination or high in turbidity) results in high costs of disinfection. There was no assessment of water sources, or planning/budgeting for protection of water sources in the majority of projects assessed.
	The project could not deliver fully satisfactory development results because of institutional and financial shortcomings.
	In retrospect, two main shortcomings were identified in project's design. First, the project did not include any formal coordination mechanism and/or specific budget allocation to enable the Ministry of Health (MOH) to carry out the activities under its responsibilities (control of water quality and sanitary conditions of water points, and hygiene education). Second, the fact that the sanitation component was entirely financed by beneficiaries and rural communes made monitoring difficult.
	Coordination between the water utility ONEP and the Ministry of Health was missing. Due to the emergency nature of the project, sensitization and hygiene education of the beneficiaries was cut short and could affect the sustainability of public fountains.
	Difficulties with coordinating sanitation and hygiene education. Sanitation was limited to health and hygiene education. Neither the "incentives for on-plot sanitation" nor pretreatment ponds, envisioned in the Staff Appraisal Report, were implemented due to change in government policy of providing household grants.
	Sanitation and hygiene education components were cancelled because of a lack of coordination between the Public Health Engineering Department and social organizers.
	Educational materials were distributed to support the sanitary and hygienic use of latrines. Many of these materials, although fully distributed to the Regional Departments of Education, Culture and Sports (DECS) by Department of Health, were often subject to long delays in redistribution to the intended end users (primary schools), which would have diminished somewhat the benefits of the facilities, and in particular could have had some effect on the number of observed toilets that failed due to improper sanitation practices.
	The broad design of the project to cover both urban and rural water supply, in addition to water quality, sanitation, health and hygiene components, made it difficult to coordinate activities between the multiple institutions responsible for each of these sub-sectors in Turkmenistan.
	Unsatisfactory NGO performance impeded the health and hygiene education activities. While NGOs certified the completion of successful boreholes, the health and hygiene education was only partially completed.

Appendix H: Dams and Hydropower

Hydropower Projects Performed Particularly Well

FIGURE H.1 Projects Involving Hydropower Were Rated Higher than Non-Hydro Dam Projects



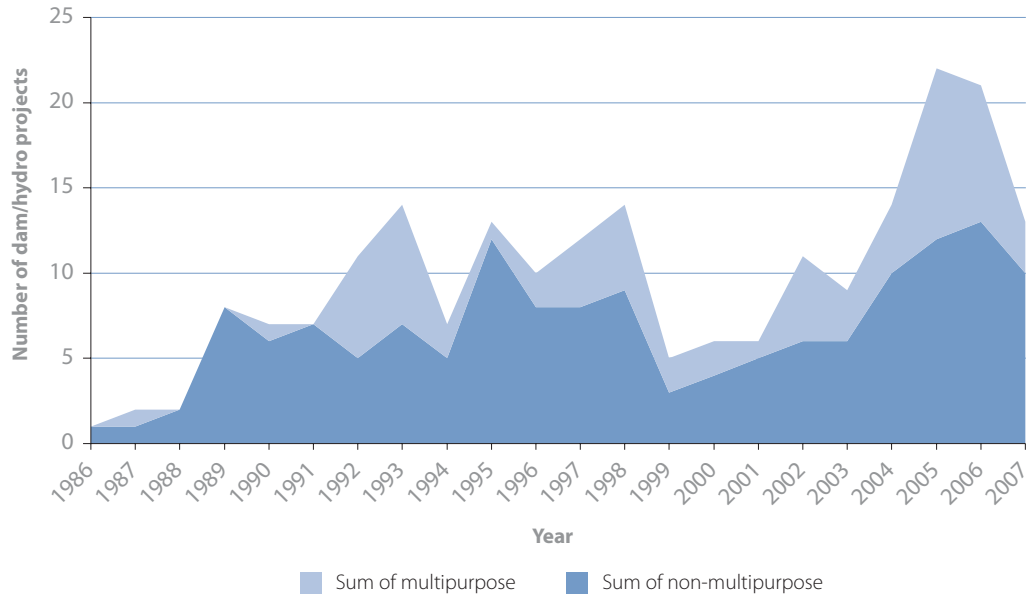
Source: IEG water database.

Multipurpose Hydropower Projects Address Several Water-Related Sectors Jointly

The Water Sector Board sees "new" hydro as demanding more sophisticated integration across disciplines; water uses; broader energy and water resources opportunities; stakeholders (local and international); and lending, reform, and capacity building (Saghir 2004). The "new" emphasis involves more projects that address both water supply and energy security. These multipurpose hydro projects, in addition to delivering electric power, also serve other water resource uses such as irrigation, flood protection, or water supply for people or industry.

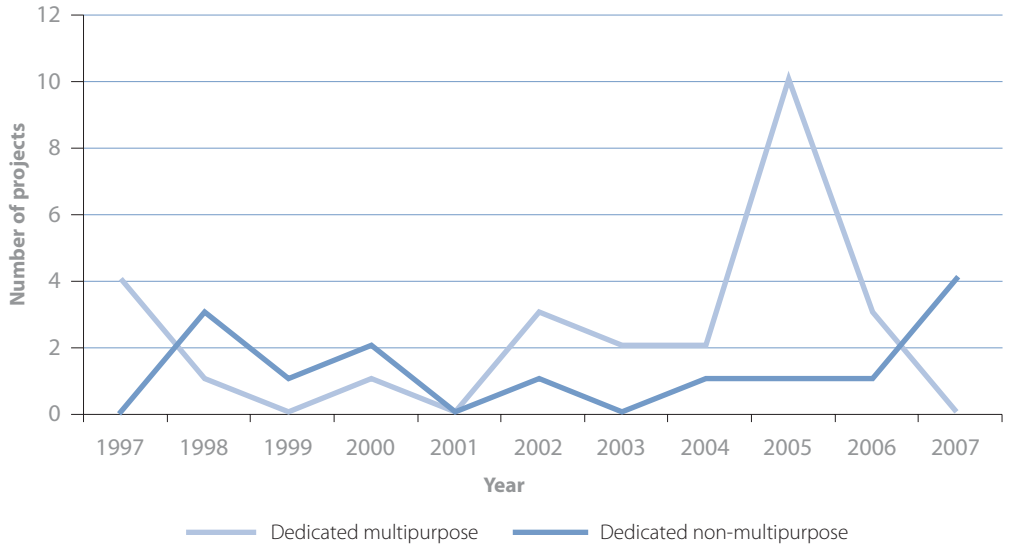
The dams/hydro portfolio contains 100 hydropower projects representing $11 billion in loans/grants at the project, component, and activity levels. Fifty-seven of these are multipurpose hydropower projects, the ratings for which are on average better than those for the non-multipurpose hydropower projects. This seems to be the direction the sector is heading, given that the number of dedicated multipurpose hydropower projects approved per year has been increasing (see figure H.3). Regardless of average outcome ratings, the choice of the best type of hydro-project is of course context specific.

FIGURE H.2 Multipurpose versus Non-Multipurpose Dam/Hydro Projects



Source: IEG water database.

FIGURE H.3 The Number of Dedicated Multipurpose Projects Has Increased over Time



Source: IEG water database.

TABLE H.1	Number of Large Dams Completed during Study Period			
Project ID	Country	Project name	Approval year	Project status
P006036	Argentina	Yacyreta II	1993	Closed
P035728	Brazil	State of Bahia Water Resources Management	1998	Closed
P000310	Burkina Faso	Engineering Credit	1993	Closed
P000457	Central African Republic	Energy	1989	Closed
P003493	China	Inland Waterways	1995	Closed
P003492	China	Daguangba-Hainan	1992	Closed
P003506	China	Ertan Hydroelectric Project	1992	Closed
P003507	China	Ertan II Hydroelectric Project	1996	Closed
P003526	China	Shuikou Hydroelectric Project II	1993	Closed
P003562	China	Xiaolangdi Multipurpose	1994	Closed
P003596	China	Yangtze Basin Water Resources	1995	Closed
P003616	China	CN-Tianhuangping Hydroelectric Project	1993	Closed
P034081	China	Xiaolangdi Multipurpose II	1997	Closed
P046563	China	Second Tarim Basin	1998	Closed
P046564	China	CN - Gansu & Inner Mongolia Poverty Red.	1999	Closed 1999
P049665	China	CN-Anning Valley Agric. Development	1999	Closed 1999
P056424	China	CN-Tongbai Pumped Storage	2000	Closed 1999
P056199	China	CN-3rd Inland Waterways	2001	Closed 2001
P008365	Cyprus	Southern Conveyor II	1988	Closed
P000736	Ethiopia	ET-Energy 2 (fiscal 1998)	1998	Closed
P000771	Ethiopia	ET-Soc Rehab & Dev Fund (fiscal 1996)	1996	Closed
P009869	India	Nathpa Jhakri Power Project	1989	Closed
P009898	India	Upper Krishna Phase	1989	Closed
P003910	Indonesia	Sumatera & Kalimantan Power	1994	Closed
P001340	Kenya	3rd Nairobi Water Supply	1990	Closed
P001396	Lesotho	Highland WTR.I	1992	Closed
P001409	Lesotho	LS-Hiland Water IB (fiscal 1998)	1998	Closed
P001642	Malawi	Infrastructure I	1990	Closed
P001662	Malawi	MW Power V	1992	Closed
P001667	Malawi	MW-National Water Development (BD fiscal 1995)	1995	Closed
P007609	Mexico	Hydroelectric Development	1989	Closed
P002428	Sierra Leone	SL-Urban Water Supply	1995	Closed
P002756	Tanzania	TZ-Power VI	1993	Closed
P009019	Turkey	Berke Hydro Plant	1992	Closed
P004834	Vietnam	Irrigation Rehabilitation Project	1995	Closed

	New dam	Large dam	Total amount (US$ millions)
	Yacyreta dam. The project completed an earth dam about 65 kilometers long with a uniform elevation above sea level of 86 meters, and a maximum height of 42 meters (1996)	1	300
	Ponto Novo and Pindobaçu	2	51
	Ziga dam	1	4.2
	M'Bali river storage dam	1	18
	Guigang dam, Dayuandu dam	2	210
	A 56-meter high, 719-meter long concrete gravity dam	1	67
	240 meters	1	380
	244 meters	1	400
	101 meters	1	100
	154 meters	1	460
	128-meter RCC gravity dam	1	552
	72-meter, earth rockfill	1	300
	154-meter rockfill dam	1	430
	18 meters	1	150
	Construction of a new dam	1	160
	93-meter rockfill dam	1	120
	68.3-meter dam	1	320
	15-meter-high dam	1	100
	Kouris Dam and the Akhna dam	2	30
	Rock fill dam with a maximum height of 41 meters	1	200
	Tebi Dam in Amhara	1	120
	60-meter gravity dam	1	485
	Earth fill dam, 40 meters, plus another at 29 meters	1	325
	18.3 meters (9 meters above river bed), run of river hydro	1	261
	Thika dam supplying Neirobi, 63 meters rolled earthfill	1	64.8
	182-meter-high concrete arch dam; 55-meter-high concrete gravity arch dam, other infrastructure facilities	1	110
	145-meter rockfill dam and hydro plant	1	45
	Raise one 4.5 meter sand, build one 20 meters high	1	28.8
	Kapichira dam (55 meters high)	1	55
	The Zomba dam —a 47-meter-high rockfill dam	1	79.2
	The Aguamilpa Hydroelectric Project: concrete faced rock-filled dam, 187 meters high, 675 meters wide	1	460
	70 meters	1	36
	25 meters; referred to as 35 meters in another section of the Staff Appraisal Report	1	200
	Construction of arch dam with height of 201 meters	1	270
	18.7 meters	1	100

TABLE H.2 Number of Large Dams in Ongoing Water Portfolio

Project ID	Country	Project name	Approval year	Project status
P068049	China	CN-Hubei Hydropower Dev in Poor Areas	2002	Active 2002
P068058	China	CN-Yixing Pumped Storage Project	2003	Active 2003
P077137	China	4TH Inland Waterways Project of Guangxi	2004	Active
P085333	China	5TH Inland Waterways	2006	Active
P076445	Lao PDR	LA-Nam Theun 2 Power Project	2005	Active 2005
P086801	Sierra Leone	SL-Bumbuna Env. and Social SIL (fiscal 2005)	2005	Active 2005
P086903	Sierra Leone	SL-Bumbuna Hydro Guarantee (GU) (fiscal 2005)	2005	Active
P087154	Tanzania	TZ-Water Sector Support SIL	2007	Active 2007
P089659	Uganda	Private Power Generation (Bujagali)	2007	Active
P064981	Yemen, Rep.	RY-Sana'a Basin Water Mgmnt Project	2003	Active 2003

Source: IEG water database.

TABLE H.3 Approvals of Major Hydropower-Related Infrastructure in US$ (2003–08) from the 2009 Publication *Directions in Hydropower*

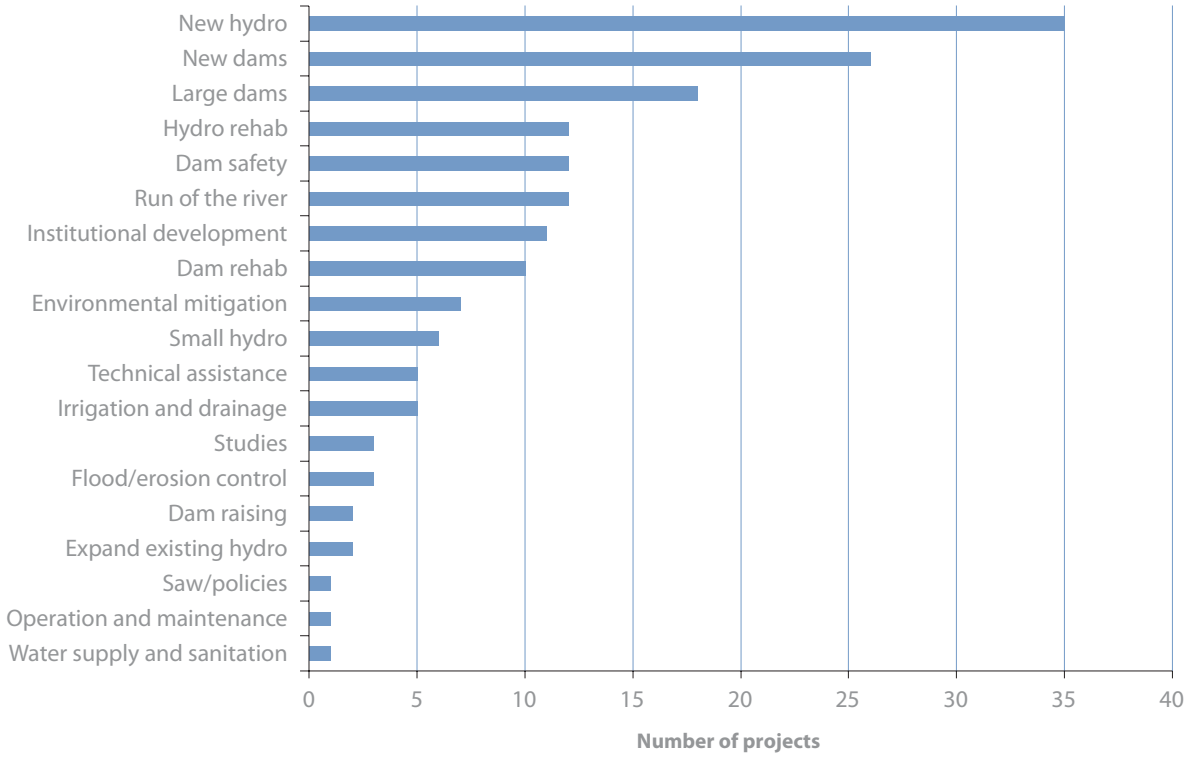
Year	Region (country)	Project	Total amount (US$ millions)
2003	East Asia & Pacific (China)	Yixing Pumped Storage	145
2004	Europe & Central Asia (Turkey)	Turkey Renewable Energy Project	202
2004	East Asia & Pacific (China)	Fourth Inland Waterways	91
2005	East Asia & Pacific (Lao PDR)	Nam Theun 2	270
2005	Europe & Central Asia (Ukraine)	Hydropower Rehabilitation	106
2006	Africa (Regional)	Felou	75
2006	East Asia & Pacific (China)	Fifth Inland Waterways	100
2007	Africa (Congo, Dem. Rep.)	Inga Rehabilitation	297
2008	South Asia (India)	Rampur	400
2008	Africa (Regional)	Niger	186
2008	East Asia & Pacific (Philippines)	Magat Privatization	105

Sources: World Bank data; World Bank (2009).

	New dam	Large dam	Total amount (US$ millions)
	3 dams: 39-meter concrete gravity dam; a single purmose concrete gravity dam, 65- meters; multi-purpose concrete arch dam. 85 meters	1	105
	75 meters, 35 meters, raise height of another	1	145
	2 dams: 20 meters	1	91
	18 meters	1	100
	48-meter concrete gravity dam	1	42
	88 -meter-high rockfill dam	1	12.5
	Yes, guarantee for 88-meter dam	1	38
	Doesn't say. Over 15 meters though.	1	200
	30-meter clay core rockfill dam	1	115
	5 dams: 18-meter rockfill, 16- meter rockfill, 8-meter rockfill, 8-meter earthfill, and 3-meter cascade	1	24

Projects (Dedicated)

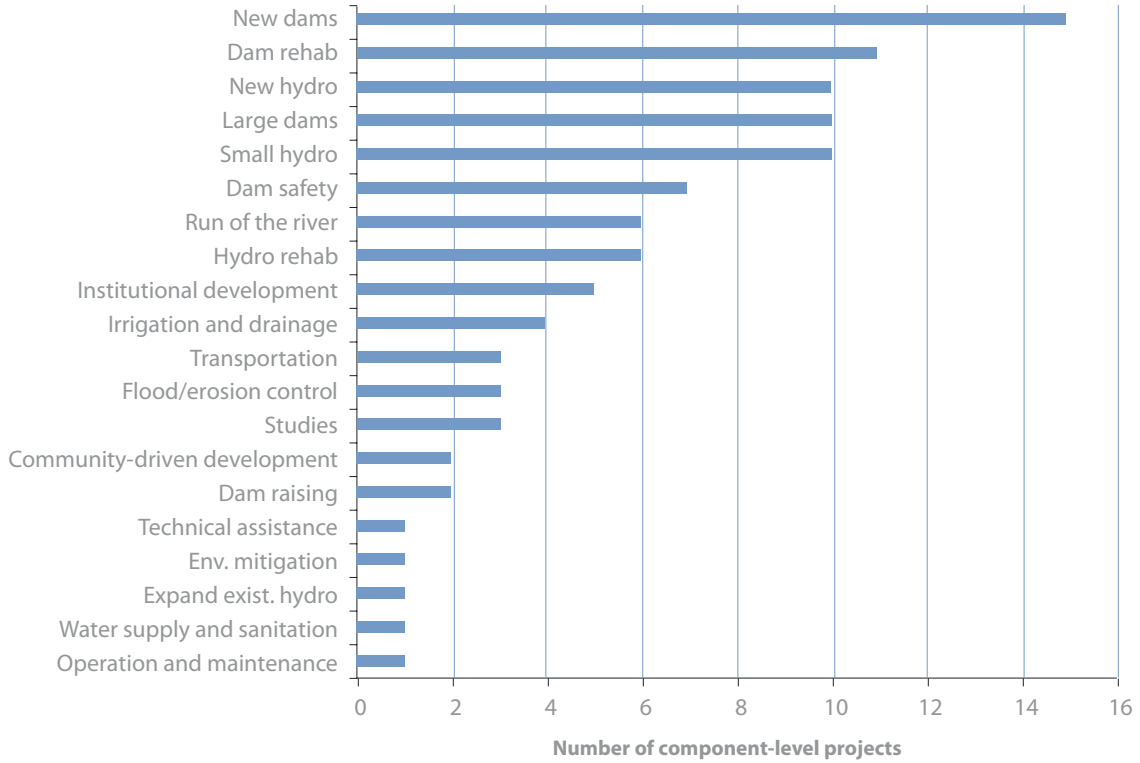
FIGURE H.4 Dedicated Projects Deal with a Variety of Subjects—New Hydro and New Dams Are the Most Frequent (*n* = 69)



Source: IEG water database.

Component-Level Projects (Non-Dedicated)

FIGURE H.5 Projects with Dam Activities Only at the Component Level (*n* = 46)



Source: IEG water database.

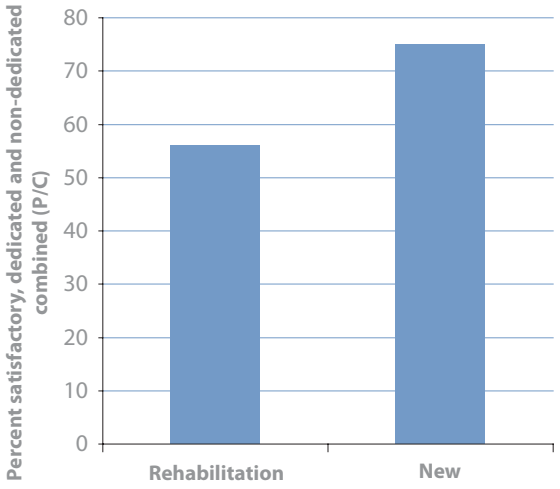
Note: Overlaps exist between categories.

Building New versus Rehabilitation

Many dams face gradual deterioration caused by lack of maintenance. Moreover, many dams are shut down because of salinity, sedimentation, and other problems. Almost a third (66) of the 211 dam/hydro projects include the rehabilitation of dams, hydro, or both (37, dam only; 24, hydro only; and 5, hydro and dam). Dam improvements can involve replacement of gates on outlet structures, excavation to make slopes more stable at critical locations, better instrumentation, repair of slope protection, and other activities.

Part of the hydropower business plan includes "growing the rehabilitation side of the business (e.g., undertaking rehab projects while scoping new projects)" as an area for emphasis. However, projects building new hydro (47) or dam (77) infrastructure rated higher than projects involving rehabilitation.[1] Looking just at projects with dam/hydro rehab at the component or project level, 18 are closed and rated, and 56 percent of these were rated satisfactory. By comparison, 36 projects involved the building of new dams/hydro, and 75 percent were rated satisfactory.

Figure H.6 Projects Building New Dams/Hydro Perform Better Than Those with Dam/Hydro Rehab

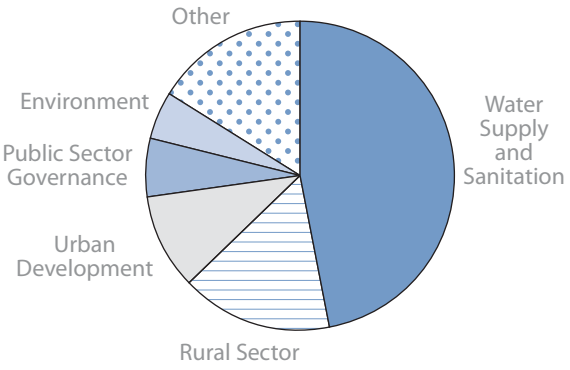


Source: IEG water database.

Appendix I: Experience with Private Sector Involvement in the WSS Sector

Evidence from project self-evaluation reports and IEG Project Performance Assessments reveals that since 1997, 46 of 70 projects that intended to facilitate private sector participation implemented private sector arrangements and 24 did not. Among the 24 projects, Turkey and República Bolivariana de Venezuela terminated the contracts prematurely. In República Bolivariana de Venezuela, political matters led to the termination. In Turkey, the contract was abbreviated because the operator did not reach the agreed targets for reducing unaccounted-for water. Seven countries (Algeria, Argentina, Bolivia, Nigeria, Rwanda, Tunisia, and Uganda), cancelled only one or two out of several contracts. In six countries (Guinea, Jordan, Kosovo, Sierra Leone, Trinidad and Tobago, and West Bank and Gaza), private companies managed water supply and/or sanitation efficiently for several years. However, when the contract was up for renewal, the government was reluctant or contractors were not ready to continue to work in a conflict-affected region. Water management reverted back to the public utility. The IEG water database contains 147 projects that involve the private sector. Among them, about half (70 projects) address WSS (figure I.1).

Figure I.1 Private Sector Involvement in Water by Sector Board



Source: IEG water database.

BOX I.1

FORMS OF PRIVATE INVOLVEMENT IN BANK-FINANCED PROJECTS

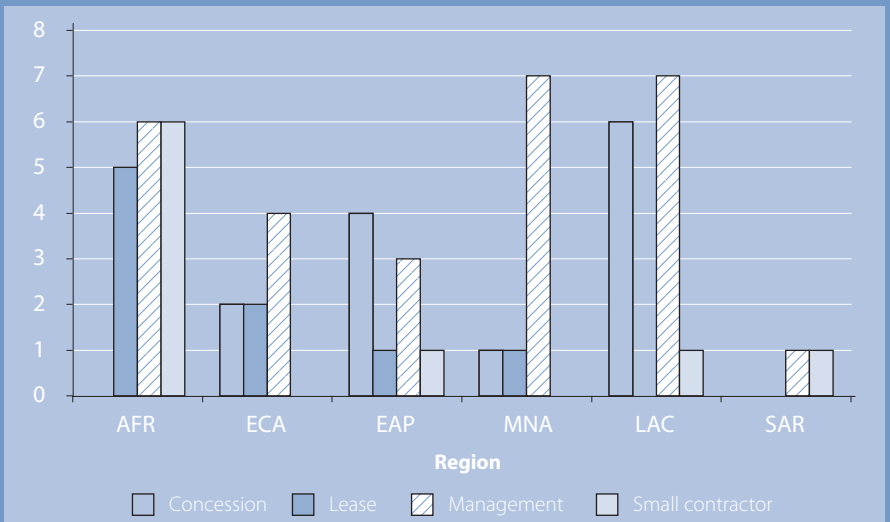
With the idea of making a lasting impact on water utility reform in developing countries, the Bank, in conjunction with IFC, developed a set of different forms of engagement with the private sector in the form of concession, lease, and management contracts. While more contract types are described in the Bank's 2006 toolkit,[a] four different contract types with varying modalities of private sector involvement can be identified:[b]

- Twenty- to 30-year concession contracts where the operator runs the business and finances investments, but does not finance the infrastructure asset (concession contracts were prepared for Argentina, Bolivia, Brazil, Bulgaria, China, the Dominican Republic, Indonesia, Morocco, Paraguay, the Philippines, and Romania, with the Latin American Region being the most active, see figure)
- Lease contracts, where a private operator runs the business, retains revenue from customer tariffs, pays a lease fee to the contracting authority, but does not finance investments in infrastructure assets (for example, Armenia, Guinea, Madagascar, Mozambique, the Philippines, Senegal, Turkey, and the Republic of Yemen)
- Performance-based management contracts in 28 projects (this contract form was most commonly used by the Bank and its borrowers). Under this contract type, the operator supplies management services to the utility in return for a fee
- Local contractors mostly in low population-density areas providing goods and services to communities willing to improve water and sanitation in their villages (Benin, Ethiopia, Ghana, India, Malawi, the Philippines, and Rwanda).

(*Box continues on the following page.*)

BOX I.1

FORMS OF PRIVATE INVOLVEMENT IN BANK-FINANCED PROJECTS (*continued*)



Note: AFR = Africa; ECA = Europe and Central Asia; EAP = East Asia and Pacific; MNA = Middle East and North Africa; LAC = Latin America and the Caribbean; SAR = South Asia.

Sources: IEG issues research: private sector participation in urban WSS.

a. Public-Private Infrastructure Advisory Facility & World Bank, 2006.

b. In practice, countries often used a combination of these types to make contract fit their specific needs.

TABLE I.1 Concession Contracts

Project ID	Country	Name	Approval fiscal year
P003868	Indonesia	Second Jabotabek Urban Development Project	1990
P004611	Philippines	Manila Second Sewerage Project	1996
P005435	Morocco	Fifth Water Supply Project	1994
P059510	Dominican Republic	Wastewater Disposal in Tourist Centers Projects	2000

What happens in terms of PSP	Reported PSP-relevant results
30-year concession contract awarded to two international operators.	Piped water supply increased from about 28 percent of the population to about 50 percent. Water production increased, reducing intermittent supply. Staff productivity roughly doubled. A tariff increase of roughly 35 percent approved on March 29, 2001, should improve the working ratios of the two operators.
25-year concession contract awarded to international operator.	Total population served: 1,389,000 (East – Manila Water Company, Inc. (MWCI) operator: 768,000; West – Maynilad Water Services, Inc. (MWSI) operator: 621,000); MWCI shows strong performance, with the percentage of sewerage connections rising from 8 percent in 1997 to 15.7 percent in 2005. MWSI's performance was more modest in relative terms. Although the data suggest that MWSI was not able to develop its sewer/sanitation service in pace with its water service, it did increase the number of people with access to sewer/sanitation service.
30-year concession contract awarded to international operator.	A total of 61,234 social connections have been constructed, to be compared with the initial target of 47,770 forecast at appraisal.
A 20-year concession contract has been prepared. Five international operators have been interested. However, no contract has been awarded because changes in government diminished support for PSP.	N/A

(*Table continues on the following page.*)

TABLE I.1 Concession Contracts (*continued*)

Project ID	Country	Name	Approval fiscal year
P005977	Argentina	Water Supply and Sewerage Sector Project	1991
P007926	Paraguay	Asuncion Sewerage Project	1995
P008778	Romania	Bucharest Water Supply Project	1997
P008319	Bulgaria	Water Companies Restructuring & Modernization Project	1994
P005945	Argentina	Water Supply Project	1986
P003648	China	Second Shanghai Sewerage Project	1996
P006368	Brazil	Water Sector Modernization Project	1992
P006172	Bolivia	Major Cities Water Supply & Sewerage Rehabilitation Project	1991
P003586	China	Shanghai Environment Project	1994

Source: IEG water database.

Note: N/A = not available.

Concession contract	Outputs and outcome
Long-term (mostly 30-year) concession contracts for Santa Fe, Santiago del Estero, Formosa, Misiones, and La Rioja were awarded to international and local contractors.	The number of water supply connections has increased by 67 percent, from 476 to 797 connections per '000. The number of sewerage connections increased by 58 percent, from 252 to 398 connections per '000. By project closing, more than 60 percent (nearly 70 percent, if we include cooperatives) of Argentina's urban population were being served by private operators.
Concession contract was prepared, but Congress suspended a law allowing private sector participation in water in 2000.	N/A
25-year concession contract awarded to a joint venture of national and international contractors.	Consumer complaints about water quality decreased by 20 percent from 5.64/day in 1997 to 4.52/day in 1999. Water supply availability increased from 12 to close to 24 hours a day in most areas of the city. Unaccounted-for water decreased from 45 percent to 35 percent.
Two concession contracts prepared for Shumen and Varna. Neither one was completed because of the less than satisfactory quality of the relevant documents and incomplete understanding of the related risks and benefits.	N/A
Long-term concession arrangement with international operator for Buenos Aires, the province of Santa Fe, and Cordoba.	Financial performance of the concessioned utilities in Buenos Aires, Santa Fe, and Cordoba shows a significant improvement. Water tariffs were initially reduced as a consequence of privatization, while the concessionaires have increased the billing and collection rates.
Concession contracts negotiated for Shanghai in parallel to this project.	N/A
30-year concession contract awarded to an international contractor. Contract was prepared in parallel to the project.	Implementation seemed successful, but results were not documented in Bank documents.
30-year concession contract for La Paz. A cooperative arrangement for Santa Cruz whereby the cooperative is owned by its customers. Contract cancellation in Cochabamba.	Water supply coverage over the period 1988–99 increased in La Paz and Santa Cruz, while in Cochabamba it declined. Overall, however, 416,200 people obtained assured water supplies, while the Pampahasi-Ovejuyo pipeline created a supply link for another 192,000 in the southern zone of La Paz. Thus, La Paz's household water connections rose from 75 to 92 percent. Santa Cruz did even better, with household connections increasing from 70 to 94 percent. Conversely, Cochabamba's households connected to water fell from 70 to 60 percent, and only 47,520 of the 300,000 new connections planned were achieved. While water supply availability at about 4 hours a day remained unreliable in Cochabamba, the 24 hours a day service in Santa Cruz was maintained, and in La Paz availability increased from about 19 to 22.5 hours a day.
Concessions or ownership arrangements in both the water and wastewater sectors in Shanghai was developed as well as a non-state-owned Build-Operate-Transfer (BOT) operation for Zhuyuan wastewater treatment.	Implementation seemed successful, but results were not documented in World Bank documents.

TABLE I.2 Lease Contracts

Project ID	Country	Name	Approval fiscal year
P035805	Armenia	Municipal Development Project	1998
P002346	Senegal	Water Sector Project	1995
P001564	Madagascar	Rural Water Supply and Sanitation Pilot	1998
P001075	Guinea	Third Water Supply and Sanitation	1997
P001044	Guinea	Water Supply Project	1989
P009093	Turkey	Antalya Water Supply & Sanitation Project	1995
P039015	Mozambique	National Water Development I Project	1998
P039022	Philippines	Local Government Unites Urban Water & Sanitation Project Phase I	1999
P005907	Yemen, Rep.	Sana'a Water Supply & Sanitation Project	1999

Source: IEG water database.

Note: N/A = not available.

Lease contract	Outputs and outcomes
A four-year lease contract was awarded to a national private operator. In addition, an investment fund was established. and the sewerage system was improved.	Meters were installed, fees collected, and tariffs increased. In addition, the number of subscribers with continuous water supply has increased from about 28 percent to about 50 percent. Furthermore, water production and quality have increased.
10-year lease contract was awarded to an international operator.	Meters were installed, fees collected, and tariffs increased. The private operator also installed 80,896 new connections, rehabilitated 22,079 pipes, and renewed 53,331 connections. The quality and continuity of services has considerably improved, with few interruptions in the water supply. In addition, between 1996 and 2003, water production increased by 18 percent, from 264,000 m3/day to 312,000 m3/day, and unaccounted-for water decreased from 31.5 percent in 1996 to 20 percent in 2003.
Lease contracts prepared and awarded to 18 private local operators for 24 small towns.	Fees were collected, but no meters were installed. A tariff study was undertaken to assess willingness to pay. More water supply systems than originally planned were built, and about 400,000 people (compared to 280,000 targeted at appraisal) have gained access to safe water through the construction of 627 boreholes equipped with hand pumps and 320 gravity schemes.
Renegotiation of the lease / afermage contract for the water supply company was planned, but contract renegotiation failed.	Revenue collection from private customers decreased from US$5.8 million in 1998 to US$1.7 million in 2005. In addition, there was a tariff freeze until 2005, and tariffs actually declined in real terms. However, an estimated one million people benefited from the sludge treatment facilities. More than 200,000 people are now connected to the sewerage network in the Kaloum area, the most densely populated of Conakry.
10-year lease contract was awarded to a foreign (French) investor-manager.	Collection efficiency from private customers rose to a peak of 75 percent in 1990 but declined later due to the high tariff level. In addition, billing was revamped and computerized in an impressively short time span of less than six months. The number of connections in Conakry grew from 12,000 in 1988 to over 23,000 in 1996, and corresponding coverage grew from 40 percent to approximately 60 percent. A water treatment plant of 38,000 m3 was installed instead of a plant of 40,000 m3. However, at project closing, only 11,000 of a projected 15,000 connections could be installed, partly because the network was not long enough to reach so many additional customers.
10-year operating contract with a zero lease fee was signed. The contract was awarded to a national operator in a joint venture with a French operator. National operator ENKA sold its shares to Lyonnaise des Eaux shortly after start.	All connections were metered. Collections rose from annual US$9 million in 1995 to US$33 million as a result of higher sales and roughly doubled tariffs. In addition, the total number of water customers rose by 23 percent, from 205,000 to 253,000 between 1996 and 2003. For water supply, the share of residential households connected to the public water supply rose from an estimated 95 percent at the time of appraisal to 100 percent from 1995 onward. Sewerage demand was also met at least cost. In addition, annual water production rose by 12 percent, from 64 million m3 in 1996 to 71 million m3 in 2003. Water quality improved.
Private local lease contracts for Maputo and management contracts for Beira, Quelimane, Nampula, and Pemba.	Institutional developments have introduced new, innovative and more efficient urban water service provision regimes through the engagement of the private sector, which has reduced the burden on public spending while greatly improving the extent and level of services. The rural water supply component has increased sustainable access by constructing 130 water points through which 62,000 people have been served. Small piped systems using small-scale providers have increased service to 108,000 people.
Design-build-lease contracts prepared. However, none of the water systems actually went into commercial operation by a private sector operator. The private sector lost interest due to the risk of low revenues and the uncertain policy environment.	N/A N/A
Lease contract for Sana'a Local Water Supply and Sanitation Services Corporation was prepared. Unfortunately, none of the prequalified bidders submitted an offer.	

TABLE I.3 Performance-Based Management Contract

Project ID	Country	Name	Approval fiscal year
P004974	Algeria	Water Supply & Sewerage Rehabilitation Project	1994
P070365	Kosovo	Pilot Water Supply Project - TF	2001
P064008	Nigeria	Small Towns Water Supply & Sanitation Program Pilot Project	2000
P037006	Trinidad and Tobago	Water Sector Institutional Strengthening Project	1995
P002428	Sierra Leone	Urban Water Supply Project	1995
P005731	Tunisia	Greater Tunis Sewerage & Reuse Project	1997
P007257	Guyana	Water Supply Technical Assistance & Rehabilitation Project	1994
P008224	Venezuela, R.B. de	Water & Sewerage Decentralization Project in the State of Monagas	1996
P043367	Yemen, Rep.	Taiz Water Supply Pilot Project	1997
P040505	West Bank and Gaza	Water & Sanitation Services Project in Gaza	1997
P006894	Colombia	Santa Fe I Water Supply and Sewerage Rehabilitation Project	1996

Performance-based management contract	Outputs and outcomes
Performance-based management contract awarded to an international (French) private operator.	Meters were installed, but tariffs remained low and fee collection did not improve. The water and sewerage system was rehabilitated and water quality improved. Leaks were detected and partially repaired.
Performance-based management contract with fixed management fee and with additional performance incentive, compensation based on an agreed set of indicators and targets, was awarded to an international (German) contractor. An independent reviewer (IR) was used to verify the achievements of the indicators.	Water meters were installed to 86 percent. A tariff increase was achieved late in the project. The installed meters lowered water consumption and thus revenues for the private operator. Water connections remained short of targets at 69 percent. However, water quality and continuity improved.
Management contract awarded to Nigerian and international contractors ranging from local artisans to multinational companies.	Contracts were signed for 16 instead of a planned 12 small towns. Meters were installed, fees collected, and tariffs increased. Access to water and sewerage increased.
3-year management contract awarded to an international (British) operator.	Efficiency increased through metering, fee collection, and a tariff increase. Water connections increased by 14 percentage points from 300 to 343 per '000. Water production increased by 30 percent, but was less continuously available.
Freetown City Council has contracted out the management of public toilets, including cleaning and collection of user fees, to the private sector, with monitoring done by the community.	Seven sanitary facilities were completed. Thirteen rehabilitated sanitary facilities were provided to a low-income area with high population density in addition to five market centers spanning Greater Freetown. These now have improved environmental sanitation, hygiene education, and facility management. Fee collection was modest and interrupted by the civil war.
Build-operate-transfer (BOT) contracts awarded to private companies.	At the end of 2004, the operator's total number of customers in Tunisia reached 1.25 million, surpassing the figure of 0.99 million targeted for the end of 2005. The project's sewerage component has connected 40,640 new customers in Greater Tunis. A population of about 192,000 people have thus benefited from improved level of service and reduced urban pollution in their neighborhoods.
Performance-based management contract based on international competition awarded for five years in October 2002 to an international operator.	More than 170,000 people received safe water as a result of these interventions, raising the percentage of the population with access to treated water from 36 percent in 2001 to 45 percent in 2003; 3,484 new service connections were implemented in 2003.
4-year management contract.	Meters were installed, the collection rate improved from 29 percent in 1996 to 48 percent in 2000, and tariffs were maintained throughout project implementation. Leakage was reduced as well as unaccounted for water, and the average number of service hours per day increased from 11 to 21. In addition, 100 percent of water was chlorinated.
Management contract was not awarded.	N/A
4-year management contract was awarded to an international operator; plus an investment fund was set up. The incentive fee for the private operator was calculated by an independent auditor.	22,000 meters were repaired and 40,000 meters were installed. By the end of the project, system efficiency was reported to be at 66 percent, compared to an estimate of 50 percent at appraisal. The operator replaced 26,800 service connections, chlorinated water, and increased water production from a level of 70 liters per capita per day (lcd) in 1996 to about 100 lcd by 2000. However, following the outbreak of renewed hostilities in October 2000, this improving trend was no longer sustainable, and at the end of the project, per capita usage declined to around 80 lcd.
20-year BOT contract with a private firm for rehabilitating, operating, and maintaining the Tibito system. In addition, five contracts were signed with three firms to improve customer services.	Meters were installed, fees collected and tariffs increased. Water and sewerage services were provided to about 2 million additional inhabitants in the period 1996–2003. 100 percent of the population living in formal settlements of the city was covered. 348,000 water connections were installed. In addition, 393,000 sewer connections were installed, covering 90 percent of the population. Water production increased, but water sales decreased because of higher costs. Water quality and continuity improved and unaccounted-for water decreased from 184 million m3 in 1996 to 167 million m3 in 2003.

(*Table continues on the following page.*)

TABLE I.3 Performance-Based Management Contract (*continued*)

Project ID	Country	Name	Approval fiscal year
P005680	Tunisia	Water Supply & Sewerage Project	1995
P064064	Zambia	Mine Township Services Project	2000
P051564	West Bank and Gaza	Southern Area Water & Sanitation Improvement Project	1999
P000217	Burundi	Water Supply Sector Project	1992
P066491	Albania	Water Supply Urgent Rehabilitation Project	2000
P000901	Ghana	Water Sector Rehabilitation Project	1989
P006540	Brazil	Minas Gerais Water Quality & Pollution Control	1993
P009065	Turkey	Bursa Water & Sanitation Project	1993
P006836	Colombia	Water Supply & Sewerage Sector Project	1988
P004169	Korea, Rep.	Kwangju & Seoul Sewerage Project	1993
P009482	Bangladesh	Fourth Dhaka Water Supply	1997
P008595	Poland	Bielsko-Biala Water & Wastewater Project	1996
P004830	Vietnam	Water Supply Project	1997
P006646	Chile	Second Valparaiso Water Supply & Sewerage Project	1991
P003637	China	National Rural Water Supply Project	1997

Performance-based management contract	Outputs and outcomes
Management contract signed.	Meters were installed, fees collected, and tariffs increased. Water supply connections increased, serving 7,760,000 people. Newly installed sewerage connections cover 84,000 people. In addition, 280 kilometers of sewerage network were constructed. Water production has increased and is more continuous. Unaccounted-for water has reached 20 percent, making the operator's performance one of the best in the region.
4-year performance based management contract awarded to an international private operator (PO).	Some meters were installed. Billings rose by 54 percent from 2001. The collection ratio increased from about 55 percent to 82 percent and, coupled with reduced costs, resulted in a substantial improvement of the agency's operating income. Water connections increased, and previously dilapidated and bypassed wastewater treatment plants were rehabilitated to full operation. Over 95 percent of solid waste is being collected and disposed of, contributing to environmental mitigation by ending direct discharge of sewerage into the rivers. Constancy of supply increased from an average of 13.5 hours/day to about 17 hours/day, and unaccounted-for water was substantially reduced from an estimated level of 58 percent to 26 percent.
Performance-based management contract was not renewed because no bidders submitted bids. Security was an issue at the time. The project area was occupied by Israeli troupes.	N/A
A management assistance program in partnership with a professional operator was prepared, but not implemented because of a coup d'état in 1993.	N/A
Private sector involvement was prepared, but not implemented.	N/A
Private sector involvement was prepared, but not implemented.	N/A
Construction of a wastewater treatment plant under a BOT arrangement was prepared, but not signed.	N/A
Private operator managed the waste collection and landfill operation services; meter reading, billing, and invoicing.	The private operator increased efficiency with respect to meter reading, billing, and invoicing. The operating ratio declined from 89 percent in 1993 to 59 percent in 2000. The targets for working ratio were achieved —working ratio declined from 87 percent in 1993 to 51 percent in 2000. In addition, the project had substantial impact on reduction in unaccounted-for water in Bursa.
Management contracts were signed for the cities of Cartagena and Barranquilla.	Implementation seemed successful, but results were not documented in World Bank documents.
Since 1998, a private operator has managed the water treatment plant in Kwangju city.	Implementation seemed successful, but results were not documented in World Bank documents.
Private sector involvement in the form of contracting-out billing and collection was prepared, but not implemented.	N/A
Management contract signed with an international contractor.	All wastewater was treated. Water became continuously available and water quality was improved. Unaccounted-for water was reduced to 47 percent.
Thu Duc Build-Own-Operate (BOO) Project in Ho Chi Minh City and the Song Da BOO Project in Hanoi were prepared.	Implementation seemed successful, but results were not documented in World Bank documents.
A private operator engaged for the San Antonio area (Litoral Sul).	Implementation seemed successful, but results of the private operator were not documented.
Private sector involvement was prepared with a grant from PPIAF and many township governments are considering management contracts or leasing out O&M to a third party. Several experiments are taking place.	N/A

(*Table continues on the following page.*)

TABLE I.3 Performance-Based Management Contract (*continued*)

Project ID	Country	Name	Approval fiscal year
P003241	Zambia	Urban Restructuring & Water Supply Project	1995
P048521	Jordan	Amman Water & Sanitation	1999

Source: IEG water database.

Note: N/A = not available.

TABLE I.4 Local Contractors Providing Goods and Services

Project ID	Country	Name	Approval fiscal year
P004561	Philippines	Water Supply, Sewerage & Sanitation Project	1990
P000924	Ghana	Community Water & Sanitation Project	1994
P050616	Ghana	Community Water	2000
P002222	Rwanda	Community Water & Sanitation Project	1987
P001667	Malawi	MW-National Water Development (BD fiscal 1995)	1995
P000764	Ethiopia	ET-Water Supply Dev & Rehab (BD fiscal 1996)	1996

Performance-based management contract	Outputs and outcomes
Management contract for the water and sanitation systems used in addition to small contractors.	Implementation seemed successful, but results of the private operator were not documented.
Performance-based management contract with 40 indicators was signed; plus an operations investment fund established. However, after project completion, the government decided to have WSS managed by a public utility.	The private management contract operator met or exceeded 12 of 15 performance targets. The hours of water service were to be increased from one 8-hour period in a week to 36 hours, and it was actually increased to 46 hours. The target for the number of water and sewerage network repairs was only partially met, however. The project improved management of water and sanitation services. Operating and maintenance procedures were prepared, staff productivity was improved, an energy management plan was developed and implemented, power consumption was reduced by 18 percent by 2004, a customer service and public information program developed and implemented, unaccounted-for water was reduced by 25 percentage points from 54 percent in 1999 to 29 percent in 2004.

Local contractors providing goods and services	Outputs and outcomes
Small contracts with private well drillers and manufacturers; in addition, local competitive bidding was used to construct school wells.	A total of 7,150 shallow well hand pumps, 1,900 deep well hand pumps, and 100 percent of plastic toilet bowls (650,000) were locally produced. Training was provided to increase water quality.
Individual contracts with local operators.	320,000 rural inhabitants have access to new water points; 120,000 residents have improved water in 29 towns; 1,288 new water points were installed; and 2,610 conversions were completed. In addition, 29 small town systems were completed. Approximately 93 percent of the rural water facilities surveyed (all of which were at least two years old) are functioning adequately. With respect to sewerage, 6,000 household latrines have been constructed, serving about 36,000 people.
Private sector activity at the district level was significant, and over 300 contracts were issued to the private sector.	The project provided an estimated 794,900 people (representing about 6 percent of the total rural population in Ghana) in 2,000 communities with safe water supply and sanitation facilities.
Local small and medium enterprises, private engineering firms, and NGOs to be contracted. However, participation of the private sector encountered difficulties and hardships because of contract cancellations, nonpayment of claims by the government, and deteriorated security conditions in the project area.	N/A
Over 50 percent of the project was carried out by local experts, artisans, consultants, suppliers, and contractors.	Water production and sales increased. Unaccounted-for water decreased from 32 percent in 1999/2000 to 27 percent in 2003. Tariffs were increased.
Private contractors provided goods and services and participated in the management of water and sanitation systems.	Partnerships between communities, the local private sector, and districts has been developed and piloted in 109 communities. Forty-six community water systems were rehabilitated. Eight districts developed and piloted sustainable rural water supply & sanitation management systems to support communities. Four regions developed an enhanced capacity to support sustainable rural water supply & sanitation management systems. Although hygiene promotion has been carried out in eight districts, improvements in sanitation and hygiene are limited.

(*Table continues on the following page.*)

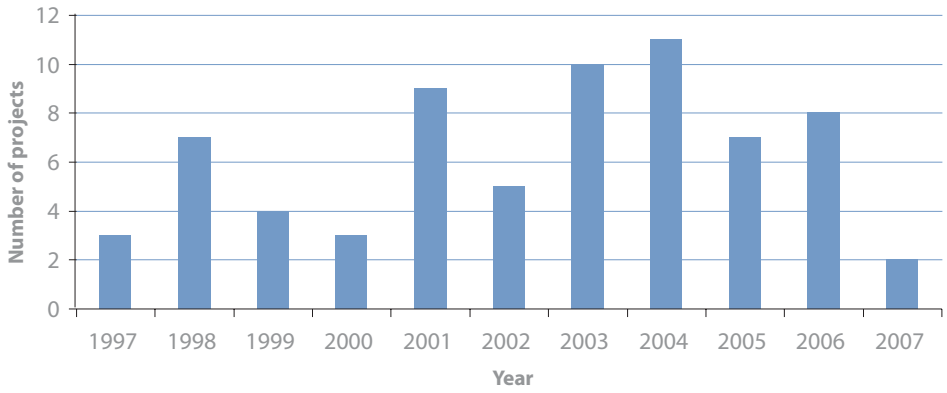
TABLE I.4 Local Contractors Providing Goods and Services (*continued*)

Project ID	Country	Name	Approval fiscal year
P000121	Benin	Rural Water Supply & Sanitation Project	1994
P010418	India	Karnataka Rural Water Supply & Environmental Sanitation Project	1993

Source: IEG water database.

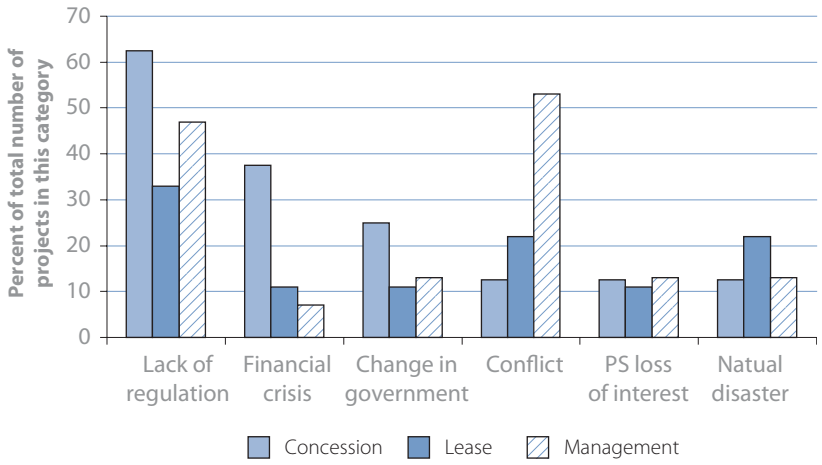
Note: N/A = not available.

FIGURE I.2 Water Projects with Private Sector Involvement by Exit Year (1997–2007)



Source: IEG water database.

FIGURE I.3 Among the Obstacles to Private Sector Participation Are Conflicts and the Lack of Regulation

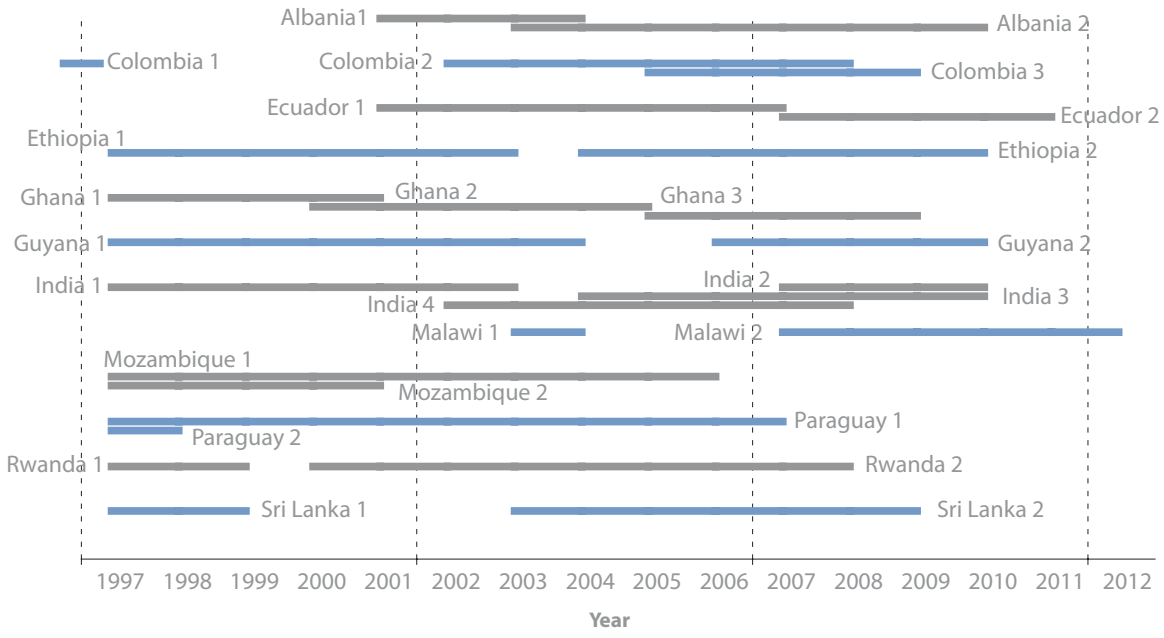


Source: IEG water database.

Local contractors providing goods and services	Outputs and outcomes
Local private operators and artisans provided goods and services.	A total of 323 rural systems were completed; 120 rural systems were partially completed; 162 water points were also completed. 296 school latrines and 285 rainwater systems were constructed. In addition, local artisans built 809 household latrines. 99 percent of systems have water available throughout the year. With respect to cost recovery, 65 percent communities practice "pay as you fetch," 94 percent have a bank account.
Local private operators and artisans provided goods and services.	N/A

Private Sector Participation in Rural Water Supply and Sanitation

FIGURE I.4 The Bank Has Made a Long-Term Commitment to Foster PSP in Rural WSS in Some Countries



Note: Projects are mapped by approval fiscal year. Approval years before 1997 are not reflected in this figure, meaning that a project may have started in 1988, but is only shown in its final year of 1997, as is the case for Colombia 1, for example.

TABLE I.5 Activities Undertaken During Project Implementation to Create Enabling Environment for Private Sector Participation

Activity	Number of projects
Policy framework for private sector participation developed	19
Private sector capacity building in rural areas undertaken	12
Studies undertaken on private sector participation	12
Contracts and management models prepared for private sector involvement	8

Note: Total number of completed projects: 34.

TABLE I.6 Activities Undertaken by the Private Sector in Rural Water Supply and Sanitation Projects

Private sector activity	Percentage of completed projects[a]	Percentage of ongoing projects[b]
Involved in new construction of WS systems	41	55
Involved in the provision of O&M	35	64
Provision of goods and services	21	50
Involved in the design of RWSS	15	32
Rehabilitates community water systems	12	9
Responsible for spare part distribution	12	23
Involved in toilet manufacturing	9	5
Involved in construction supervision	9	5
Involved in hygiene promotion	9	0
Involved in monitoring and data collection of rural WSS facilities/coverage	3	14
Supports community rural WSS management systems	3	18
Involved in information dissemination	0	5
Involved in water quality monitoring	0	9
To collect user fees	0	5

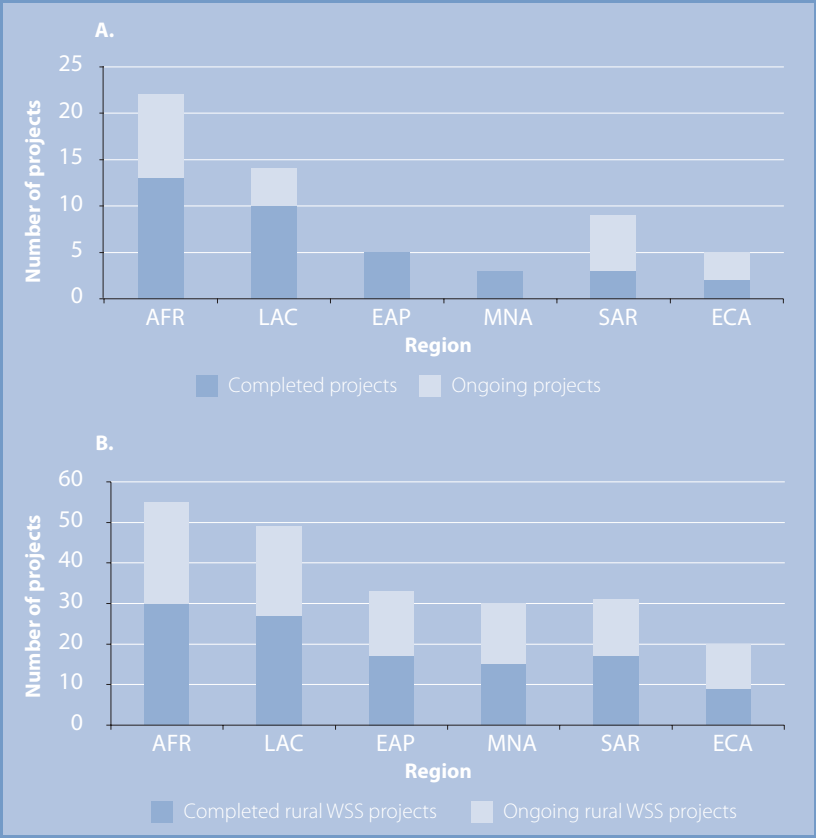
a. 34 completed projects.

b. 22 ongoing projects.

BOX I.2

COMPARING RURAL WATER SUPPLY AND SANITATION PROJECTS WITH PRIVATE SECTOR PARTICIPATION WITH THE WHOLE RURAL WATER SUPPLY AND SANITATION PORTFOLIO

Comparing rural water supply and sanitation (RWSS) projects with private sector participation (PSP) with the whole RWSS portfolio reveals that Bank financing for ongoing private sector involvement in the Middle East and North Africa and East Asia and Pacific Regions is absent (see figure A). A lack of private sector engagement does not mean that the Bank is not financing RWSS in those Regions (see figure B). Rather, it means that the Bank is not supporting PSP in rural areas. In both Regions, PSP is fairly recent and started with providing WSS services to urban areas. According to a 2008 OECD study (Perard 2008), Algeria, Egypt, Jordan, Lebanon, Morocco, Tunisia, and West Bank and Gaza have outsourced WSS services to the private sector only since the late 1990s. In these countries, between 10 and 40 percent of the population is served by the private sector, mostly in urban areas. In the East Asia and Pacific Region, the private sector also focused on urban areas in Vietnam, China, and the Philippines, and on build–operate-transfer (BOT) contracts for sewerage in China, for example.



Source: IEG water database.

Note: Figure A: total number of projects: 56 (34 completed, 22 ongoing); figure B: total number of projects: 218 (115 completed, 103 ongoing). AFR = Africa; LAC = Latin America and the Caribbean; EAP = East Asia and Pacific; MNA = Middle East and North Africa; SAR = South Asia; ECA = Europe and Central Asia.

BOX I.2

LESSONS FROM THE COLOMBIA SELF-EVALUATION REPORT REFLECT UPON HOW TO BETTER ENGAGE THE PRIVATE SECTOR IN SMALL MUNICIPALITIES

The predominant difficulty encountered by involving the private sector in rural areas is the problem of economies of scale. Water and sewerage companies in large and medium-size cities are attractive for the private sector. It is in smaller cities—remote, with no technical or managerial capacities, and where political interference is most prevalent—where the efforts to attract private participation need to be directed. A favorable environment should be developed for such cases. Lessons from a Colombia self-evaluation recommend the following:

- Merge small neighboring utilities to create regional companies.
- Increase competition by reducing the stringent requirements for prior experience of the private sector, and thus encouraging buildup of local capacity.
- Provide concessional financing terms to small utilities that incorporate the private sector.
- Provide technical assistance in preparing the PSP process.
- Provide transparent subsidies for nonprofitable utilities.

Source: Colombia - Water Supply and Sewerage Sector Project, closed fiscal 1997 (P006836).

Appendix J: Supplemental Data

This appendix contains supplemental charts and tabular data organized by chapter and subject.

Chapter 2

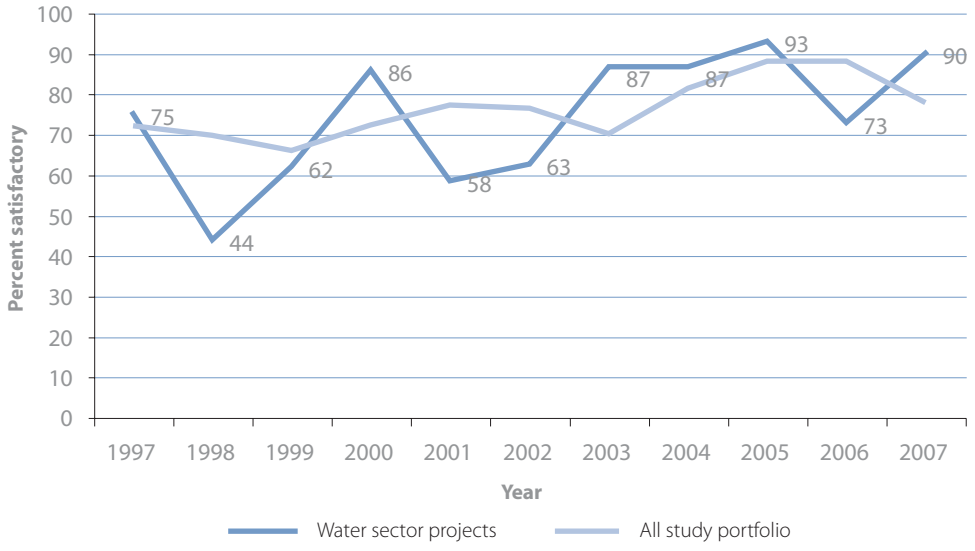
Country Rankings

TABLE J.1 Ranking of Borrowing Countries, 1997–2007

Country	Number of projects	
	Water portfolio	Entire Bank portfolio
China	1	2
Brazil	2	1
India	3	3
Indonesia	4	5
Vietnam	5	7
Philippines	6	17
Tanzania	7	15
Mexico	8	6
Argentina	9	4
Uganda	10	21

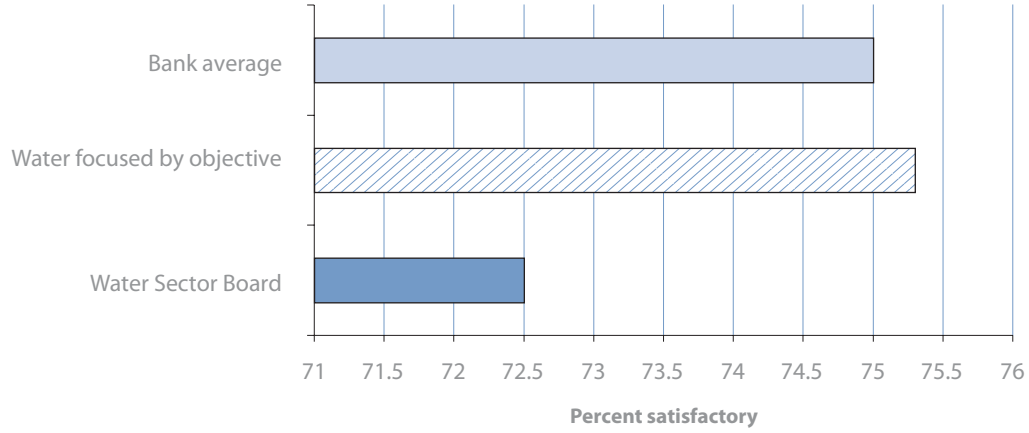
Project Performance

FIGURE J.1 Outcome Ratings by Year



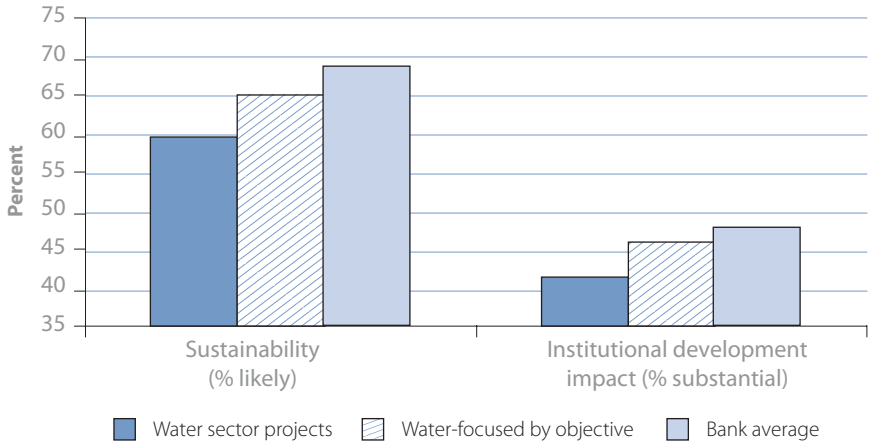
Source: IEG water database.

FIGURE J.2 Outcome Ratings for Water Projects



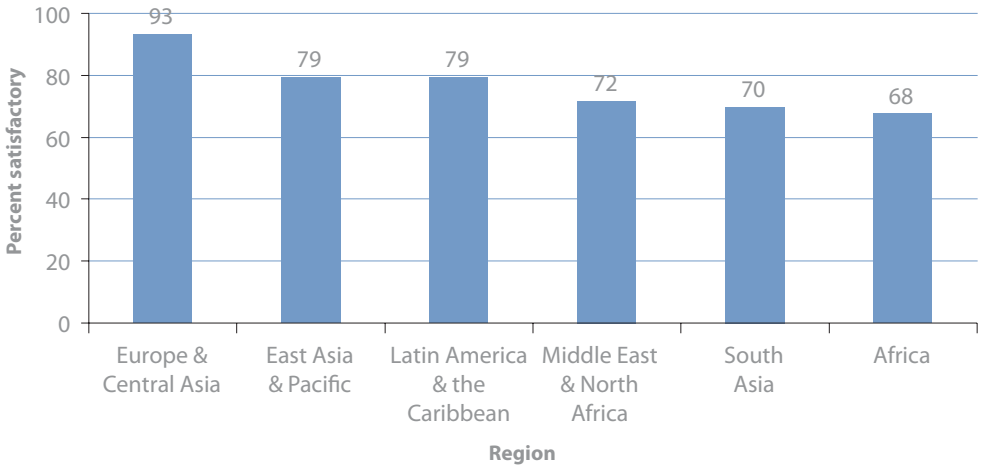
Source: IEG water database.

FIGURE J.3 Sustainability and Institutional Development in Water Projects, Exit Years 1997–2007



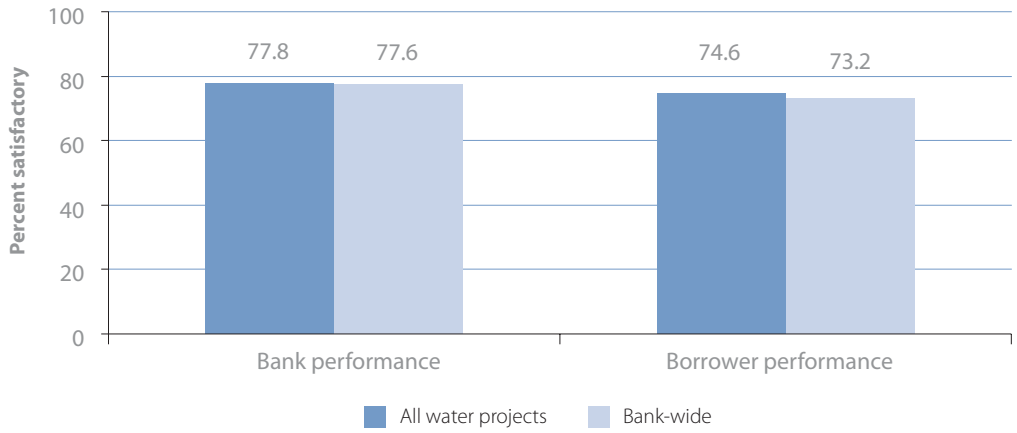
Source: IEG water database.

FIGURE J.4 Regional Outcome Ratings for Entire Water Portfolio



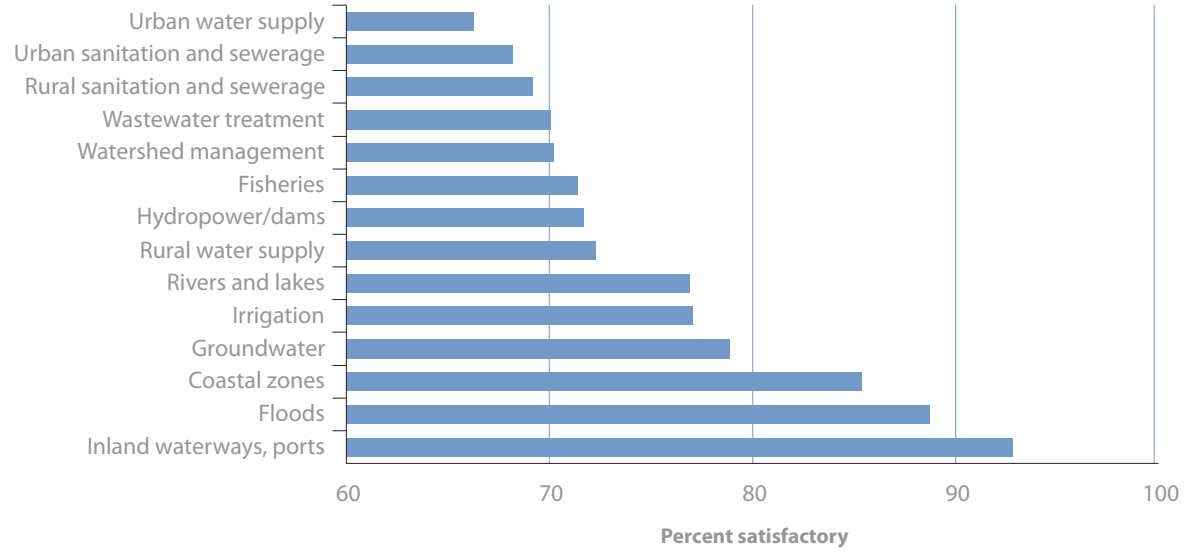
Source: IEG water database.

FIGURE J.5 Bank and Borrower Performance in Water Projects, Exit Years 1997–2007



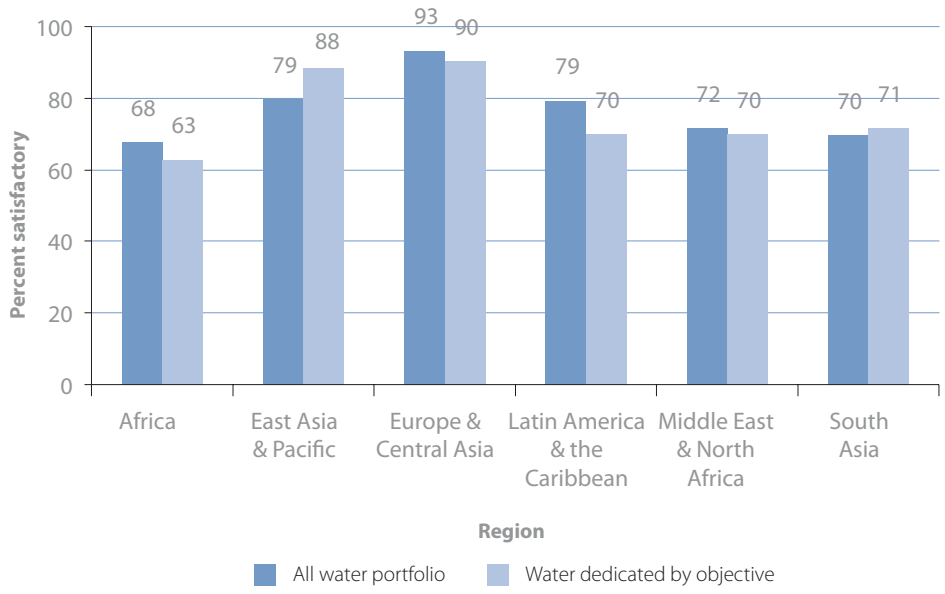
Source: IEG water database.

FIGURE J.6 Ratings of Focal Areas in Water-Dedicated Projects Show Significant Variability



Source: IEG water database.

FIGURE J.7 Outcome by Region



Source: IEG water database.

TABLE J.2 Subsets of Water Projects Categorized by Focal Area and Ratings

Portfolio	Number of projects	Total commitment (US$ millions)	Number rated: all water portfolio	Percent satisfactory: all water portfolio	Number rated: water-dedicated	Percent satisfactory: water-dedicated
Water and land						
Irrigation	311	26,490	213	77.7	96	77.1
Groundwater	229	20,508	146	80.1	90	78.9
Hydropower/dams	211	21,800	108	73.1	60	71.7
Floods	177	15,509	104	85.6	53	88.7
Water supply and sanitation						
Urban water supply	229	15,522	113	70.8	80	66.3
Rural water supply	218	13,871	113	76.1	47	72.3
Wastewater treatment	312	13,460	241	76.8	110	70.1
Urban sanitation and sewerage	190	15,609	94	72.3	66	68.2
Rural sanitation and sewerage	108	5,894	40	75	26	69.2
Environment						
Watershed management	218	13,100	110	75.5	40	70.2
Rivers and lakes	174	14,780	90	77.8	52	76.9
Coastal zones	121	4,660	84	80.9	41	85.4
Inland waterways, ports	104	7,632	43	81.4	14	92.8

Source: IEG water database.

Subportfolio Overlaps

TABLE J.3 Top 20 Larger Portfolio Comparisons with Two Overlaps

Portfolios	Number of projects	Percent of first portfolio[a]
Groundwater and water quality	179	77.16
WWT and water quality	312	76.10
Rivers/lakes and WRM	115	66.47
Rivers/lakes and water quality	114	65.90
WWT and urban	266	64.88
Groundwater and WRM	149	64.22
WRM and water quality	329	60.26
WWT and WSSS	241	58.78
WSSS and water quality	302	55.72
Urban and water quality	289	53.03
Watershed management and WRM	133	51.75
WSSS and urban	274	50.55
Urban and WSSS	274	50.28
Irrigation and WRM	155	49.84
Urban and WWT	266	48.81
Groundwater and WSSS	112	48.28
Watershed management and water quality	120	46.69
Water quality and WRM	329	45.44
Irrigation and water quality	139	44.69
WSSS and WWT	241	44.46

Note: WWT = wastewater treatment; WRM = water resources management; WSSS = water supply, sanitation, and sewerage.

a. Percent of first portfolio is the percent of the first-listed portfolio—for example, in the first line, it would be the percent of the groundwater portfolio that also has water quality activities.

TABLE J.4 Top 20 Smaller Portfolio Comparisons with Two Overlaps

Portfolios	Number of projects	Percent of first portfolio[a]
Hydrometeorological monitoring and WRM	39	70.91
Environmental flow and WRM	26	66.67
Hygiene education and WSSS	88	66.67
Environmental flow and water quality	24	61.54
Environmental flow and dams/hydropower	24	61.54
Coastal zones and water quality	83	60.14
Hygiene education and water quality	79	59.85
Hydrometeorological monitoring and floods	28	50.91
Dams and WRM	99	47.83
Drought and WRM	92	47.42
Floods and WRM	91	46.67
Floods and water quality	90	46.15
Fisheries and water quality	40	45.98
Dams and water quality	95	45.89
Transport and water quality	47	45.19
Coastal zones and WRM	59	42.75
Fisheries and WRM	37	42.53
Hydrometeorological monitoring and rivers and lakes	23	41.82
Drought and irrigation	81	41.75
Drought and water quality	77	39.69

Note: WRM = water resources management; WSSS = water supply, sanitation, and sewerage.

a. Percent of first portfolio is the percent of the first listed portfolio—for example, in the first line, it would be the percent of the hydrometeorological portfolio that also has WRM activities.

TABLE J.5 Top 20 Portfolio Comparisons with Three Overlaps

Portfolios	Number of projects	Percent of first portfolio[a]
Environmental flow and WRM and water quality	20	51.28
Hygiene education and WSSS and water quality	60	45.45
Rivers/lakes and WRM and water quality	83	47.98
WWT and urban and WSSS	177	43.17
Groundwater and water quality and WSSS	95	40.95
Environmental flow and WRM and dams	14	35.90
Environmental flow and water quality and dams	14	35.90
Hydrometeorological monitoring and WRM and floods	19	34.55
Hydrometeorological monitoring and WRM and rivers/lakes	19	34.55
Coastal zones and water quality and WRM	47	34.06
Rivers/lakes and water quality and WWT	57	32.95
Hydrometeorological monitoring and WRM and water quality	18	32.73
WSSS and urban and WWT	177	32.66
Urban and WSSS and WWT	177	32.48
Groundwater and WRM and irrigation	75	32.33
WWT and water quality and WRM	132	32.20
Rural PSP and water quality and WRM	18	32.14
Watershed management and water quality and WRM	82	31.91
Dams and WRM and water quality	65	31.40
Environmental flow and WRM and rivers/lakes	12	30.77

Note: WWT = wastewater treatment; WRM = water resources management; WSSS = water supply, sanitation, and sewerage.

a. Percent of first portfolio is the percent of the first listed portfolio—for example, in the first line, it would be the percent of the environmental flow portfolio that also has WRM and water quality activities.

TABLE J.6 Top 10 Portfolio Comparisons with Four Overlaps

Portfolios	Number of projects	Percent of first portfolio[a]
Environmental flow and WRM and water quality and dams	11	28.21
Environmental flow and WRM and water quality and rivers/lakes	11	28.21
Environmental flow and WRM and water quality and WSSS	11	28.21
Groundwater and water quality and WRM and WSSS	58	25.00
Rivers/lakes and water quality and WWT and urban	40	23.12
Environmental flow and WRM and water quality and groundwater	9	23.08
Groundwater and water quality and WRM and irrigation	53	22.84
Rivers/lakes and WRM and water quality and WWT	39	22.54
Rivers/lakes and water quality and WSSS and WWT	39	22.54
Water quality and urban and WSS and WWT	158	22.00

Note: WWT = wastewater treatment; WRM = water resources management; WSSS = water supply, sanitation, and sewerage.

a. Percent of first portfolio is the percent of the first listed portfolio—for example, in the first line, it would be the percent of the environmental flow portfolio that also has WRM, water quality, and dam activities.

TABLE J.7 All Portfolio Comparisons with Five Overlaps

Portfolios	Number of projects	Percent of first portfolio[a]
WWT and water quality and WRM and urban and WSSS	80	19.51
WRM and water quality and urban and WSSS and WWT	80	14.65
Groundwater and water quality and WRM and WSSS and urban	33	14.22
Water quality and WRM and urban and WSS and WWT	80	11.05
Groundwater and water quality and WRM and WSSS and watershed management	15	6.47
Groundwater and water quality and WRM and WSSS and irrigation	14	6.03
Rivers/lakes and water quality and WWT and urban and floods	6	3.47
Rivers/lakes and water quality and WWT and urban and dams	5	2.89
WWT and WRM and urban and WSSS and irrigation	7	1.71
WRM and urban and WSSS and WWT and irrigation	7	1.28

Note: WWT = wastewater treatment; WRM = water resources management; WSSS = water supply, sanitation, and sewerage.

a. Percent of first portfolio is the percent of the first listed portfolio—for example, in the first line, it would be the percent of the WWT portfolio that also has water quality, WRM, urban, and WSSS activities.

TABLE J.8 Total Net IFC Commitments for Water (US$ '000)

Subportfolios	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Animal aquaculture		5,500	2,900	3,000						-		11,400
Fishing						4,505						4,505
Large hydro	30,000	1,642	5,000			23,000			94,091	29,925	139,700	323,358
Water and wastewater utilities			7,147	20,000	31,195		77,325	75,404		80,418	16,408	307,897
Water transportation	24,803				373	27,490		21,760	15,750	15,000		105,176
Total	54,803	7,142	15,047	23,000	31,567	54,995	77,325	97,164	109,841	125,342	156,108	752,335

Source: IFC data.

TABLE J.9 Total IFC Projects for Water

Subportfolios	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Animal aquaculture		1	2	1						1		5
Fishing						1						1
Large hydro	1	1	1			2			2	2	2	11
Water and wastewater utilities			1	1	3		5	2		4	3	19
Water transportation	1				1	3		2	1	1		9
Total	2	2	4	2	4	6	5	4	3	8	5	45

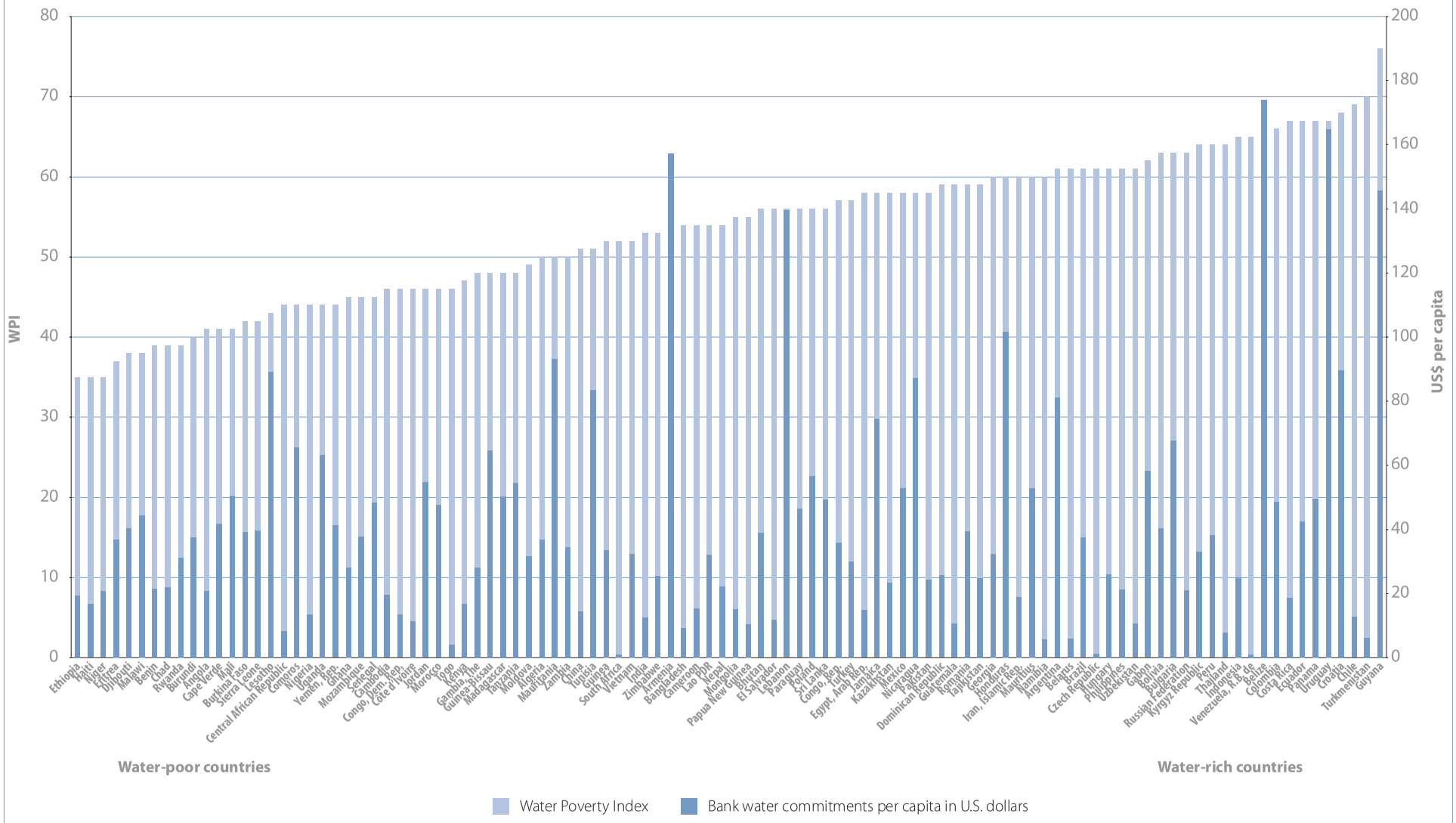
Source: IFC data.

TABLE J.10 Total IFC Projects for Water, by Region

Regional analysis	Africa	Asia	Europe and Central Asia	Latin America and the Caribbean	Middle East and North Africa	Total
Animal aquaculture	2	1		2		5
Fishing	1					1
Large hydro	1	4	1	5		11
Water and wastewater utilities	2	7	1	9		19
Water transportation		3	2	3	1	9
Total	6	15	4	19	1	45

Source: IFC data.

FIGURE J.8 Water Poverty Index and World Bank per Capita Financing – All Countries



Source: WRI and IEG.

TABLE J.11 Country Breakdown – Water Stress and Economic Stress

Water-poor and GNI per capita below US$1,095	Bank commitment to water (US$m)	Share of water portfolio (%)	Water- poor and GNI per capita above US$1,095	Bank commitment to water (US$m)	Share of water portfolio (%)
Angola	353	0.30	Algeria	1,244	1.05
Armenia	473	0.40	China	18,840	15.91
Bangladesh	1,482	1.25	Jordan	312	0.26
Benin	195	0.16	Morocco	1,467	1.24
Burkina Faso	579	0.49	South Africa	38	0.03
Burundi	319	0.27	Tunisia	854	0.72
Cambodia	282	0.24			
Cameroon	283	0.24			
Cape Verde	22	0.02			
Central African Republic	36	0.03			
Chad	236	0.20			
Comoros	41	0.03			
Congo, Dem. Rep.	841	0.71			
Côte d'Ivoire	220	0.19			
Djibouti	34	0.03			
Eritrea	178	0.15			
Ethiopia	56	0.05			
Gambia, The	48	0.04			
Ghana	657	0.55			
Guinea	313	0.26			
Guinea-Bissau	110	0.09			
Haiti	16	0.01			
India	13,993	11.82			
Kenya	632	0.53			
Lao PDR	187	0.16			
Lesotho	179	0.15			
Madagascar	988	0.83			
Malawi	615	0.52			
Mali	250	0.21			
Mauritania	291	0.25			
Moldova	120	0.10			
Mozambique	808	0.68			
Nepal	622	0.53			
Niger	294	0.25			
Nigeria	2,000	1.69			
Rwanda	303	0.26			
Senegal	601	0.51			
Sierra Leone	232	0.20			
Tanzania	2,204	1.86			
Togo	27	0.02			
Uganda	1,954	1.65			
Vietnam	2,740	2.31			
Yemen, Rep.	924	0.78			
Zambia	412	0.35			
Zimbabwe	340	0.29			
TOTAL	37,490	32.03		22,755	19.44

Sources: WRI and World Bank IDA classification.

Note: Total of shares do not equal 100 percent due to rounding and other than country-specific lending (that is, Africa, Caribbean, and so on). GNI = gross national income.

Water-rich and GNI per capita below US$1,095	Bank commitment to water (US$m)	Share of water portfolio (%)	Water-rich and GNI per capita above US$1,095	Bank commitment to water (US$m)	Share of water portfolio (%)
Bhutan	25	0.02	Argentina	3,199	2.70
Bolivia	385	0.33	Belarus	58	0.05
Congo, Dem. Rep.	135	0.11	Belize	53	0.04
Georgia	142	0.12	Brazil	7,153	6.04
Guyana	108	0.09	Bulgaria	519	0.44
Honduras	721	0.61	Chile	211	0.18
Kyrgyz Republic	173	0.15	Colombia	2,142	1.81
Mongolia	39	0.03	Costa Rica	84	0.07
Nicaragua	489	0.41	Croatia	397	0.34
Pakistan	3,931	3.32	Czech Republic	13	0.01
Papua New Guinea	65	0.05	Dominican Republic	252	0.21
Sri Lanka	984	0.83	Ecuador	566	0.48
Tajikistan	167	0.14	Egypt, Arab Rep.	1,120	0.95
Uzbekistan	283	0.24	El Salvador	80	0.07
			Gabon	78	0.07
			Guatemala	141	0.12
			Hungary	261	0.22
			Indonesia	5,637	4.76
			Iran, Islamic Rep.	1,339	1.13
			Jamaica	199	0.17
			Kazakhstan	363	0.31
			Lebanon	571	0.48
			Mauritius	67	0.06
			Mexico	5,556	4.69
			Namibia	12	0.01
			Panama	166	0.14
			Paraguay	284	0.24
			Peru	1,064	0.90
			Philippines	1,874	1.58
			Poland	21,61	1.82
			Romania	847	0.72
			Russian Federation	2,984	2.52
			Thailand	493	0.42
			Turkey	2,211	1.87
			Turkmenistan	30	0.03
			Uruguay	548	0.46
			Venezuela, R.B. de	28	0.02
	7,647	6.53		2,761	36.54

Watershed Management

TABLE J.12 Area Covered by Watershed Management Activities and People Served in 31 Closed Livelihood-Focused Watershed Management Projects

Project ID	Country	Area covered	People served	Ratings
P001967	Niger	234,000 hectares	566,000 people	Satisfactory
P006473	Brazil	400,000 hectares	106,000 farm families	Highly satisfactory
P049665	China	3,014 hectares orchard development	900,000 people	Satisfactory
P043868	Brazil	860,000 hectares	94,300 farmers	Satisfactory
P056216	China	35,7000 hectares	1.9 million people	Highly satisfactory
P003540	China	100,411 hectares	1 million farmers	Highly satisfactory
P003649	China	16,107 hectares terracing; 12,766 hectares horticulture; 1,677 hectares reforestation	4.1 million people	Satisfactory
P003639	China	6,601 hectares terracing; 20,046 hectares soil improvement	280,000 people	Satisfactory
P003595	China	25,750 terracing	400,000 people	Satisfactory
P006858	Colombia	24,429 hectares	23,663 groups	Satisfactory
P039437	Ecuador	19,000 kilometers^2	37,633 families	Satisfactory
P005153	Egypt, Arab Rep.	4,394 acres dike construction; 18,917 acres shrub plantation	10,440 households	Satisfactory
P009860	India	433,498 hectares in 12 watersheds in Gujarat, Orissa, and Rajasthan	100,000 rural families	Satisfactory
P009958	India	86,380 hectares	171,000 small landholders	Satisfactory
P041264	India	103,652 hectares covering 36 subwatersheds in 835 villages	16,620 beneficiaries	Satisfactory
P009882	India	147,501 hectares	17,000 farmer families	Satisfactory
P010408	India	2,000 hectares	19,540 farmers receiving training	Satisfactory
P003985	Indonesia	10,000 hectares	20,000 small farmers	Unsatisfactory
P003912	Indonesia	518 watersheds	8,000 farm families	Satisfactory
P001556	Madagascar	16,832 hectares	45,074 families	Moderately unsatisfactory
P001745	Mali	844 villages	844 villages	Moderately satisfactory
P005519	Morocco	16,000 hectares	14,700 people	Satisfactory
P007847	Panama	Not available	296,434 people	Satisfactory
P007918	Paraguay	264,567 hectares	13,000 farm families	Satisfactory
P042442	Peru	415,000 hectares	31,000 farm families	Satisfactory
P004613	Philippines	1,035 hectares reforestation, 650 hectares enrichment planting,163 hectares riverbank stabilization, 360 hectares rattan plantation, and 1,227 hectares agroforestry	Don't know	Satisfactory
P010513	Sri Lanka	12,000 hectares	12000 households	Satisfactory
P005721	Tunisia	34,000 hectares watershed treatment, 15,500 hectares pasture improvement	5,200 beneficiaries	Moderately satisfactory
P005733	Tunisia	53,000 hectares	Don't know	Satisfactory
P009023	Turkey	520,000 hectares	40,000 families	Satisfactory
P008173	Uruguay	17,991 hectares	395 producers	Moderately unsatisfactory

Source: IEG water database.

BOX J.1

MOROCCO—LAKHDAR WATERSHED MANAGEMENT PILOT PROJECT (LOAN 4426; P005519)

The community outreach effort undertaken in this project had high up-front costs for staff, staff training, staff transport, and the like. The longer the extension work could be implemented (with a concomitant increase in number of families attending), the lower the per-family cost of the operation. In other words, efficiency in staff costs depended to some degree on scaling up the pilot operation.

It would not be unreasonable for an economic analysis to consider that having staff trained in participatory methods, as was done in this pilot operation, is a positive externality. Expensive staff training costs would not be incurred in any follow-on operation. But the up-front costs of the participatory approach to natural resources management selected for this project proved to be relatively costly in the short term: $0.8 million was spent to educate and motivate beneficiaries in natural resources management. Another $0.8 million was spent on training and equipping government officials.

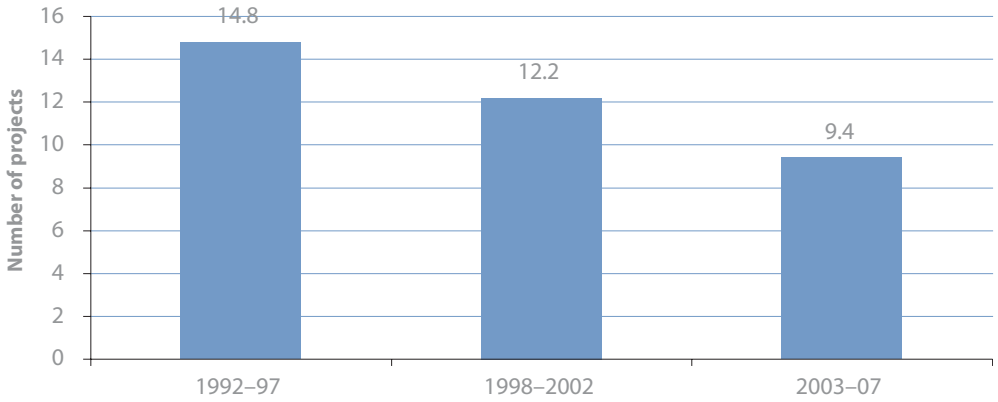
Although almost half the project costs were spent for social purposes, had the decision been made to scale up this effort, little of this cost would have had to be repeated. Thus, while the efficiency of this approach is suboptimal due to the abandonment of the follow-on, the project evaluation does not take this outcome into account in determining the overall project efficiency for two reasons. First, the successful demonstration that beneficiary participation can work in rural Morocco will lead to other similar work in time, and that will produce a considerable amount of additional economic benefits. And second, the awareness raising that has happened in the mountain communities regarding the importance of preserving and restoring natural resources borders on the priceless, and it will also yield positive economic results in the future.

Source: PPAR for the Morocco – Lakhdar Watershed Management Pilot Project (Loan 4426); (P005519).

FIGURE J.9 Frequency of Groundwater Activities

Source: IEG water database.

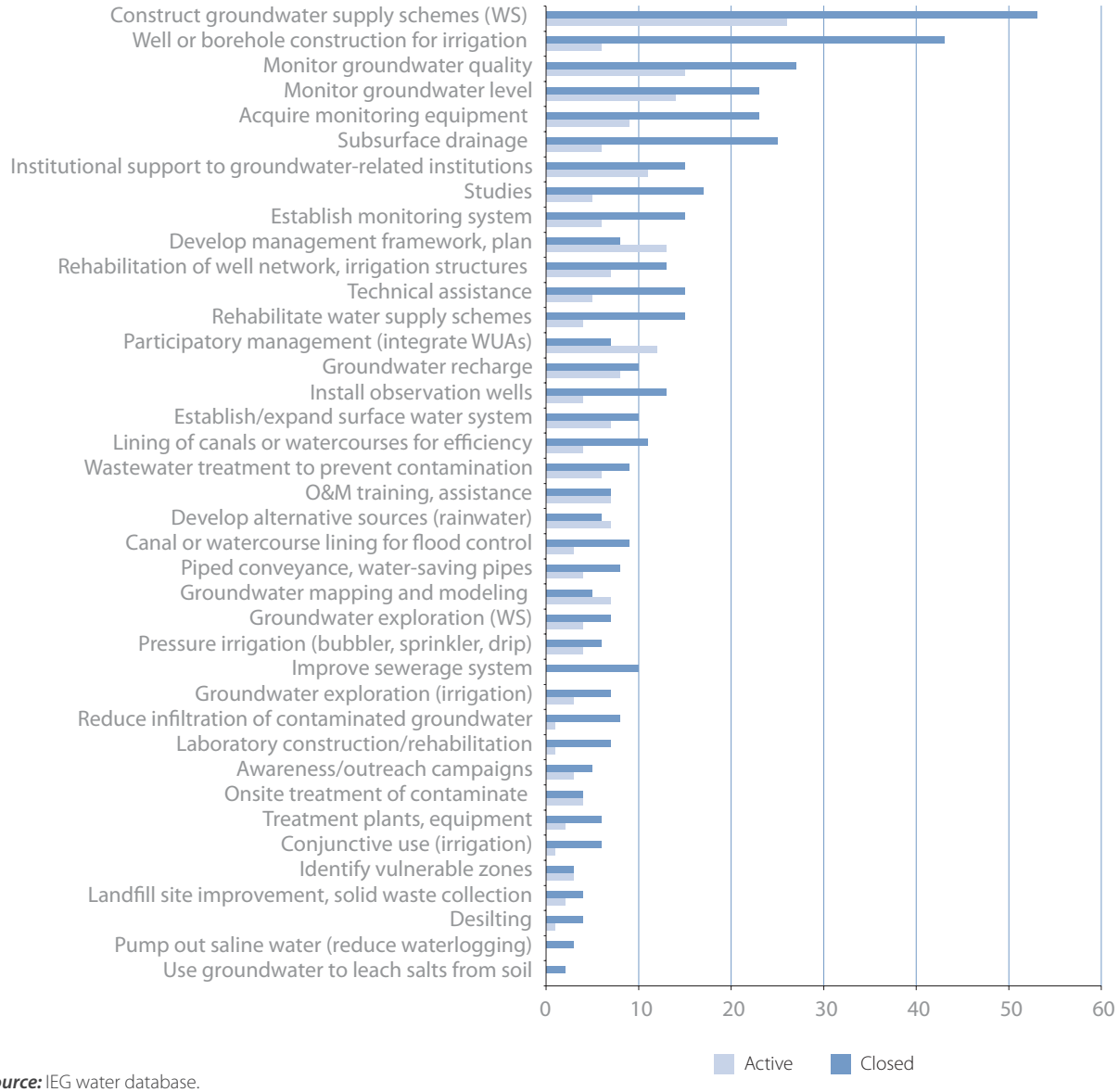
FIGURE J.10 Groundwater Approvals: 5-Year Averages



Source: IEG water database.

Completed and Ongoing Projects

FIGURE J.11 Frequency of Activities in Closed and Active Groundwater Projects



Source: IEG water database.

TABLE J.13 Percentage of Activity Found in Ongoing Groundwater Projects

Activity	Percentage of activity found in ongoing projects	Active projects	Total projects
Participatory management (integrate WUAs)	67	12	18
Develop management framework, plan	62	13	21
Groundwater mapping and modeling	58	7	12
Develop alternative sources (rainwater)	54	7	13
Identify vulnerable zones	50	3	6
Onsite treatment of contaminate	50	4	8
O&M training, assistance	50	7	14
Groundwater recharge	44	8	18
Institutional support to groundwater-related institutions	42	11	26
Establish/expand surface water system	41	7	17
Pressure irrigation (bubbler, sprinkler, drip)	40	4	10
Wastewater treatment to prevent contamination	40	6	15
Monitor groundwater level	38	14	37
Awareness/outreach campaigns	38	3	8
Groundwater exploration (WS)	36	4	11
Monitor groundwater quality	36	15	42
Rehabilitation of well network, irrigation structures	35	7	20
Landfill site improvement, solid waste collection	33	2	6
Piped conveyance, water-saving pipes	33	4	12
Construct groundwater supply schemes (WS)	33	26	79
Groundwater exploration (irrigation)	30	3	10
Establish monitoring system	29	6	21
Acquire monitoring equipment	28	9	32
Lining of canals or watercourses (irrigation efficiency)	27	4	15
Treatment plants, equipment	25	2	8
Canal or watercourse lining for flood control	25	3	12
Technical assistance	25	5	20
Install observation wells	24	4	17
Studies	23	5	22
Rehabilitate water supply schemes	21	4	19
Desilting	20	1	5
Subsurface drainage	19	6	31
Conjunctive use (irrigation)	14	1	7
Laboratory construction/rehabilitation	13	1	8
Well or borehole construction for irrigation	12	6	49
Reduce infiltration by contaminated surface water	11	1	9
Use groundwater to leach salts from soil	0	0	2
Pump out saline water (reduce waterlogging)	0	0	3
Improve sewerage system	0	0	10

Source: IEG water database.

TABLE J.14 National and Transboundary Basin Institutions

Project ID	Country/ Region	Project name	Total amount (US$ millions)	IEG outcome rating	Approval year	Building the capacity of existing institutions
National Basin Institutions						
P006541	Brazil	Water Quality and Pollution Control Project	245	Satisfactory	1992	Basin-level management units were established. Regulation for water use in the basin was decreed. However, basin organizations did not get full support from the state due to a change of government administration. Law on establishing water use charges in the basin was not approved by project closure. No information provided about different basin agencies that planned to be established under the project.
P038895	Brazil	Federal Water Resources Management Project (PROAGUA)	198		1998	Water resources management will support institutional development, which will cover the areas of legislation, state agencies, human resources, and bulk water rights. It will also support the technical basis for National Water Resources Management System (SINGRH), including the hydrometeorological networks and information systems.
P006449	Brazil	Ceara Integrated Water Resource Management Project (PROGERIRH)	136		2000	To improve institutional, legal, and administrative frameworks, emphasizing participatory management mechanisms.
P089929	Brazil	Rio Grande do Norte Integrated Water Resources Management Project	35.9		2007	To improve the state's water resource management (WRM) capabilities and develop adequate WRM instruments.
P075035	China	Hai Basin Integrated Water and Environment Management Project	17		2004	Hai Basin Project management will support coordinated and integrated actions by the ministries/bureaus of environmental protection and water resources at the various levels.
P010476	India	Tamil Nadu Water Resources Consolidation Project	282.9	Satisfactory	1995	Basin water resources planning was legalized. Basin management committee of stakeholders was formed. However, government did not approve National Water Resources Act legislation, thus basin organizations have no legal standing. Stakeholder participation did not take place as planned. Law on establishing water use charges in the basin was not approved by project closure due to devastating, continuous natural disasters.
P073370	India	Madhya Pradesh Water Sector Restructuring Project	394		2004	To support the establishment and operationalization of the proposed planning, allocation, and regulatory institutions and instruments at the state and basin levels.
P003954	Indonesia	Java Irrigation Improvement and Water Resources Management Project	165.7	Unsatisfactory	1994	Basin water resources planning was legalized. However, basin management agencies are weak due to limited access to financial sources and technical assistance. Lack of clear responsibility over water distribution hampered basin agencies in fulfilling their duties successfully. Law on establishing water use charges in the basin was not approved by project closure.
P064118	Indonesia	Water Resources Adjustment Loan	300	Satisfactory	1999	Basin-level management units were established. Water use rights framework was adopted in the basin. However, government did not approve National Water Resources Act legislation, thus basin organizations have no legal standing. Basin management agencies are weak due to limited access to financial sources and technical assistance. Law on establishing water use charges in the basin was not approved by project closure due to devastating, continuous natural disasters.

(*Table continues on the following page.*)

TABLE J.14 National and Transboundary Basin Institutions (*continued*)

Project ID	Country/ Region	Project name	Total amount (US$ millions)	IEG outcome rating	Approval year	Building the capacity of existing institutions
P059931	Indonesia	Water Resources & Irrigation Sector Management Program	70		2003	Basin Water Resources Management assists in establishing and/or strengthening sector governance, planning, management capacity, and fiscal and cost recovery for national water agencies/institutions; supports an operational and monitoring system for hydrology, water allocation, basin water quality, and flood management as well as a program for river infrastructure management and repair and establishment of a national water quality monitoring network system.
P005521	Morocco	Water Resources Management Project	20	Moderately satisfactory	1998	Basin-level management units were established. Various donor communities committed to strengthen ing basin agencies. However, basin management agencies are weak due to limited access to financial sources and technical assistance. Basin agencies encounter difficulties due to lack of sufficiently skilled and motivated staff. Law on establishing water use charges in the basin was not approved by project closure.
P034212	Sri Lanka	Mahaweli Restructuring and Rehabilitation Project	57	Unsatis-factory	1998	Basin-level management units were established. Basin management committees of stakeholders were formed. However, government did not approve new National Water Resources Act legislation, thus basin organizations have no legal standing. Basin management agencies are weak due to limited access to financial sources and technical assistance.
Transboundary Basin Institutions						
P070073	Africa	3A-GEF Nile Transboundary Environmental Action (fiscal 2003)	8		2003	Nile Basin Council of Ministers (Nile-COM)
P070252	Africa	Lake Chad Basin	2.9		2003	Lake Chad Basin Commission (LCBC)
P070256	Africa	Reversing Land & Water Degradation Trends in the Niger River Basin	13		2004	Niger Basin Agency
P093826	Africa	Senegal River Basin Multi-Purpose Water Resources Development	110		2006	Senegal River Basin Organization (OMVS)
P093806	Africa	Niger Basin Water Resources Development and Sustainable Ecosystems Management (APL) Project	186		2007	Niger Basin Agency
P085782	Africa	Lake Victoria Transboundary Project	1		2005	The Treaty for the Establishment of the East African Community (EAC) came into force in July 2000, and it mandates the EAC to coordinate management aspects of the Lake Victoria Basin through its Committee for Lake Victoria Development (CLVD).
P000306	Burkina Faso	BF-Ouaga Water Supply (fiscal 2001)	70		2001	Information-exchange mechanism established through a joint technical committee (DGH in Burkina Faso and the Volta River Authority in Ghana).
P053349	Central America	GEF 6C-Meso American Barrier Reef System	11		2001	The project fostered new mechanisms for coordination and multistakeholder representation within the countries themselves through the National Barrier Reef Committees (NBRCs), comprised of representatives from both the public and private sectors.

P035783	Lithuania	SIAULIAI Environment	6.2	Moderately satisfactory	1996	The Lithuanian side of the Lielupe River Basin Commission was established.
P046651	Mali	Regional Hydropower Development	17.1	Satisfactory	1997	The creation of a permanent commission on water resources (CPE) has offered a forum for representatives for water users, territorial communities, NGOs, and committees for decentralized management. In addition, national and local coordinating committees have been created.
P046650	Mauritania	Regional Hydropower Development	11.1	Satisfactory	1997	The creation of a permanent commission on water resources (CPE) has offered a forum for representatives for water users, territorial communities, NGOs, and committees for decentralized management. In addition, national and local coordinating committees have been created.
P076809	Mozambique	MZ-GEF TFCA & Tourism Dev (fiscal 2006)	10		2006	Bilateral agreement by Mozambique and Zimbabwe for the Chimanimani TFCA resulted in the enhanced management and protection of important transboundary water catchments.
P046648	Senegal	Regional Hydropower Development	10.5	Satisfactory	1997	The creation of a permanent commission on water resources (CPE) has offered a forum for representatives of water users, territorial communities, NGOs, and committees for decentralized management. In addition, national and local coordinating committees have been created.
P058120	Tanzania	TZ-IDF NBI (fiscal 1998)	0.25		1998	The NBI was formally launched in February 1999 by the ministers of water affairs of the 10 countries that share the Nile River: Burundi, Democratic Republic of Congo, Egypt, Ethiopia, Eritrea, Kenya, Rwanda, Sudan, Tanzania, and Uganda. Together, these ministers make up the Nile Basin Council of Ministers (Nile-COM). The NBI is guided by a shared vision "to achieve sustainable socioeconomic development through the equitable utilization of, and benefit from, the common Nile basin water resources."
P087154	Tanzania	TZ-Water Sector Support SIL	200		2007	The WSDP will improve access to water supply and sanitation services and strengthen sector institutions for integrated water resources management.
P090680	Tanzania	Lake Victoria Environmental Management Project Second Supplemental Credit	3.5		2005	The project was to support the Regional Policy Steering Committee meetings for Lake Victoria.
P084213	Tanzania	TZ-GEF Marine & Coastal Env Mgmt (fiscal 2006)	10		2006	The East African Community (EAC) passed the Lake Victoria Protocol and, with its ratification by member states in November 2004, created the Lake Victoria Basin Commission (LVBC), based in Kisumu.
P046836	Uganda	Lake Victoria Environmental Management	12.1	Moderately satisfactory	1997	Lake Victoria Basin Commission (LVBC).

Source: IEG water database.

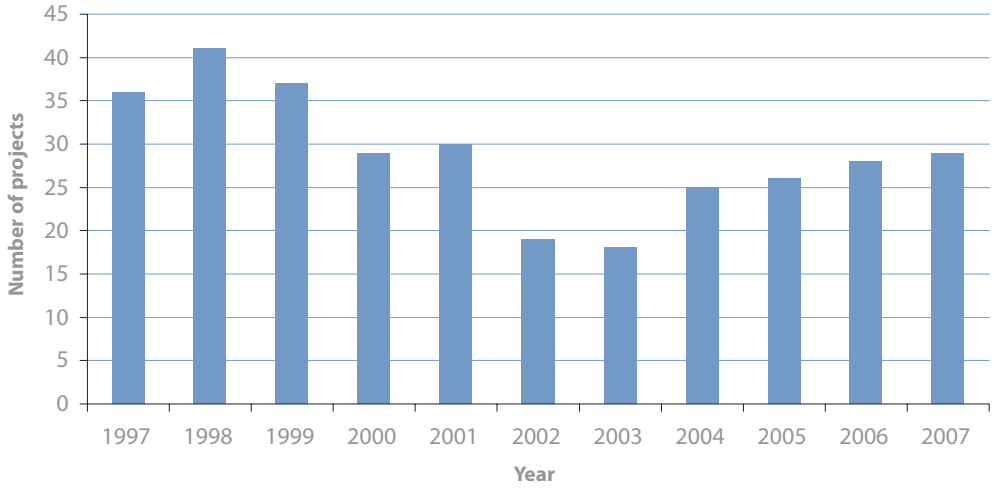
TABLE J.15 "What Happened Analysis" for the 11 Completed Projects with National Basin Organizations

Positive results	Number of projects	Negative results	Number of projects
Basin-level management units were established	6	Basin management agencies are weak due to limited access to financial sources and insufficient technical assistance	5
Basin management committee of stakeholders was formed	4	Law on establishing water use charges in the basin was not approved by project closure	5
Basin water resources planning was legalized	2	Government did not approve National Water Resources Act legislation, thus basin organizations have no legal standing	4
Basin management agencies were strengthened	2	Basin agencies encounter difficulties due to lack of sufficiently skilled and motivated staff	2
Water use rights framework was adopted in the basin	1	No information provided about different basin agencies that were planned for establishment under the project	1
Regulation for water use in the basin was decreed	1	No clear responsibility over water distribution hampered basin agencies in fulfilling their duties successfully	1
River basin management concept was adopted	1	Basin organizations did not get full support from the state due to a change of government administration	1
Various donor communities committed to strengthening basin agencies	1	Stakeholder participation did not take place as planned	1

Source: IEG water database.

Managing Demand for Water

FIGURE J.12 After a Peak in the Late 1990s, the Number of (Annual Approvals of) Demand-Side Management Projects Declined



Source: IEG water database.

Hydrological and Meteorological Monitoring

TABLE J.16 National Monitoring Systems Are Most Frequently Implemented

Monitoring system	Closed projects	Active projects	Total number of projects	Percent of total
National	15	8	23	42
Regional	8	9	17	31
Local	3	5	8	15
Transboundary	1	5	6	11

Source: IEG water database.

TABLE J.17 The Most Frequently Pursued Activities in Hydrological and Meteorological Monitoring

Frequency count—ranking, highest to lowest	Activities pursued	Completed projects	` Ongoing projects	Total
1	Equipment and supplies	27	27	54
2	Institutional capacity building	23	21	44
3	Use of monitoring data for disaster prevention and mitigation	15	14	29
4	Development of monitoring-related products (maps, publications)	10	18	28
5	Participation by beneficiaries	7	7	14
6	Use of monitoring for agriculture	2	10	12
7	Use of monitoring for water resources management	5	5	10

Sources: IEG water database, completed projects 1997–2008 (*n*=28).

TABLE J.18 The Most Common Results for Hydrological and Meteorological Monitoring

Positive results	Number of projects	Negative results	Number of projects
The equipment has been procured	16	Data collection and analysis, to the extent that data is available, are not effectively disseminated	8
Scientific equipment was installed and is operational	14	Equipment/facilities inadequate, obsolete, function poorly or not at all	7
Communications equipment and/or IT hardware and software were installed	13	Network achievements impossible to evaluate because guidelines on network performance not available	7
Training was given as planned	13	Activity cancelled or not implemented [equipment and supplies-related]	5
Improvement in methods and capacities to collect and report weather information is documented	12	Training had no short- or long-term impact	5
Monitoring information shared in timely manner with intended users	10	Design of the system inappropriate relative to existing institutional capacity and/or prevailing conditions	4
System disseminated information used successfully for mitigation and prevention (natural disaster damage was reduced)	8	Weak existing legal framework was a constraint	4
Institutional development achieved as planned	7	Installation was begun but insufficient time was allocated so that system was not set up	3
Monitoring system has been established and/or data collection and management were initiated	6	Personnel for O&M required to ensure continued effective operation have not been hired (permanently)	3
New or additional personnel were hired	6	Staff insufficiently skilled to conduct data collection and analysis	3

(*Table continues on the following page.*)

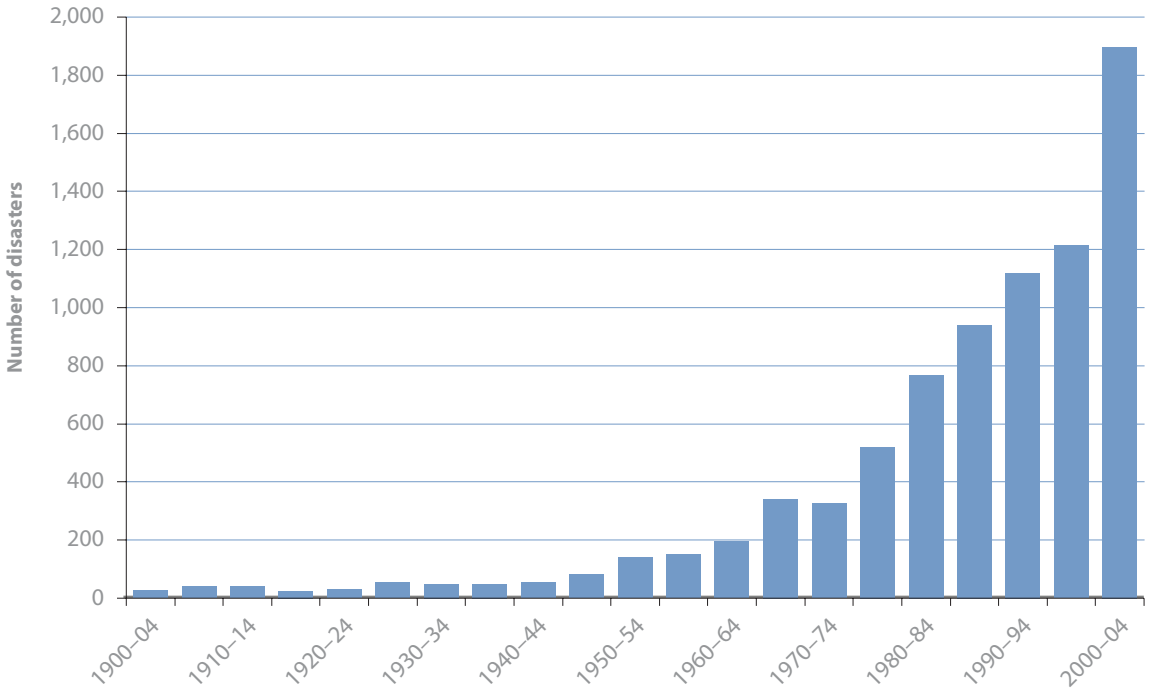
TABLE J.18 The Most Common Results for Hydrological and Meteorological Monitoring (*continued*)

Positive results	Number of projects	Negative results	Number of projects
New/revised policies and strategies	5	Limitations on hardware and software capacities are reported	3
Monitoring materials were prepared	5	Data collection and dissemination are not taking place as anticipated	3
System data used for investment planning and infrastructure construction	4	Mechanisms that allow participatory analysis and dissemination are absent	2
Facilities were constructed	4	Monitoring data and results intended for sharing were not disseminated	2
Upgrades were completed	3	Expected benefits from monitoring did not materialize	2
Monitoring equipment rehabilitated as planned	3	Institutional development achievements unknown	2
Information available from modern computer-based system is accessible on a real-time basis	3	Expected benefits from monitoring did not materialize	2
Continuous environmental monitoring and dissemination of information is taking place	3	Lack of sufficient personnel or adequately qualified personnel to install the system	1
More government agencies and stakeholders receive monitoring information than anticipated	3	Activity cancelled or not implemented (institutional capacity building)	1
Financing and monitoring continues after project interventions	3	Stakeholder support was partial or inadequate	1
New committees/ units were established to manage or coordinate monitoring, or such a role was given to stakeholders	3	Activity cancelled or not implemented (development of monitoring-related products)	0
Enforcement and compliance	2		
Reservoir use	2	Activity cancelled or not implemented (use of monitoring data for disaster prevention and mitigation)	0
Groundwater issues	2		
Agreements achieved	2		
Monitoring programs were organized and are in place	2	Activity cancelled or not implemented (use of monitoring for disaster prevention and mitigation)	0
System benefits neighboring communities (near monitoring points)	1		
Water management measures were improved in agricultural decisions	1	Activity cancelled or not implemented (use of monitoring for agriculture)	0
Transboundary water issues	1		
Private sector participates in monitoring activities	1	Activity cancelled or not implemented (use of monitoring for water resources management)	0

Source: IEG water database (*n*=28).

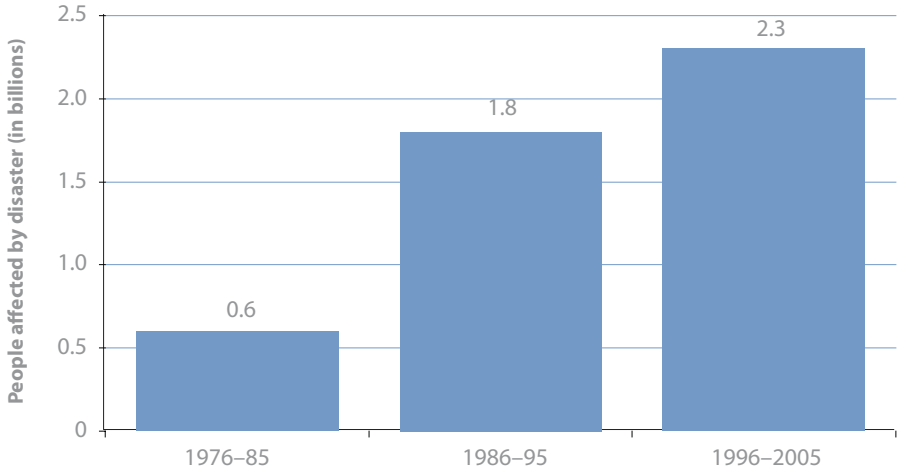
Disasters

FIGURE J.13 Number of Natural Disasters in All Countries



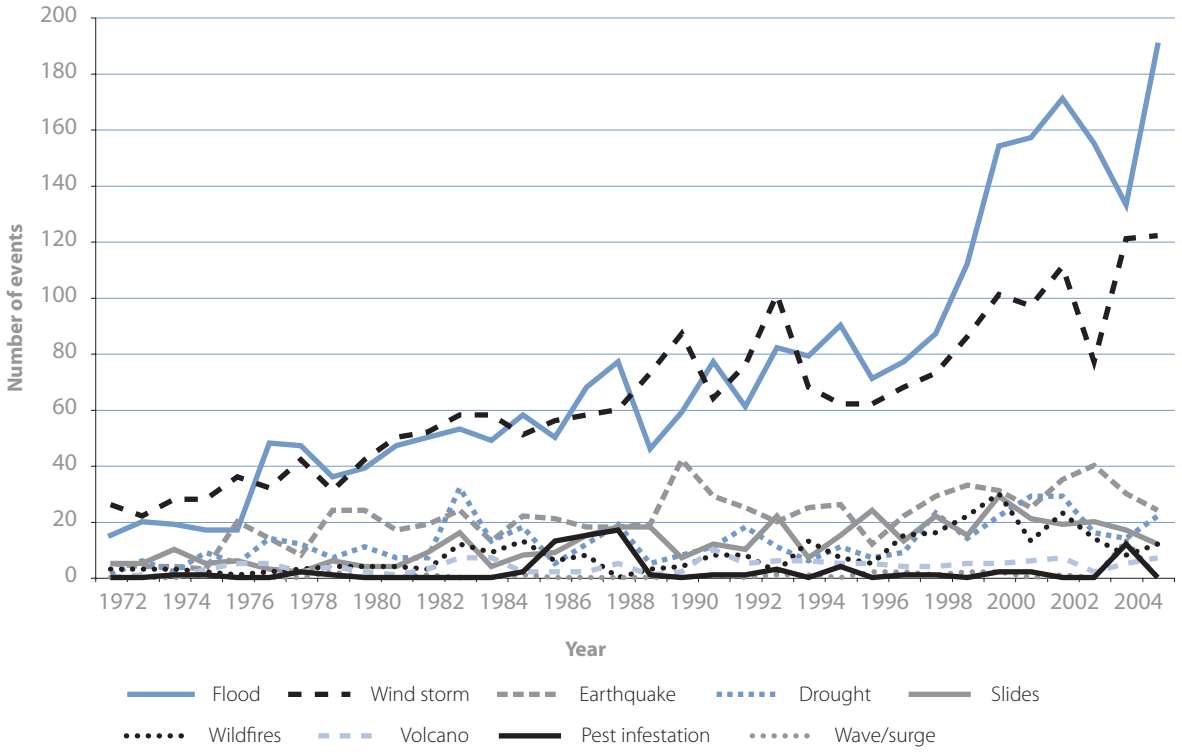
Source: EM-DAT: The OFDA/CRED International Disaster Database, www.em-dat.net - *Université Catholique de Louvain* - Brussels – Belgium.

FIGURE J.14 Billions Affected



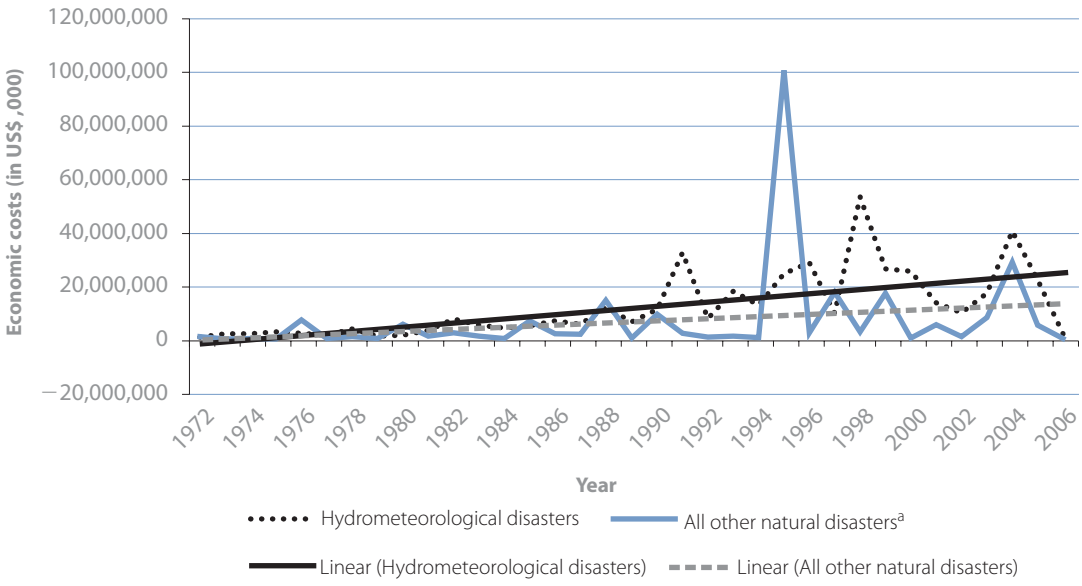
Source: EM-DAT: The OFDA/CRED International Disaster Database, www.em-dat.net - *Université Catholique de Louvain* - Brussels – Belgium.

FIGURE J.15 Flood and Wind Storm Disasters Are Increasing in Frequency



Source: EM-DAT: The OFDA/CRED International Disaster Database, www.em-dat.net - *Université Catholique de Louvain* - Brussels – Belgium

FIGURE J.16 Economic Cost of Hydrometeorological Disasters is Higher Than That of All Other Disaster Types Combined



Source: EM-DAT: The OFDA/CRED International Disaster Database, www.em-dat.net - *Université Catholique de Louvain* - Brussels – Belgium.

Note: this database reports large- and medium-scale disasters, not local, small-scale ones.

a. This category includes earthquake, insect infestation, volcanoes, and wildfires. Hydrometeorological disasters include drought, extreme temperatures, floods, mudslides, wave/surges, and wind storms.

TABLE J.19 Top 20 Activities in World Bank Flood Projects

Flood project activity	Number of flood projects
Rehabilitation of road infrastructure	55
Rehabilitation of flood control structures	50
Equipment and supplies acquisition	39
Preventive flood control activities and structures (pre-event)	31
New construction of flood control structures	31
Rehabilitation of irrigation/drainage infrastructure	25
Rehabilitation of (rural) water systems infrastructure	24
Rehabilitation of (urban) water systems infrastructure	24
Institutional development/strengthening (disaster specific)	21
Early warning/public awareness	18
Design and supervision	18
Studies and research	17
Restoration of education facilities	16
Technical assistance: engineering	15
Planning	15
Restoration of health facilities	13
Support for a Project Implementation Unit	13
Operations and maintenance	13
Rehabilitation of (urban) water/sanitation infrastructure	12
Relocation to safe area	12

Source: IEG water database.

BOX J.2

INTEGRATED WATER RESOURCES MANAGEMENT AND HYDROLOGICAL AND METEOROLOGICAL MONITORING IN MEXICO

In 1996, the Bank approved the Water Resources Management Project in Mexico designed to help the government face major critical challenges in water resources management. The general objectives were to promote conditions for environmentally sustainable, economically efficient. and equitably allocated use of water resources in Mexico; to support the integrated, comprehensive management of water resources; and to increase the benefits and reduce the risk related to existing hydraulic infrastructure.

The project had five main components. The second component—water quantity and quality monitoring improvement and assessments—supported the improvement and upgrading of the hydrological and hydrogeological water quality and quantity monitoring and related climatological/meteorological networks, including telemetric networks to provide information to improve the quality of information for better and more efficient water resources management. The networks were to improve data collection, processing, and dissemination among users. Assessments of surface and groundwater bodies and hydrological and hydrogeological studies were planned.

The outcomes of this component were (i) technological modernization of the various networks of the Meteorological Observation System, telecommunications, and the computational base for the processing of meteorological data; (ii) improvement of the National Bank for Climatological Data; and (iii) improvement in the quality of meteorological prognostics.

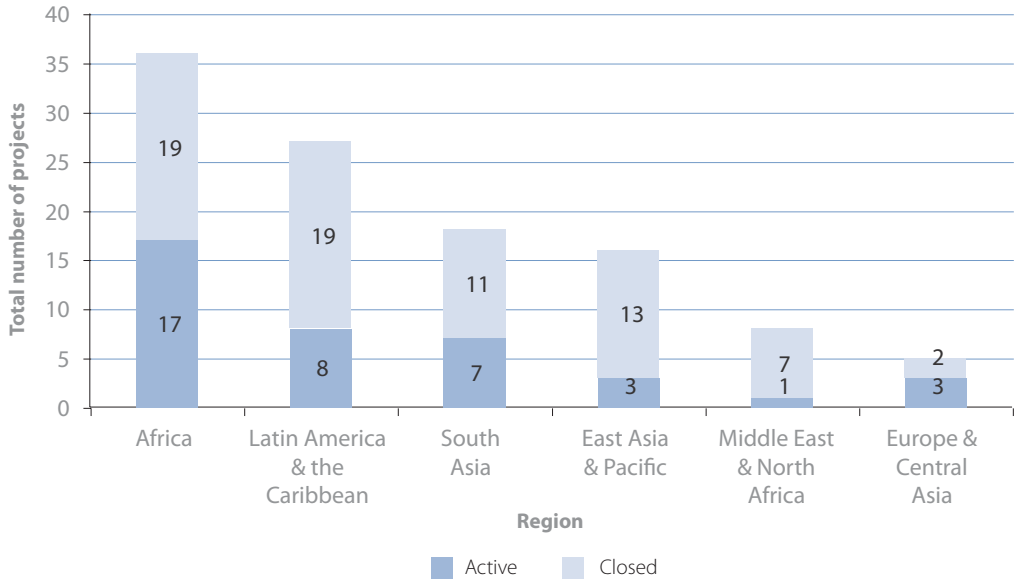
The project files noted a substantial increase in the quantity and opportunity of available data on the state of the atmosphere and the hydrological cycle, in particular during emergency situations such as hurricanes and droughts. Improvement of emergency alert capabilities was also noted, in particular within the National Civil Protection System. Prognostics at the disposal of users and the general public through a Web site recorded more than 2.2 million discrete users in 2004 on daily weather, rapid-onset emergency alerts, and drought reporting.

The benefits reported include (i) improved daily decision making for social and economic activities (such as agricultural and similar activities in general, social events, and so on); (ii) minimization of damage caused by extraordinary hydrometeorological phenomena (protection of human lives, reduced destruction in cultivation zones, triggering of emergency evacuation, averted economic loss, and the like). For groundwater management issues, the systems helped improve the decision-making process in the administration and management of groundwater, conservation and sustainable exploitation, and transparency on aquifer status.

Sources: World Bank project documents (Project P007713).

Drought

FIGURE J.17 Regional Breakdown—Most Drought Projects Are in Africa



Source: IEG water database.

TABLE J.20 Snapshot of Drought Project Portfolio Loan Commitments

Drought projects portfolio	Completed	Ongoing	Total number of projects	Total loan commitments (US$ billion)[a]	Percentage of total commitments
Projects focused on droughts with at least one drought objective	36	14	50	4.81	48
Projects with drought-related components	34	26	60	5.14	52
Total number of projects	70	40	110	9.96	100

Source: IEG water database.

a. This figure represents the total size of the loans, not the specific cost of the drought-related components.

TABLE J.21 Implementation Activity Results for Drought Mitigation

Category/activity	Total number of projects for which data were found	Meet or exceed appraisal expecta-tions	Meets 50–99% of appraisal expecta-tions	Meets less than 50% of appraisal expecta-tions	Percentage[a]
Agriculture					
Support for agricultural extension, scientific and/or economic studies and research (soils)	2	2	0	0	100
Water reuse in agriculture	1	1	0	0	100
Support the breeding of drought-resistant animals	5	4	1	0	80
Erosion prevention through reforestation	2	1	1	0	50
Construction and rehabilitation of irrigation water supply schemes (systems and related equipment)	21	6	8	7	29
Provision of animal-related essential supplies	4	1	3	0	25
Support for agricultural extension, scientific and/or economic studies and research (agriculture and irrigation related)	18	4	6	8	22
Promotion of improved soil management and conservation practices	6	0	4	2	0
Implementation of water efficiency and/or sustainable farming practices	1	0	1	0	0
Implement water conservation and efficiency measures/water harvesting	4	0	3	1	0
Control and treatment of animal diseases	2	0	2	0	0
Introduction of drought-resistant crops	3	0	1	2	0
Development of rain-fed irrigation systems	1	0	0	1	0
Environment					
Forest management/reforestation	5	3	0	2	60
Drinking water efficiency	2	1	1	0	50
Effluent and run-off management	2	1	0	1	50
Small earth dams construction and rehabilitation	5	2	2	1	40
Development of watershed management plans and policies	1	0	0	1	0
Social/human dimension					
Public awareness and education	3	3	0	0	100
Creation of new drought-related institutions	1	1	0	0	100
Monitoring equipment and supplies acquisition	1	1	0	0	100
Upgrading/modernizing/rehabilitating monitoring stations and facilities	4	3	0	1	75
Road construction/repairs	4	3	0	1	75
Technical assistance and training on monitoring	3	2	1	0	67
Installing new monitoring stations	5	3	2	0	60
Energy – new infrastructure/rehabilitation	7	4	3	0	57
Community drought preparedness technical assistance or training	4	2	1	1	50
Regularization of land tenure	2	1	0	1	50
Delegating O&M roles and responsibilities to beneficiaries (infrastructure schemes)	12	4	6	2	33
Community and user association financial/administrative/ management/drought preparedness technical assistance or training	6	2	0	4	33
Food security and nutrition/health training	3	1	2	0	33
Development of agricultural and water policies/reform	3	1	1	1	33
Establishing insurance policies and funds for climate risks	3	1	0	2	33
Financing income-generating activities for women and disadvantaged groups	15	4	9	2	27
Construction and rehabilitation of drinking water supply schemes	17	4	7	6	24
Institutional capacity building (drought specific)	5	1	1	3	20
New/improved agricultural practices/technologies technical assistance and training	7	1	3	3	14
Imposition/planning of cost recovery strategies, improved billing collection, financial management, for O&M of water infrastructure	7	1	2	4	14
Developing databases and information systems/data sharing and dissemination	1	0	1	0	0
Infrastructure-construction related technical assistance and training	4	0	2	2	0
Development of drought preparedness/management plans or procedures	2	0	0	2	0
Food security measures for disadvantaged groups	5	0	4	1	0
Groundwater related studies and research	1	0	0	1	0
Poverty reduction master plan development	2	0	0	2	0

Source: IEG water database.

a. Percentage of projects that meet or exceed appraisal expectations to the total number of projects for which data were found.

Preserving Environmental Flows

TABLE J.22 Projects Involving Environmental Flows

Project number	Country	Region	Project
P001340	Kenya	Africa	Third Nairobi Water Supply Project
P001361	Kenya	Africa	Second Mombasa and Coastal Water Supply Engineering and Rehabilitation Project
P001396	Lesotho	Africa	Lesotho Highland Water Project Phase 1A
P001409	Lesotho	Africa	Lesotho Highland Water Project Phase 1B
P001662	Malawi	Africa	Power V Project
P003492	China	E. Asia & Pacific	Daguangba Multipurpose Project
P008037	Peru	Latin America & Caribbean	Irrigation Subsector Project
P008821	Russian Federation	Europe & Central Asia	Environmental Management Project
P009127	Uzbekistan	Europe & Central Asia	Drainage, Irrigation, and Wetlands Improvement Phase I Project (Aral Sea Basin Program)
P009512	Bangladesh	South Asia	Second Small-Scale Flood Control, Drainage, and Irrigation Project
P010476	India	South Asia	Tamil Nadu Water Resources Consolidation Project
P036414	China	E. Asia & Pacific	Guangxi Urban Environment Project
P038570	Tanzania	Africa	River Basin Management and Smallholder Irrigation Improvement Project
P039015	Mozambique	Africa	National Water Development I
P039281	Pakistan	South Asia	Ghazi-Barotha Hydropower Project
P040185	China	E. Asia & Pacific	Shandong Environment Project
P040610	India	South Asia	Rajasthan Water Sector Restructuring Project
P045864TF023406 (GEF TF number)	Cambodia, Lao PDR, Thailand, and Vietnam (Mekong River Commission)	E. Asia & Pacific	Water Utilization Project
P046042	Kyrgyz Republic	Europe & Central Asia	Irrigation Rehabilitation Project (Aral Sea)
P046045	Kazakhstan	Europe & Central Asia	Syr Darya Control and Northern Aral Sea Phase-I Project
P046563	China	E. Asia & Pacific	Second Tarim Basin Project
P046648	Mali, Mauritania, & Senegal	Africa	Regional Hydropower Development Project
P049290	Lao PDR	E. Asia & Pacific	Nam Theun 2 Social and Environment Project (NTSEP)
P056424	China	E. Asia & Pacific	Tongbai Pumped Storage Project
P058067	Sri Lanka	South Asia	Second Community Water Supply and Sanitation Project, Volume 1

	Project appraisal document date	Original amount (US$ million)	Assessment components
	Jul-89	64.8	Environmental Assessment (EA), Social Assessment (SA), Environmental Flow Assessment (EFA)
	Dec-91	43.2	Environmental Impact Assessment (EIA; quite extensive)
	Jul-91	110	EIA (covered this and phase 1B)
			EFA
	Dec-00	55	EA considers the issues that an EFA would consider. Does not quantify flows. More qualitative assessment.
	Sep-91	30 loan, 37 credit	Water quality, fish impacts, afforestation
	Jun-96	85	Institution/law
	Oct-94	110	An analysis similar to an EFA, including all parts of the hydrologic cycle, such as precipitation, snow melt, overland runoff, groundwater infiltration, groundwater discharge, well pumpage, reservoir regulation, diversion of surface water for water supplies and industries, discharge of point sources, and evaporation. The conceptual model will include, where possible, spatial variability; seasonal variability; long-term trends; daily, seasonal, and annual loads; and the source, cause, transport, fate, and effect of contaminants in the basins; when the data do not allow quantification of source, cause, transport, fate, and effects, hypotheses will be identified to provide guidance for designing a new monitoring program.
	May-03	Credit 25, loan 35	EA, plus SA and CH assessment.
	Dec-87	81.5	Hydrological analysis
	May-95	282.9	Institutions/law; operational hydrology assessment
	May-98	72 loan, 20 credit	Economic, environmental, and social assessments
	Jun-96	26.3	Hydrological assessment, floods and droughts studies, WRM study, rapid water resources assessment
	Dec-97	36	EA, river basin and groundwater studies, studies measuring flow and diversion, and prefeasibility studies including field exploration; EAs of proposals for works and changed river management rules, proposals for environmental monitoring of water resources
	Nov-95	350	Detailed studies and evaluations of the potential hydrological and ecological impacts of reduced flows
	Sep-97	95	EA
	14-Apr-03	140	Institution/law
	Jan-00	11	EFA law
	Mar-98	35	EA
	May-01	64.5	SA, EA, preparatory study (EFA-like)
	Apr-98	90 (started) 150 (ended)	EIA, social impact assessment (SIA), hydrological modeling studies
	Jun-97	38.7 (17.1 Mali, 11.1 Mauritania, 10.5 Senegal)	Cost benefit study, reservoir management study, and water charter (acts as living EFA)
	2005		Riparian release study, hydrology study, CIA, EA, SA
	Dec-99	320	EA as EFA—Important to note that EAs sometimes only show what the impacts of the project might be. They do not determine environmental flows; pp. 85-88 shows the EFA-like results.
	ongoing	39.8	River basin-level study

(*Table continues on the following page.*)

TABLE J.22 Projects Involving Environmental Flows (*continued*)

Project number	Country	Region	Project
P060474	Bolivia	Latin America & Caribbean	Sustainability of the National System of Protected Areas Program, Phase I
P064573	Senegal	Africa	Senegal River Basin Water and Environmental Management Project
P071170	Iran, Islamic Rep.	Middle East & N. Africa	Alborz Integrated Land And Water Management Project
P073397	Tanzania	Africa	Lower Kihansi Environmental Management Project
P075035	China	E. Asia & Pacific	Hai Basin Integrated Water and Environment Management Project
P076445	Lao PDR	E. Asia & Pacific	Nam Theun 2 Hydroelectric Project
P078220	Colombia	Latin America & Caribbean	Amoya River Environmental Services
P080093	Ecuador	Latin America & Caribbean	Ecuador Netherlands Clean Development Facility (NCDF) Umbrella Project
P086505	China	E. Asia & Pacific	Ningbo Water Management Project or "Ningbo Water and Environment Project"
P086903 and P086801	Sierra Leone	Africa	Completion of the Bumbuna Hydroelectric Project Under a PPP
P087964	Serbia and Montenegro	Europe & Central Asia	Serbia Irrigation and Drainage Rehabilitation Project
P088671	Kyrgyz Republic	Europe & Central Asia	Water Management Improvement Project
P089659	Uganda	Africa	Private Power Generation (Bujagali) Project
P092015	Chile	Latin America & Caribbean	Quilleco Hydropower Project Purchase of Certified Carbon Emissions Reductions by the Netherlands Clean Development Mechanism Facility

Source: IEG water database.

	Project appraisal document date	Original amount (US$ million)	Assessment components
		15	Ecosystem analysis/institution-building
	Oct-03	5.26	EA (TEA and TDA)
	Feb-05	120	Studies of river morphology, water flows, and quality comprehensive set of ecological monitoring, survey, and analytical studies
	May-01	6.3	EMP; task force to investigate the scope for a modified environmental flow regime; ecosystem monitoring.
	Mar-04	17	Studies to determine minimum ecological flows, water ecological environment monitoring systems
	Mar-05	20 Credit, 50 IDA Guarantee, 200 MIGA Guarantee	EIA, SIA, fish studies
	May-04	7.5	Water cycle study to document water flows and sources, including: * Collection of river flow and rainfall data * Water cycle and water balance modeling * Formulation of scenarios incorporating anticipated local and global changes
	Dec-04	7.47	Ecological flow review
	Feb-05	130	EFA
	May-05	38 (partial risk guarantee) 12.5 (grant)	EA, EIA, RAP, contractor EMPS, biodiversity studies, fish species study; an amenity or environmental flow maintained
	Jun-05	25	EA
	Mar-06	19	EA, EMP
	Mar-08	115 IDA PRG, 100 IFC "A" Loan, 30 IFC "C" Loan, 115 MIGA	Hydrological assessment, EA
	May-06	2.4	EFA (instream flow increase methodology)

TABLE J.23 The Costs and Benefits of EFAs

Location	Cost	Benefits
China Hai Basin	US$0.858 million (WB) US$2.1 million (total) (ongoing project)	Determining minimum flows and their scheduling: • Helps ensure that the Bohai Sea, with its globally important ecological resources, will continue to provide significant fishery benefits to China, Korea, Rep., and Korea, Dem. People's Rep., and Japan • Allows minimum flows to be factored into the planning process • Helps develop priorities for follow-up actions • Helps maintain ecological functions • Helps reduce pollution to preserve environmental uses of water • Helps in the effort to control toxic pollutant loads • Helps avoid overuse of surface water • Aids in the arrest of the decline and deterioration of water resources and damage to freshwater in coastal environments in the Hai Basin • Saves the Bohai ecosystem and fishery resource • Preserves this seasonal spawning and nursery ground for the larger and more productive Yellow Sea
Ecuador	Funded by the Bank-Netherlands Water Partnership Program Figures not available Ongoing project	• The EFA saved three species of rare and endangered fish from harm. The species most affected by the water diversion is the prefiadilla (*Pinielodes cyclopum*), a small fish that does not migrate significantly. The prefiadilla survives in turbulent high-quality waters and tends to hide in small lateral creeks under critical conditions. The flow regulations were altered accordingly • The EFA helped mitigate the impacts of the project on the natural distribution of aquatic species, migratory events, and food web interactions within the watershed
China Tarim Basin	Figures not available	• Development of a mechanism for defining the rights to water, including the in-stream environmental needs, and effective monitoring systems drives sensible investment in water-saving measures, conjunctive use of surface and groundwater, water quality improvements and drainage • Analyses allowed evaluation of overall river basin management options, and sub-basin investment and operation proposals to ensure adequate water availability for downstream purposes • Development of a mechanism for defining the rights to water, including the in-stream environmental needs, and effective monitoring systems can drive sensible investment in water-saving measures, conjunctive use of surface and groundwater, water quality improvements and drainage Policy and legal frameworks developed as part of the project, and institutional reforms meant that the Tarim Basin Water Resources Committee (TBWRC) was able to monitor and control water extraction and ensure minimum environmental flows. As a result: • Water deliveries to the "Green Corridor" recreated 200 square kilometers of terminal lake systems • Water table rose between 3.2 meters and 12.6 meters in the lower river reach • The mineral content of the groundwater has improved dramatically, from 4–5 grams per liter to 2–3 grams per liter • The trees, shrubs, and grasslands have been revitalized on both sides of the river, providing food, shelter, and water for wildlife and people • The lower river has seen a return of 25 species of native birds, amphibians, reptiles, and 11 species of fish. Other wildlife, such as red deer, have also returned • Dramatic revitalization in the growth of trees
Tanzania	Figures not available	• The droughts studies informed the water-use policy formulation process by determining, inter alia, river flow characteristics • The impacts of unregulated abstraction were lessened by minimum flow maintenance
Lower Mekong Basin	Basin modeling and institutional knowledge base US$9.9 million	• Provide a "unifying framework" for assessing the ecosystem needs as part of the river basin management • Help avoid changes in flows and salinity from, inter alia, deforestation, dams, increased abstraction for irrigation • Help protect the Tonle Sap fishery, which provides jobs to 1.2 million people • Help avoid increased flood frequency and peaks in the rainy season • Help avoid exacerbated drought conditions and therefore rice production[a]

a. http://www-esd.worldbank.org/bnwpp/documents/3/EnvironmentalFlowCaseStudy.pdf

Water Quality Management

TABLE J.24 The Top 20 Approaches to Water Quality Management

Activities pursued	Projects approved since 1997 that include this activity
Technical assistance and training for water quality improvement	**333**
Development of plans, policies, and regulations to improve water quality management	**211**
Construction of new potable water systems	174
Construction of new sanitary systems	153
Control or treatment of polluted water	98
Storm and flood control (drainage)	83
Irrigation	68
Public awareness campaign on the use of improved water for drinking and to avoid pollution	**64**
Information management	**63**
Transportation	41
Watershed protection and management	42
Provision of in-household installations	41
Commercial development of water-related business	40
Water for energy	33
Ocean/coastal/wetland pollution	33
Attention to aquatic biodiversity	29
Installing water or sanitation in public facilities	24
Monitoring of groundwater	15
Water recycling	6
Bacteriological control	6

Source: IEG database, ***n***=423 (projects approved 1997–2007).

Note: Activities in **bold** text are considered software.

TABLE J.25 Water Quality Management—Taxonomy of Activities

Activity	Subactivity
Construction of new potable water systems	a. Installation of pipes and household connections b. Development of reservoirs c. Construction of water treatment facilities d. Protection of the drinking water supply e. Expansion of existing water systems f. Provision of pumps and/or other equipment, construction of gravity systems g. Installation of water filters for surface water, rain harvesting h. Dam expansion or strengthening i. Construction of wells, tube wells, and related infrastructure
Construction of sanitary systems	a. Construction of sewage treatment plants b. Construction of sewer systems c. Connecting households to system d. Expansion/augmentation of existing systems e. Installation of sewage flow meters
Provision of in-household installations	a. Provision of latrines, toilets, sinks, baths, and the like
Installing water or sanitation in public facilities	a. Provision/ of potable water to schools, health facilities, or public offices b. Installation of bathrooms/latrines and sinks for schools, health facilities, or public offices

(*Table continues on the following page.*)

TABLE J.25 Water Quality Management—Taxonomy of Activities (*continued*)	
Activity	**Subactivity**
Monitoring of groundwater	a. Monitoring quality of aquifer water b. Monitoring aquifer depth c. Monitoring, preventing, or studying salinity d. Monitoring transboundary aquifers
Control or treatment of polluted water	a. Control or treatment of leachate from solid waste sites b. Control or treatment of industrial runoff or wastewater c. Control or treatment of agricultural drainage water or runoff d. Control of the quality of water provided to croplands e. Closing facilities that pollute f. Measuring or limiting use of fertilizers g. Relocation of water-borne pollutants h. Clean up of marine oil spills i. Construction of road microcatchments to prevent erosion j. Improved manure management practices k. Promotion of aqua-friendly agriculture l. Reuse of treated water (except for agriculture) m. Dewatering n. Construction of sludge treatment or disposal facility o. Roadside soil erosion prevention p. Promotion of cleaner industrial practices q. Stabilization of waste ponds containing pollutants r. Invasive species control (hyacinths) s. Planting of forests
Irrigation	a. Promotion of irrigation efficiency b. Rehabilitation of irrigation schemes c. Use of tube wells to extract groundwater d. Reuse of treated water for irrigation e. Microcatchment system development f. Construction of small irrigation schemes g. Conversion of irrigation schemes pump to gravity h. Hill dams construction for irrigation i. Construction of pressurized irrigation j. Pumping station rehabilitation/expansion k. Promotion of improved techniques for rain-fed farming
Storm and flood control (drainage)	a. Construct storm drainage b. Construct water channels c. Dredging d. Lining of watercourses e. Construction of retaining walls f. Construction for flood prevention dikes g. Rehabilitation of existing drainage systems h. Construction of new drainage systems or components i. Desalting basin construction/improvements
Attention to aquatic biodiversity	a. Fisheries rehabilitation b. Protection of coastal spawning grounds c. Promotion of dryland biodiversity to protect wetlands or water
Commercial development of water-related business	a. Support for fishermen b. Commercialization (fish and seafood) c. Support for disadvantaged stakeholders

Activity	Subactivity
Watershed protection and management	a. Forest management /reforestation b. Rangeland c. Erosion control d. Nurseries e. Vegetative cover restoration f. Agricultural pollution management mechanisms with manure improved practices to prevent nitrates going into waters g. Transboundary cooperation h. Small earth dams construction i. Improved soil management practices to prevent loss of grasslands and biodiversity
Development of plans, policies, and regulations	a. Support for scientific and economic research/ studies for project preparation or to develop policies b. Support for professional education c. Master plan development d. Development of standards and methodologies e. Definition of procedures and standards f. Development of monitoring methods g. Imposition/planning of tariffs, fees, funds, cost recovery strategies, improved billing collection, financial management, financial planning, creation of revolving funds, cost recovery schemes
Public awareness	a. Education campaigns b. Schools, education, environmental-related curriculum c. Information dissemination in websites, other publicity
Technical assistance and training	a. For project preparation (experts, best practices) consulting services b. For project management (monitoring equipment)/to manage studies, to set up labs c. Capacity building, training for government officials d. Institutional-level capacity building i.e. Equipment, knowledge, improved authority and administration/ management schemes.
Information management	a. GIS systems, database (design, data entry, and use), environmental monitoring b. Laboratory data/monitoring c. Other
Water recycling	a. In agriculture b. Other uses domestic uses, such as toilets c. Industrial uses
Water for energy	a. Hydropower plants construction b. Rehabilitation or expansion of plants c. Oil distribution/equipment acquisition d. Monitoring hydrocarbons in water e. Construction of CHP generation/ steam facilities
Transportation	a. Roads and highways construction b. Rural roads/small-scale road construction/improvements
Bacteriological control	a. Chemical treatment to control water-borne diseases b. Protection of the food supply c. Decontaminating fruits and vegetables d. Floating plants as indicator of water quality e. Non-chemical alternatives for pest management
Ocean/coastal/wetland pollution	a. Monitoring b. Preventing c. Treatment d. International transboundary protection e. Restoration

Source: IEG water database.

TABLE J.26 Non-Point-Source-Related Projects Are Mostly Focusing on Implementing Efficiency in Irrigation, Reforestation, and the Construction of Drainage Systems

Top-five implemented activities in non-point-source projects	Most common implemented strategic approach (top in the list)	Total number of projects implementing this approach, frequency count
Technical assistance and training	Institutional-level capacity building; that is, equipment, knowledge, improved authority, and administration/ management schemes	151
Development of policies and regulations	Support for scientific and economic research and studies for project preparation or to develop policies	76
Irrigation	Promotion of irrigation efficiency	54
Storm and flood control (drainage)	Construct storm drainage	29
Watershed protection and management	Forest management/reforestation	39

Source: IEG water database.

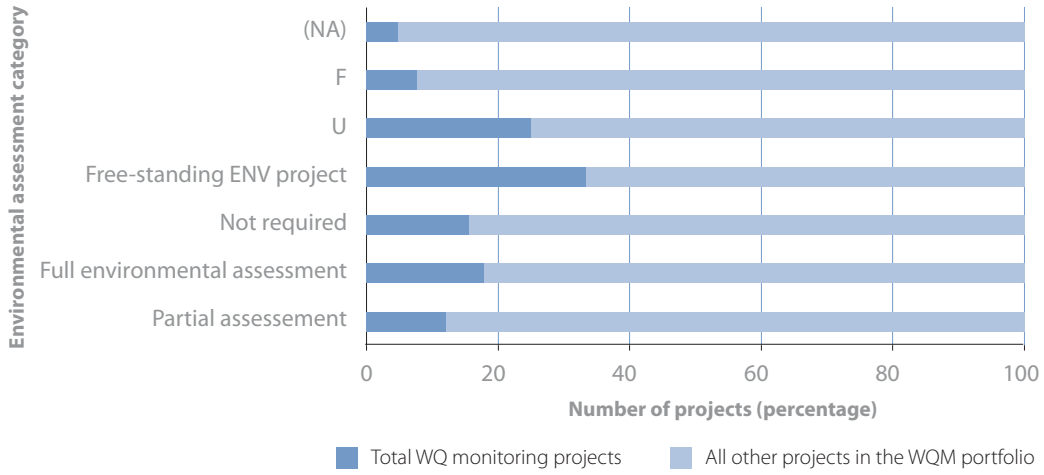
Water Quality Monitoring

TABLE J.27 Environmental Assessment Category Analysis of Water Quality Monitoring Projects Compared with All Other Projects in the Water Quality Monitoring Portfolio

	All other projects in the water quality management portfolio			Total projects that monitored water quality		
Environmental assessment category	Completed	Ongoing	Total number of projects (*n*=629)	Completed	Ongoing	Total number of projects (*n*=102)
Partial assessment B	216	149	365	28	22	50
Full environmental assessment A	56	73	129	16	12	28
Not required	73	19	92	13	4	17
Freestanding ENV project	8		8	3	1	4
U	2	1	3	1		1
F	1	11	12		1	1
(NA)	2	18	20		1	1

Source: IEG water database.

FIGURE J.18 Projects Conducting Full Environmental Assessments Are Not Implementing the Most Water Quality Monitoring Projects



Source: IEG water database. *n*=731. Water quality monitoring projects (*n*=102), all other projects in the WQM portfolio (*n*=629)

TABLE J.28 Snapshot of Monitoring Activities at the Bank

Water quality management activities	Total number of projects	Percent
All projects that intended to monitor water quality	61	100
A monitoring process was begun that continued (at least) until project closing, or a monitoring system was designed	55	90
Projects that reported collecting water quality data	48	79
Projects that used appropriate data parameters given the nature of objectives	40	66
Projects that reported improved water quality	29	48

Source: IEG water database.

Note: *n*=61.

TABLE J.29 Water Quality Monitoring Analysis: Where Is Monitoring Taking Place?

Subsector category	All other projects in the water quality management portfolio (*n*=629)	Total projects that monitored water quality (*n*=102)	Sum of all projects by subsector	Percentage of water quality monitoring by subsector
Petrochemical and fertilizer	4	2	6	33
Oil & gas	7	3	10	30
Mining & other extractive industries	14	5	19	26
Other industry	28	9	37	24
Forestry	19	5	24	21
Sewerage	88	21	109	19
Central government administration	223	51	274	19
Animal production	25	5	30	17
Sanitation	66	13	79	16
Agricultural extension and research	71	13	84	15
Power	40	7	47	15
Water supply	154	23	177	13
Health	42	6	48	13
Ports/water/shipping	14	2	16	13
Flood protection	48	6	54	11
Irrigation and drainage	99	11	110	10
General water/sanitation/flood sector	92	10	102	10
General agriculture/fisheries/forest sec	92	10	102	10
Agro-industry	16	1	17	6
Roads and highways	122	1	123	1
Crops	23	0	23	0

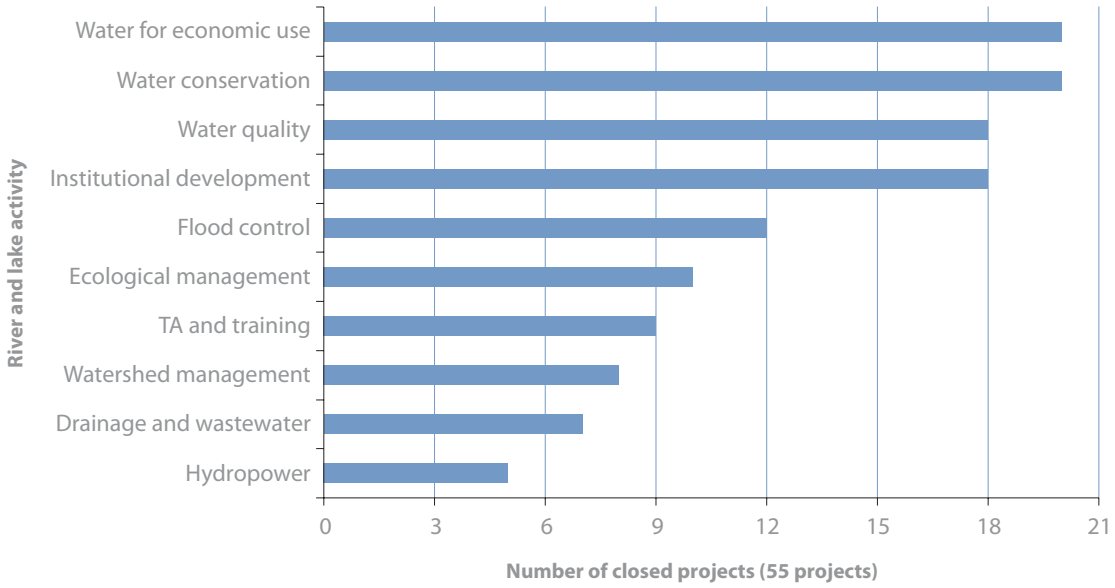
Source: IEG water database.

TABLE J.30	Project Documents Show Little about the Effectiveness of Monitoring Systems
Project ID	**Monitoring systems, sampling and analysis methods**
P057927 (Bulgaria)	Industrial monitoring systems were established. Monitoring data is generated on industrial effluent waters. Sampling is described in project documents as "regular." There is no report of analysis methods, but the data collected are sent to the regional inspectorates.
P046838 (Kenya)	A "network of monitoring spots in the lake and rivers" was installed in three neighboring countries. A water quality analysis laboratory exists that is "functioning" and "operational." Multiple sample-gathering sites have been "harmonized" within the water quality monitoring network. Sampling is described as "episodic," which could be interpreted as suboptimal given that management measures for pollution reduction were identified but not developed or implemented.
P034081 (China)	A "complete environmental monitoring system" was installed for the duration of the project. The documents indicate that monitoring tasks were assigned to technical institutes. Sampling methods are not described in detail. Documents mention the generation of "large amounts of monitoring data" that were used to take corrective actions to resolve "environmental issues." Sampling is described as being "periodic" and "systematic."
P010485 (India)	A set of "rational networks" was installed for "the first time" for surface and groundwater monitoring. Documents do not describe the sampling techniques utilized but mention the use of "state-of-the-art" equipment and note that "standards for sample collection" had been developed. Hydrological information is said to be collected and banked "systematically." Other "historical data" were computerized, but agencies have only been able to "partly validate" it.
P009906 (India)	A "network of air and water quality monitoring stations" was established. It is doing "routine" sample collection and performing analysis. The monitoring tasks were assigned to certified laboratories. They are supposed to run "legal" and "random cross-testing of private lab tests" as well as "surprise testing of industries." A database is mentioned. It collects inventory data on industries, types of waste, brands of equipment, costs of controlling pollution "monitoring equipment costs, availability, and suitability."
P008586 (Poland)	"Four mobile groundwater monitoring stations" are said to be producing "regular reliable" information on groundwater quality for use in policy making. The sampling techniques are not described in detail, but the project was going to demonstrate "new techniques to monitor groundwater on an operational level." Computer systems were introduced to equip and modernize three new GIS "environmental laboratories."
P007846 (Panama)	One new laboratory and the upgrade of six existing ones was done to support "ongoing water quality testing programs that had stopped" due to a lack of funding. No further details are mentioned on the types of tests conducted or data parameters used. According to the documents, the water quality control program was supposed to conduct the monitoring on a "systematic basis" but it had actually done it based on an "on demand [basis] from communities."
P005347 (Morocco)	Sampling of effluent quality was going to be analyzed to ensure that it would be complying with the MARPOL 73/78 Convention standards. Three governments and the Bank negotiated an agreement that by a set date, and "under TOR acceptable to the Bank," a laboratory would conduct "analysis and produce a report on the findings of the analysis every three months." Governments gave assurances that this would occur but no further information was found in documents to determine the outcome of the monitoring activities.
P005237 (Jordan)	Monitoring of marine water quality is reported to be "regular." The documents do not mention the sampling methods used. Monitoring equipment that was purchased for the project is "functioning" and providing "monthly reports on monitoring data" that are being sent to local authorities. A GIS division that was created was reported to have been "completed beyond expectations," which is supporting authorities in planning and decision making and "sharing the results [of aquifer monitoring] with its neighbor," which could be interpreted as a neighboring country.
P005146 (Egypt, Arab Rep.)	A "routine monitoring network for drainage water quality in the Nile Delta and Fayoum" was established. Three laboratories were built and "two regional units were established" to monitor water quality "using a "'before' and 'after' drainage approach." "Chemical, physical and biological" analyses are being done of the collected water samples; these are mentioned as having taken place during the project. No further information is given on the frequency of these analyses or the frequency of other "site investigations of groundwater pollution" implemented, although it is mentioned that a publication was developed that helped local authorities to "integrate qualitative and environmental aspects in the management and development of groundwater resources."
P004938 (Algeria)	A "monitoring program for water salinity/quality" and quantity was created. The documents state that "useful data are now available for developing improved methodologies and strategies." Nevertheless, the information available indicates that "more analytical and preparatory work needs to be carried out for the full benefits of these studies." The Government had given assurances that it will continue drainage and groundwater quantity and quality monitoring activities which were "foreseen this year." Documents on the implementation of the project outline "limited" "usefulness" of studies given that they were not deemed to be sufficient to develop a master-plan.

Project ID	Monitoring systems, sampling and analysis methods
P004871 (Algeria)	Sampling of effluent quality was going to be analyzed to ensure that it would be complying with the MARPOL 73/78 Convention standards. Three governments and the Bank negotiated an agreement that by a set date, and "under TOR acceptable to the Bank," a laboratory would conduct "analysis and produce a report on the findings of the analysis every three months." Governments gave assurances that this would occur, but no further information was found in documents to determine the outcome of the monitoring activities.
P004799 (Thailand)	Water quality monitoring studies done during the "pre-project phase" had helped to determine that "water quality in the reservoir had not measurably changed, " according to documents. These studies are mentioned will be continued "four times each year for five years." Data on parameters used is not given but it is mentioned that "six new environmental monitoring systems" had been acquired, which with the use of an "Integrated Environmental Management Information System" provided capacity to analyze data "required for environmental studies and analysis."
P003632 (China)	"Automatic, transboundary water quality monitoring stations" were installed to monitor water in 20 cities in 12 provinces/ regions within the central and western regions of the country. A "satellite communications system" links these stations to the local authority in charge of monitoring the water quality of nine major lakes. No further information is mentioned on the monitoring/testing methods. This system, however, is described as having assisted to "strengthen" the capacity of participating authorities, which were able to increase the number of "scientific papers" and competency to develop other "key projects."
P003602 (China)	Water quality monitoring and data management equipment was procured to strengthen the capacity of the local Environmental Monitoring Center, which is in "operation and responding to national and provincial demands." Methods of analysis the data are not given in documents. Nevertheless, "training" of staff in environmental management is mentioned as an "important aspect of this component." It is also mentioned that air and water quality monitoring is to be performed "regularly and reliably."
P003586 (China)	A water quality monitoring laboratory with equipment to monitor water quality near a water supply intake was built. The laboratory is sampling water and analyzing a "range of specific micropollutants." Monitoring data "has been enhanced by the provision of LIMS (laboratory information management systems)" and it is mentioned that a set of monitoring indicators were developed which are "reported regularly by SEPO."
P003585 (China)	The SIWMS [water monitoring system] was built and equipped and "gradually put into use." The documents estimate that the system in place can "precisely monitor 40 percent of industry wastewater from important industrial pollution sources and accurately monitor 100 percent of urban sewage waste water on a real-time basis." All gathered data are being sent to a management center "in time" and information was expected to be made available to the public. It was suggested that the system "should" support the "enforcement of regulations on water quality."
P002175 (Nigeria)	The monitoring system consists of an industrial database and map that provided baseline data for industrial effluent and other industrial emissions to improve the quality of water bodies in Lagos State. It is mentioned that this system facilitates "effective pollution control of industrial discharges." The use of the map helped to "enforce effluent limitation, standards, and guidelines." The government developed a monitoring program in "13 mini and major water works" and the monitoring is done "3 times weekly for physical, chemical, biochemical, microbiological" parameters. Rivers and streams are sampled " 3 times weekly. Groundwater pollution is sampled "twice weekly."

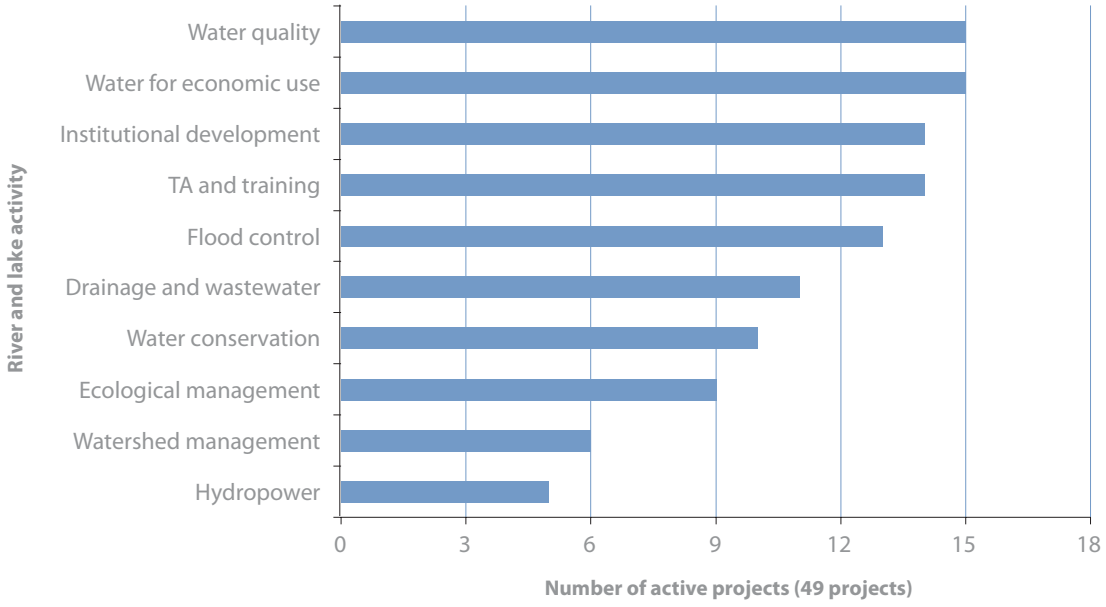
Source: IEG water database.

FIGURE J.19 Distribution of River and Lake Objective Categories among All Completed Projects



Source: IEG water database.

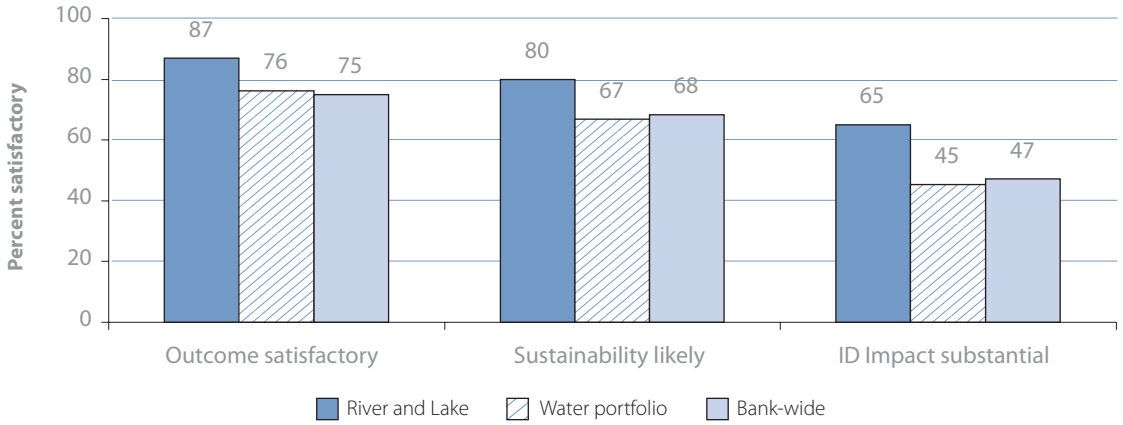
FIGURE J.20 Distribution of River and Lake Objective Categories among All Active Projects



Source: IEG water database.

IEG Outcome Ratings for Rivers and Lakes Projects

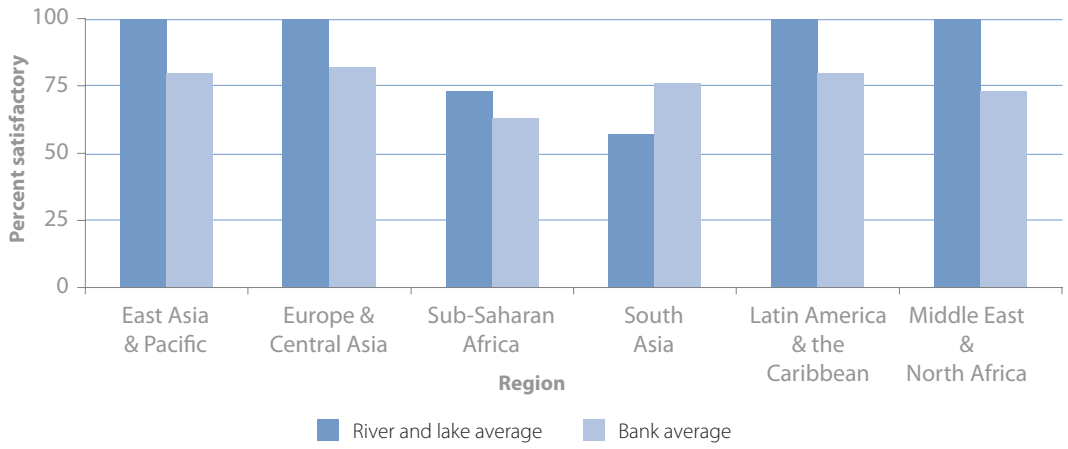
FIGURE J.21 The River and Lake Portfolio Performs Better than Average on Outcome, Sustainability, and Institutional Development Impact



Source: IEG water database.

IEG Outcome Ratings by Region

FIGURE J.22 The South Asia Region Performs Significantly Worse than Other Regions in the Bank When It Comes to River and Lake Management, Exit Fiscal 1997–2007



	IEG outcome			
	River and lake projects		All projects	
	Number of projects	Percent satisfactory	Number of projects	Percent satisfactory
East Asia & Pacific	14	100	450	80
Europe & Central Asia	11	100	584	82
Africa	11	73	759	63
South Asia	8	57	290	76
Latin America & Caribbean	5	100	646	80
Middle East & N. Africa	1	100	237	73
Total	43	87	2,966	75

Source: IEG water database.

Note: The relationships between the ratings of the following Regions was statistically significant at the 95% confidence level: South Asia & East Asia & Pacific; South Asia & Europe & Central Asia; East Asia & Pacific & Europe & Central Asia; East Asia & Pacific & Latin America & Caribbean; East Asia & Pacific & Middle East & N. Africa; Europe & Central Asia & Latin America & Caribbean; Europe & Central Asia & Middle East & N. Africa; Latin America & Caribbean & Middle East & N. Africa.

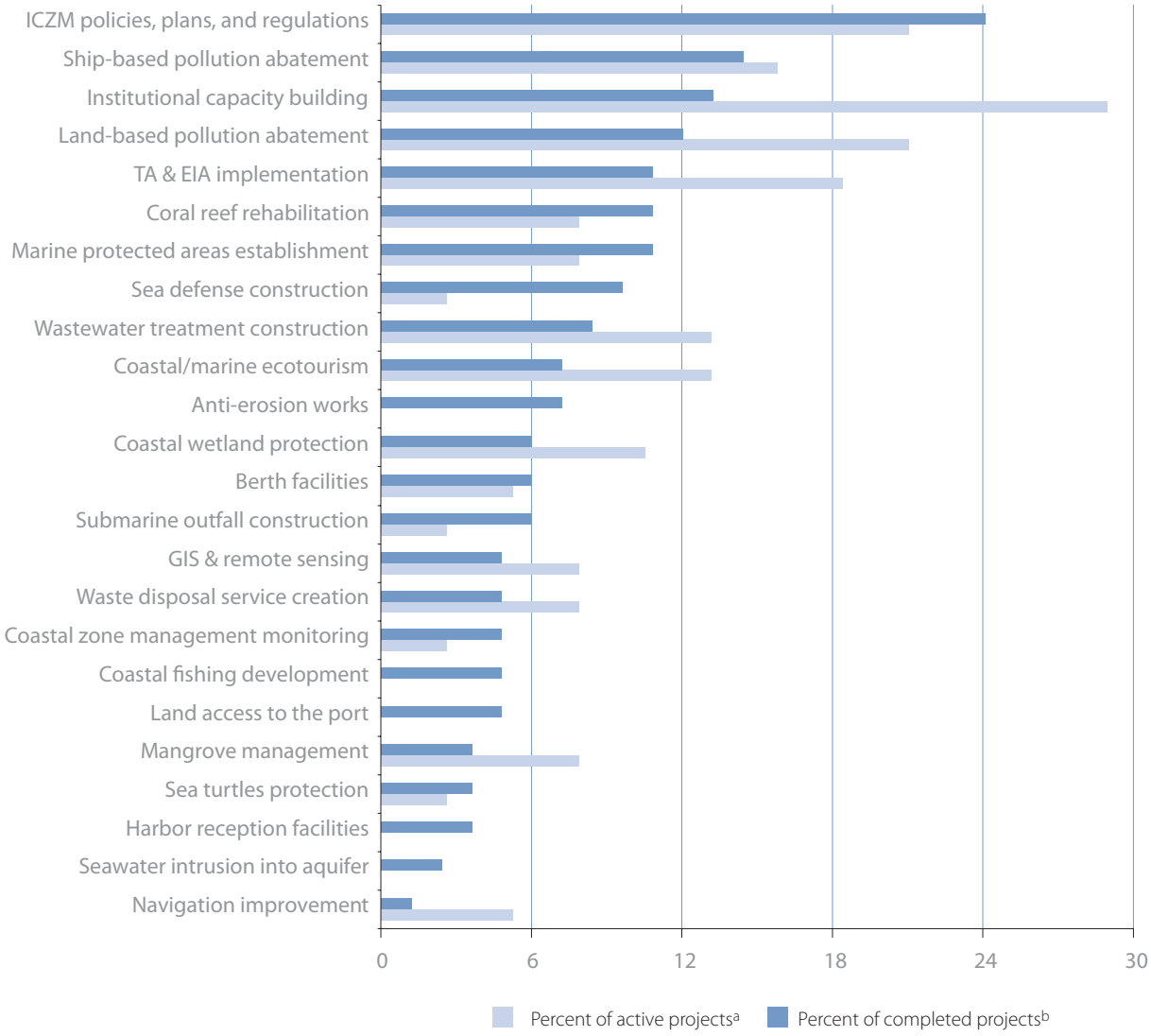
TABLE J.31 The Most Common Project Results for Rivers and Lakes

Positive results	Number of projects	Negative results	Number of projects
Access to water supply was improved or the amount of water available increased	14	No financial incentive was created for conservation or water pricing targets were not met	13
Riverine areas were reforested	12	Water pollution levels unchanged by project closing	12
Institutional reorganization took place	11	Weak existing legal framework slowed implementation	10
Embankment strengthening works took place	10	Agricultural production and/or irrigation rehabilitation did not meet its appraisal targets	9
Water availability was increased through upgrading physical infrastructures (need for conservation reduced)	10	Unaccounted-for water or water lost in transport increased during project implementation	9
New water quality analysis laboratories established or capacity expanded at existing laboratories	9	Technical assistance was of inadequate quality (example, infrastructure collapsed)	9
Flood monitoring and forecasting systems were installed	8	WSS services not improved enough in certain project areas to permit anticipated economic use of water	9
New power stations (hydropower plants) were built or existing ones upgraded	8	Institution strengthening did not take place	9
Water measuring devices (or gauging stations) were installed	7	Implementing agencies failed to coordinate	7
Flood risks were reduced by increasing bridge clearances and/or roadbed height	7	Water losses remained unchanged after project closure	5
Training was of good or acceptable quality	7	Infrastructure design did not respond to stakeholder priorities	5
Basin-level management institutions were established	6	Flood control structures constructed by project were destroyed by a flood	5
Water quality was improved through expansion of WTP	6	Species targeted for conservation actually declined in number	4
Erosion was eliminated in slope-lands through terracing, barrier construction, or other agricultural practices	6	Afforestation appraisal target was not met	4
Untreated runoff or dumping of solid waste stopped	6	Water quality deteriorated due to untreated domestic wastewater	3
Capacity of water treatment plants was increased	5	Treatment of non-household effluents did not take place	3
River or watercourse capacity increased or river channels deepened by dredging	5	Training target group missed, or trainees had excessively poor attendance	3
Wetlands were restored	4	Training had no impact because trainees lacked critical prerequisites	3
Flood hazards were eliminated through dam construction	4	Research results intended for sharing were not disseminated	3
Illegal fishing declined	4	No data was produced to verify water quality improvements	3
New parklands created to conserve species	4	Maintenance essential for water conservation did not take place	3
Pollution load was reduced through construction of new disposal sites or landfills	4	Insufficient data to confirm that flood risks were reduced	3
Sediment control dams were built	4	Ecological problem addressed by project remained unchanged after project closure	3

Source: IEG water database.

Coastal Zones

FIGURE J.23 Coastal/Marine Activities in Bank-Financed Projects



a. 38 active projects

b. 83 completed projects

Chapter 5

Water Supply, Sanitation, and Sewerage

TABLE J.32 Top 25 Activities for all Water Supply, Sanitation, and Sewerage Projects

Activity	Number of projects
Institutional strengthening/capacity building[a]	166
Rural water supply and sanitation[a]	149
Urban water supply and sanitation[a]	148
Technical assistance[a]	110
Environmental management	73
Studies	69
Training	69
Wastewater treatment	66
Financial capacity building	49
Equipment purchase	47
Pollution abatement	46
Operations and maintenance	44
Poverty-targeted intervention	43
Community or beneficiary participation	42
Rehab water supply[a]	41
Water quality improvement	40
Community-driven development (CDD)	39
New sewers	38
New pipes	37
Policy	36
Project management	36
Construction of general drainage	34
Private sector participation	33
Construction of new potable water systems	32
Privatization	30

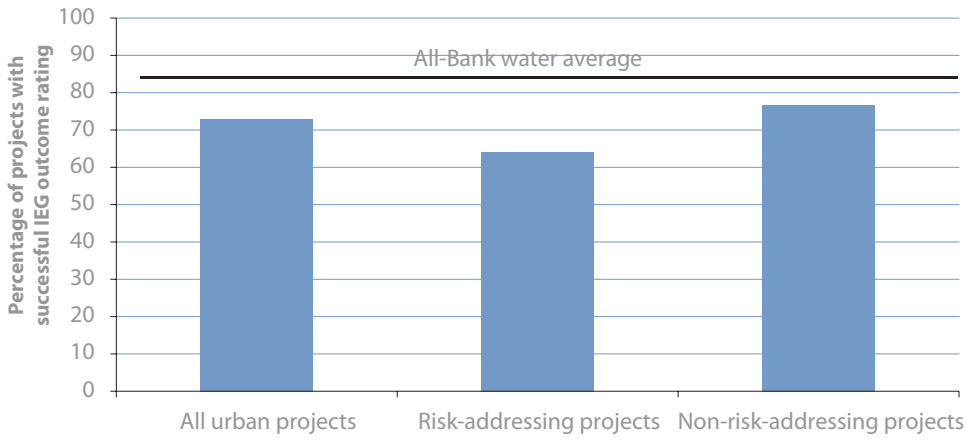
a. Activities were put in this general category when no further detail was available in the component description to allow us to categorize it more specifically.

Urban Water Services

TABLE J.33 Subsectors in the Urban Water Supply and Sanitation Portfolio

Sector	Number of urban water projects	Percentage of urban water projects
Access to urban services and housing	287	52
Pollution management and environmental health	235	42
Water supply	229	41
Municipal governance and institution building	201	36
Sewerage	149	27
Water resource management	129	23
Municipal finance	81	15
Infrastructure services for private sector development	74	13
Sanitation	72	13
Power	71	13

FIGURE J.24 Outcome Ratings of Risk-Addressing Urban Water Projects



Source: IEG water database.

Sanitation

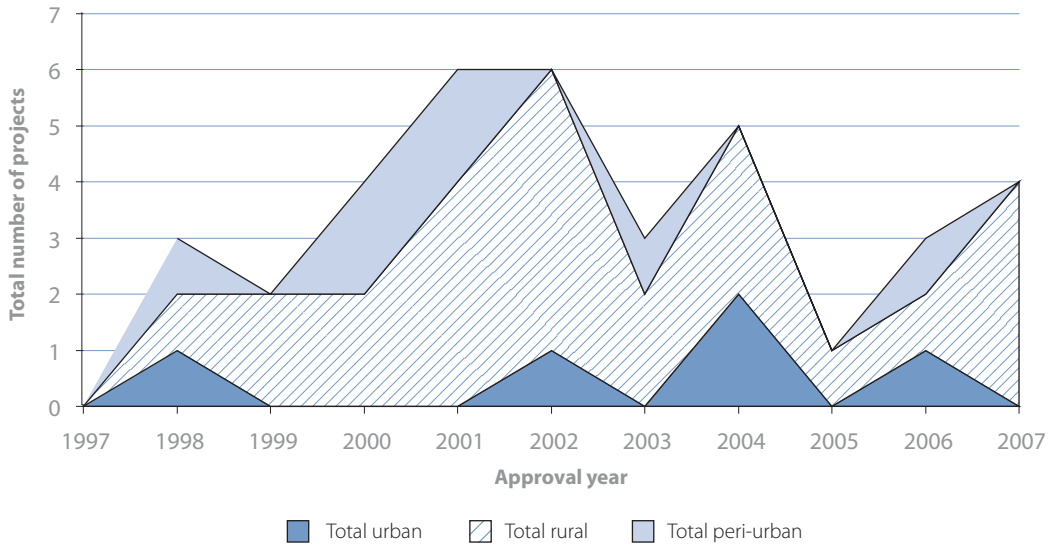
TABLE J.34 Projects Implementing Dry or Compost Latrines

Project ID	Country	Project name	Approval year	Total amount (US$ millions)
P000035	Angola	Lobito/Beng. Rehabilitation	1992	45.6
P006206	Bolivia	Rural Water Sanitation	1996	20
P055974	Bolivia	Bo El Nino Emergency	1998	25
P003509	China	Changchun Water Supply & Environmental Project	1993	120
P003637	China	CN-National Rural Water Supply Project 3	1997	70
P003644	China	CN – Xiaolangdi Resettlement	1994	110
P003587	China	Rural Water Supply and Sanitation Project	1992	110
P057352	China	CN-Rural Water IV	1999	46
P003602	China	Hubei Urban Environment	1996	150
P095315	China	CN-Western Provinces Rural Water Supply, Sanitation & Hygiene Promotion Project	2007	25
P039264	Eritrea	Community Development Fund	1996	17.5
P007392	Honduras	Nutrition and Health Project	1993	25
P010484	India	Uttar Pradesh & Uttaranchal Rural Water	1996	59.6
P009890	India	Hyderabad Water Supply and Sanitation Project	1990	89.9
P079675	India	Karn Municipal Reform	2006	216
P059477	Indonesia	Second Water & Sanitation for Low-Income Communities Project	2000	77.4
P056418	Lesotho	LS-Water Sector Improvements APL (fiscal 2005)	2005	14.1
P086877	Morocco	MA-Rural Water Supply and Sanitation	2006	60
P001789	Mozambique	Urban Rehabilitation & Employment Generation Project	1989	60
P010478	Pakistan	NWFP- Community Infrastructure Project	1996	21.5
P007846	Panama	Rural Health	1995	25
P100390	Sri Lanka	Sri Lanka: Puttalam Housing Project	2007	32
P005906	Yemen, Rep.	RY-Rural Water Supply & Sanitation Project	2001	20

Source: IEG water database.

Subsidies for Basic Sanitation

FIGURE J.25 Sanitation Subsidies in Rural Areas Are the Most Common



Source: IEG water database (*n*=37).

Note: Ten projects were double-counted because they gave subsidies in more than one geographic area.

High Uptake and Subsidy Levels

TABLE J.35 Results for the Highest Percentage of Target Beneficiary Uptake: The Five Best

ID	Country	Approval year	Planned project subsidy # (%)	Revised % subsidy	Beneficiary number at appraisal	Beneficiary number actual	Actual beneficiaries relative to expected (%)
P037709	Honduras	1996	60	No	70,000 beneficiaries	376,378 beneficiaries	538
P003990	Indonesia	1993	100	No	1.7 million people	3.1 million people	182
P000924	Ghana	1994	50	No	20,000 people, 250 schools	36,000 people, 140 schools	180
P057352	China	1999	50 and 100	No	N/A 53,370 people (estimated by using the number of latrines at appraisal times 5 people per household)	87,760 people (estimated by using the actual number of latrines built times 5 people per household)	164
P050616	Ghana	2000	90	No	550,000 people	794,900 people	144

Source: IEG water database (*n*=5).

Low Uptake and Subsidy Levels

TABLE J.36 Results for Percentage of Target Beneficiary Uptake: The Five Lowest

ID	Country	Approval year	Appraisal project subsidy # (%)	Revised % subsidy	Beneficiary number at appraisal	Beneficiary number actual	% Total beneficiaries actual of appraisal
P009873	India	1987	80	No	356,000 beneficiaries	380,000 beneficiaries	107
P000973	Ghana	1996	50	No	200,000 beneficiaries	190,000 beneficiaries	95
P009467	Bangladesh	1988	100	No	24,000 people	22,305 people	92
P009890	India	1990	80	No	120,000 people	107,300 people (reported in quarter ending December 1997), 104 settlements	89
P006206	Bolivia	1996	70	No	346,929 beneficiaries	64,500 beneficiaries	18

Source: IEG water database (*n*=5).

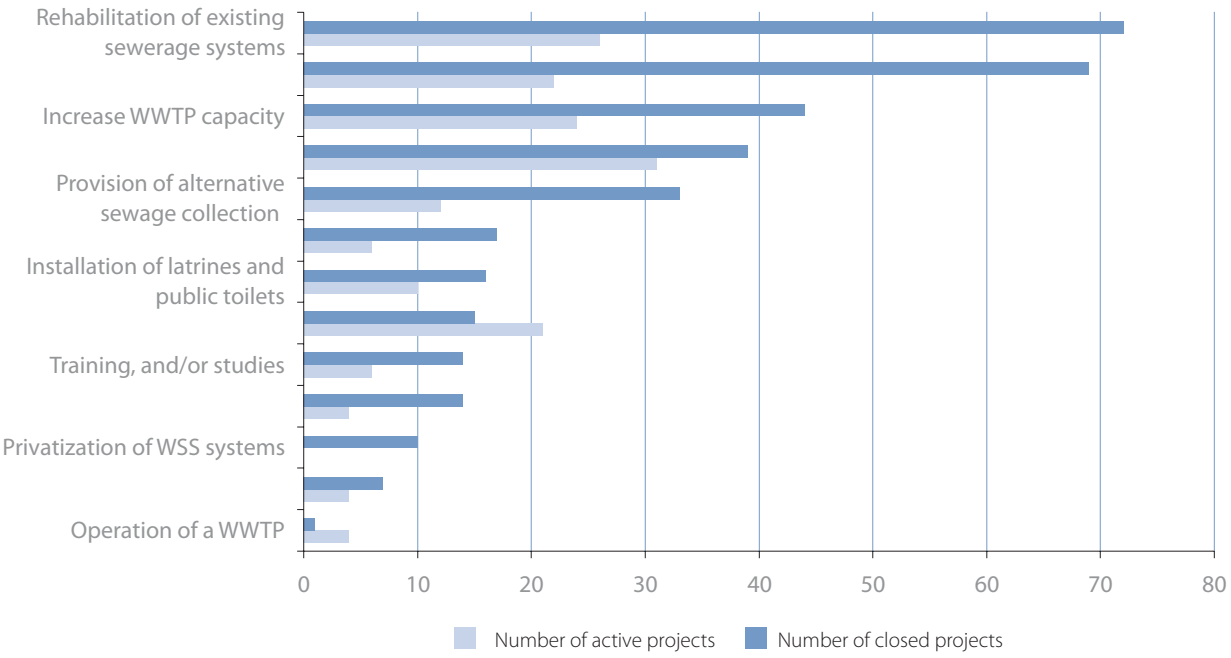
Projects with Number of Village and Town Attainment Targets

TABLE J.37 Results for the Percentage of Target Town/Village Beneficiary Attainment

ID	Country	Approval year	Appraisal project subsidy # (%)	Revised % subsidy	Beneficiary number at appraisal	Beneficiary number actual	% Total beneficiaries actual of appraisal
P064008	Nigeria	2000	30	No	16 towns, 325,000 people	13 towns (5 partially finished)	81
P010418	India	1993	33-69	Yes	1,200 villages	918 villages	77
P010484	India	1996	80	Yes	1,550 villages	1,000 villages	65
P003587	China	1992	70 and 100	No	150 demonstration villages	84 demonstration villages	56
P010369	India	1991	100	No	2,100 villages	560 villages 1100,000 people	27

Source: IEG water database (*n*=5).

FIGURE J.26 Rehabilitation of Existing Sewerage Systems Was the Preferred Strategic Approach in the Past— Currently More Attention Goes to Wastewater Treatment Plants

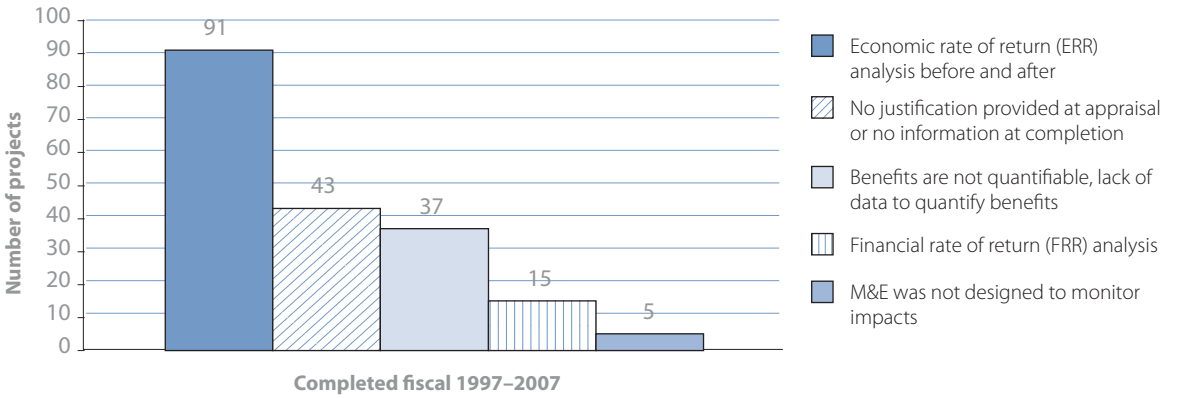


Source: IEG water documents review.

TABLE J.38 "What Happened Analysis" for the 191 Completed Wastewater Treatment Projects

Positive achievements	Number of projects	Negative results	Number of projects
Existing sewerage systems were rehabilitated	49	Planned sewerage construction works did not take place or incomplete by project closing	24
New sewerage networks were constructed	48	Existing sewerage systems were not rehabilitated	22
Existing WWTP was rehabilitated	25	WWTP was not constructed or the construction incomplete by project completion	10
WWTP capacity was increased as anticipated	25	O&M was not improved as anticipated. Financial institutional capacity did not occur	9
Sewerage system capacity was increased	14	Planned WWTP rehabilitation works did not take place	9
Public toilets and latrines were installed as planned	13	Alternative sewage collection facility was not carried out	8
Training and/or studies carried out	12	Intended privatization of WSS systems did not carried out	6
Envisioned WWTP construction work took place	11	Septic tank systems were not installed and/or improved as planned	6
Alternative sewage collection facilities were provided	10	Wastewater effluent quality remained poor	5
WSS systems were privatized	5	WWTP capacity was not increased	4
O&M was improved for WWTP and sewerage	4	Studies and/or capacity building programs did not take place	4
Septic tanks were built	1	Leakage from sewer pipes remained after project closure	3
		Planned latrines and/or communal toilets were not installed	2

FIGURE J.27 Project Economic/Financial Analysis for Water Treatment and Sewage Projects



Source: World Bank project documents, *n*=191

Note: Only 26 projects (out of 312 analyzed) supported improvement of sanitation services through the installation of latrines and public toilets. Of the 26 projects, 16 were completed and 10 were yet to close. Among the completed projects, 5 projects planned to quantify economic benefits but only 3 did so by completion. The majority of sanitation-related projects claimed that economic benefits were too difficult to quantify.

Chapter 6

Decentralization

FIGURE J.28 Activities of Completed Decentralization Projects

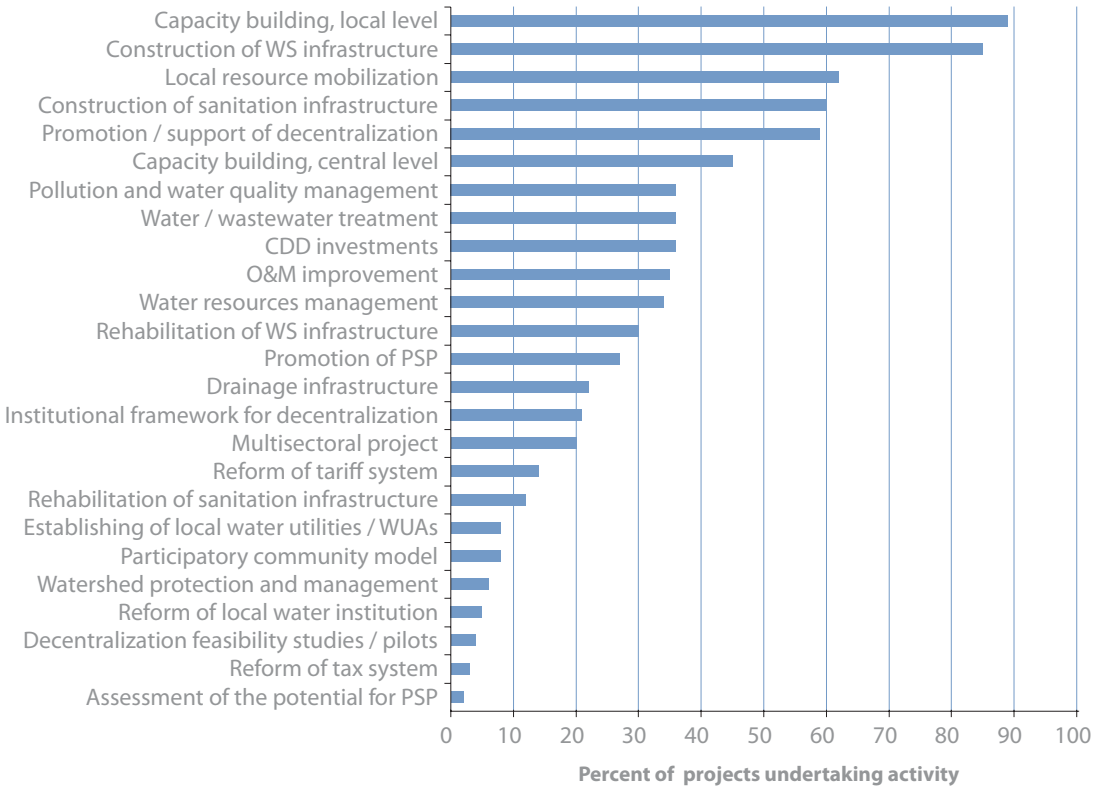


FIGURE J.29 Positive Outcomes of Completed Decentralization Projects

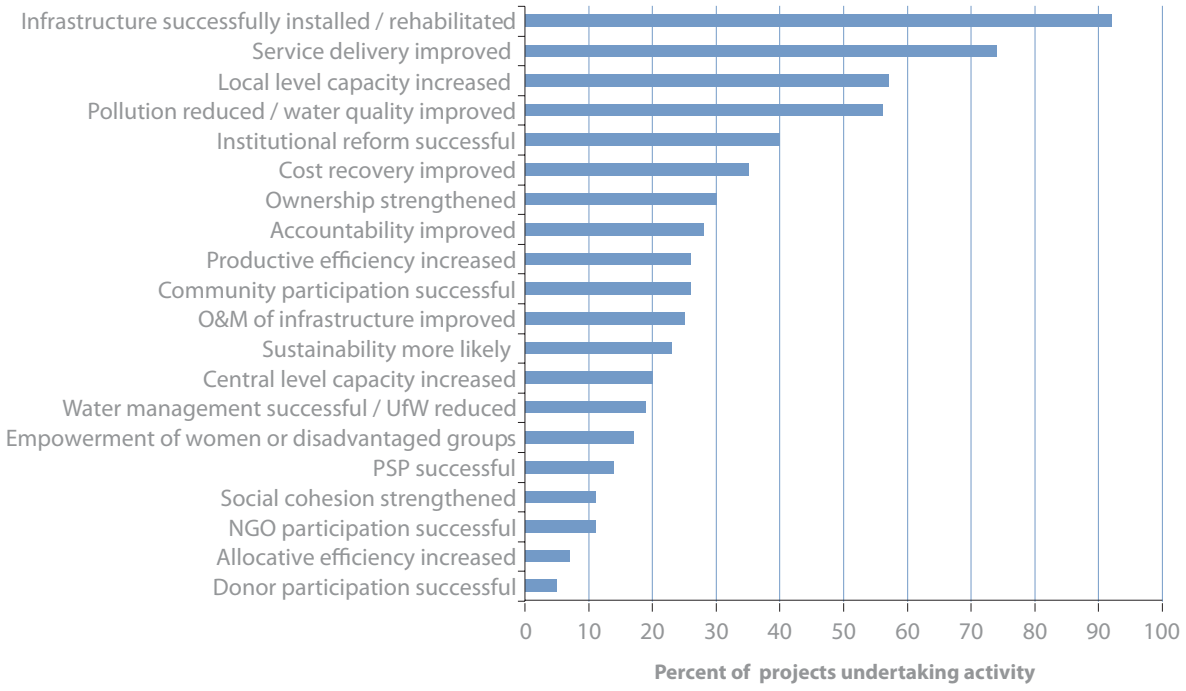


FIGURE J.30 Negative Outcomes of Completed Projects

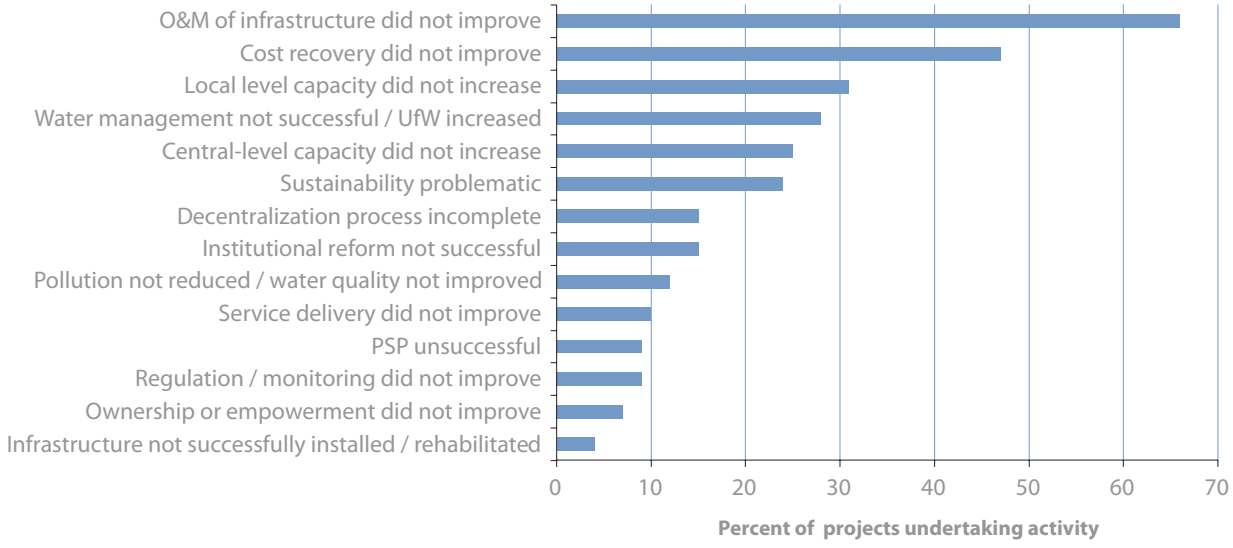


TABLE J.39 Ordinary Least Squares (OLS) Regression for Decentralization Success

Variable	Coefficient (standard error)
Decentralization type	
Devolution	0.5963***
	(0.1360)
Delegation	0.4353**
	(0.1999)
Setting	
Africa	−0.1944
	(0.1448)
Rural	−0.0808
	(0.1709)
Actors	0.1798***
	(0.0596)
Approval year	0.0325**
	(0.0164)
Activity	
Water supply	0.2634
	0.2634
Sanitation	0.1693
	(0.1360)
Community-driven development	0.1719
	(0.1596)
Decentralization-related activity	0.2529
	(0.1601)
Negative influences	
Lack of capacity	−0.1176
	(0.1773)
Inadequate cost recovery	−0.2367*
	(0.1363)
Decentralization insufficient	−0.3443*
	(0.1806)
Observations	90
R^2	0.5235

Note: [1] OLS regression with robust standard errors. [2] ***denotes significant at the 1 percent level, **at the 5 percent level, and *at the 10 percent level.

Transboundary Waters

TABLE J.40 World Bank Funding Is Going to the Basins Shared by the Highest Number of Riparian Countries

Basin name by Region	Number of basin- sharing countries	Number of projects in IEG water database supporting transboundary basins
Africa		
Congo/Zaire	13	1
Nile	13	18
Niger	11	4
Lake Chad	9	6
Zambezi	9	2
Volta	6	2
Lake Turkana	5	
Lotagipi Swamp	5	
Orange	4	9
Senegal	4	1
Limpopo	4	1
East Asia and Pacific		
Yellow Sea	Sea	1
Bohai Sea	Sea	1
Mekong	6	2
Tarim	5	1
Amur	4	
Strait of Malacca	3	1
Europe and Central Asia	18	12
Danube	8	8
Aral Sea	6	7
Adrianic Sea	5	4
Kura-Araks	5	2
Caspian Sea	5	1
Oder/Odra		
Middle East and North Africa	Sea	3
Caspian Sea	Sea and Gulf	1
Red Sea and Gulf of Aden	7	1
Jordan	7	
Euphrate and Tigris	6	
Awash	3	
Hari/Harirud	3	
Asi/Orontes	3	
Gulf of Aqaba	3	1
Latin America and the Caribbean		
Patagonian Large Marine	Marine	
Ecosystem	Ecosystem	1
Chetumal Bay and the Gulf of Honduras	Bay	1
Caribbean Sea	22	1
Amazon	9	1
La Plata	4	3
South Asia		
Ganges-Brahmaputra-Meghna	6	3
Indus	6	2

Sources: Oregon State University's database on International River Basins of the World and IEG water database.

TABLE J.41 Variation in Regional Attention to Water Focal Areas

	Africa (%)	E. Asia & Pacific (%)	Europe & Central Asia (%)	Latin America & Caribbean (%)	Middle East & N. Africa (%)	South Asia (%)	Total projects (number)
Irrigation	13	22	16	15	15	19	311
Groundwater	12	24	14	10	17	24	229
Hydropower/dams	27	22	17	15	4	15	211
Flood	16	20	14	22	10	17	177
Urban water supply	26	15	18	24	10	6	229
Rural water supply	27	17	11	17	12	16	218
Wastewater treatment	14	22	21	20	17	6	312
Urban sanitation & sewerage	17	24	19	23	12	5	190
Rural sanitation & sewerage	26	16	15	21	11	12	108
Watershed mgmt.	21	21	7	24	11	16	218
Rivers and lakes	21	20	26	18	4	11	174
Coastal zone mgmt.	19	22	20	19	11	9	121
Inland waterways & ports	33	30	6	18	6	8	104
Fisheries	31	30	7	18	3	10	87
Transboundary	41	7	37	7	6	4	123

Source: IEG water database

Note: The percentage of the total number of projects that took place in each focal area was calculated. The number of projects per Region can be determined by multiplying the percentage by the focal area total. The Region with the highest percentage of projects for every focal area is represented in darker blue, and the second-highest in lighter blue.

Chapter 7

TABLE J.42 Coverage of Water Resources Management Objectives by World Bank Strategic Documents

Water management objective	1993 WRM Policy Paper	2003 WR sector strategy	Results
Alleviate poverty	×	×	+
			–
			–
			–
			+
Promote private sector participation	×	×	+
			+
Encourage women to participate in WRM	×	×	+
			+
Restore ecosystems (wetlands, swamps, coastal zones, marinas, estuaries)	×	×	+
			+
			–
			–
			+
			+
			+
Support basin-level Institutions	×	×	+
			+
Enhance stakeholder participation	×	×	+
			–

Chapter	Section	Paragraph
Chapter 3	Watershed management	3.6
Chapter 4	Flood management	4.2–4.5
Chapter 4	Drought management	4.13
Chapter 5	Sanitation	5.17–5.18
Chapter 6	Rural PSP	6.12
Chapter 6	Urban PSP	6.2–6.7
Chapter 6	Rural PSP	6.8–6.13
Chapter 3	Watershed management	3.5
Chapter 5	Rural water services	5.16, box 17
Chapter 3	Watershed management	Box 2
Chapter 3	Groundwater	3.10 and box 5
Chapter 4	Mangroves	4.39
Chapter 4	Wetlands	4.37–4.39
Chapter 4	Rivers and lakes	4.25–4.30
Chapter 4	Coastal zones	4.31–4.36
Chapter 6	Transboundary waterways	6.33–6.35, box 24
Chapter 3	RBM	3.15–3.20
Chapter 6	Transboundary waters	6.29–6.35
Chapter 3	Watershed management	3.3
Chapter 5	WUAs	5.5–5.7

(*Table continues on the following page.*)

TABLE J.42 Coverage of Water Resources Management Objectives (*continued*)

Water management objective	1993 WRM Policy Paper	2003 WR sector strategy	Results
Employ demand management practices (promote incentives to water conservation and establish "polluter-pays" principle)	×	×	− − + − + − − + +
Strengthen policies and develop economic and sector work	×	×	+
Improve water institutions	×		+ − + + − − − + +
Coordinate WR activities across sectors (cross-sectoral)	×		+ −
Support for international waterways	×	×	+ −
Promote improved WRM	×	×	+ +
Commit to environmental improvements			+ − + + −
Create effective M&E (units) to measure results			− − +/− − − +
Protect groundwater resources	×	×	+/−
Develop hydraulic infrastructure (dams, hydropower)		×	− +
Reduce natural disaster risks			+
Prepare "high-risk/high-reward" projects		×	+ +
Promote decentralization	×		+
Improve low-cost technologies	×		+ −
Address political economy of reforms		×	+
Enhance donor coordination	×		+ + +
Develop water CASs		×	+

Note: One activity can have mixed outcomes, therefore the use of + and - for the same activity.

Chapter	Section	Paragraph
Chapter 3	Watershed management	3.4, box 2
Chapter 3	Groundwater	3.10, 3.12
Chapter 3	Demand management	3.26–3.31
Chapter 3	Cost recovery	3.34–3.37
Chapter 3	Economic analysis	3.32–3.33
Chapter 4	Drought management	4.13
Chapter 4	Rivers and lakes	4.28, 4.29
Chapter 6	Decentralization	6.15
Chapter 6	IWRM	6.20–6.24
Chapter 2	Economic and sector work	2.6
Chapter 2	Portfolio	2.25
Chapter 3	H&MM	3.21–3.25
Chapter 3	River basin organizations	3.15–3.20
Chapter 5	WSS	5.12
Chapter 5	Sanitation	5.17–5.18
Chapter 5	WWT	5.23–5.28
Chapter 6	Decentralization	6.16
Chapter 6	IWRM	6.24
Chapter 6	Transboundary waters	6.29
Chapter 2	Portfolio	2.21–2.27
Chapter 6	Inland waterways	6.38–6.39
Chapter 3	River basin organizations	3.15–3.20
Chapter 6	Transboundary waters	6.25–6.39
Chapter 3	River basin organizations	3.15–3.20
Chapter 6	IWRM	6.21–6.22, box 21
Chapter 3	Watershed management	Box 2
Chapter 4	Flood management	4.2–4.5
Chapter 4	Environmental flows	4.16–4.18
Chapter 4	Water quality management	4.19–4.21
Chapter 4	Rivers and lakes	4.28–4.29
Chapter 3	Watershed management	3.7
Chapter 3	Groundwater	3.14
Chapter 3	H&MM	3.21–3.25
Chapter 4	Water quality monitoring	4.22
Chapter 5	WWT	5.29
Chapter 6	Transboundary waters	6.37
Chapter 3	Groundwater	3.10, box 5, 3.12
Chapter 4	Drought management	4.14
Chapter 4	Dams	5.30–5.35
Chapter 4	Floods and droughts	4.2–4.14
Chapter 5	Dams and hydro	4.14
Chapter 6	Inter-basin transfers	6.32
Chapter 7	Decentralization	6.14–6.19
Chapter 3	Groundwater recharging	3.12, box 5
Chapter 4	Sanitation	5.17, 5.18
Chapter 7	Urban PSP	6.2–6.7
Chapter 4	Water quality management	4.21
Chapter 4	Water quality monitoring	4.22
Chapter 6	IWRM	6.20
Appendix F	Water CASs	

Endnotes

Appendix C

1. Poverty Reduction Strategy Papers (PRSPs) describe a country's macroeconomic, structural, and social policies and programs to promote growth and reduce poverty, as well as associated external financing needs. PRSPs are prepared by governments through a participatory process involving civil society and development partners, including the World Bank and the International Monetary Fund (IMF).
2. The objective of a CAS is to synthesize the country situation, government priorities, Bank Group strategy, and Bank partner activities into a coherent program for future work together.
3. The WSP is one of the World Bank's longest standing external partnership programs. The program follows the Bank's management and administrative processes, and it functions as an independent unit within the Department of Energy and Water in the SDN Vice Presidency. Its staff report to various donors that supply the funding for the activities they are engaged in.
4. Based on data provided by the sector board for the period October 2008 to September 2009.

Appendix E

1. The Indonesia Surabaya Urban Development Project (SUDP P003998) notes: "In support of the ICR recommendation, Bank supervision should include constant and continuous monitoring of the relevance and scope of project objectives and call for a radical redesign when a project is clearly no longer consistent with a borrower's sector strategy."

Appendix F

1. Under each heading, the relevant subcategories were identified and then the earliest CAS for each country (during the period studied) was compared to the most recent. This was done to determine the evolution in the nature of activities over time. No more than two CASs for each country were used: for those countries that had more than two, the interim documents were excluded from the analysis. The 20 highly water-stressed countries and the 20 least water-stressed countries were compared and contrasted.

Appendix G

1. Cairncross and Valmanis (2006), p. 789.
"The proportion of the total disease burden attributable to water, sanitation, and hygiene is greatest in the high-mortality countries of the Eastern Mediterranean region, reaching 6 to 7 percent of the total. They are followed by the high-mortality countries of Southeast Asia and Africa, where the water and sanitation complex accounts for 4 to 5 percent of the total. Globally, improvements in water supply, sanitation, and hygiene could eliminate 3 to 4 percent of the global burden of disease."

Appendix H

1. This includes rehabilitation, dam raising, expansion, and upgrades.

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OP/BP 4.37—Safety of Dams - October 2001
OP/BP 7.50—Projects on International Waterways
OP/BP 4.01—Environmental Assessment - January 1999
OP/BP 4.02—Environmental Action Plans - February 2000

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