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**Report No. 35004**

**PROJECT PERFORMANCE ASSESSMENT REPORT**

**YEMEN**

**LAND AND WATER CONSERVATION PROJECT (CREDIT 2373-YEM)**

**TAIZ WATER SUPPLY PILOT PROJECT (CREDIT 2913-YEM)**

**SANA'A WATER SUPPLY AND SANITATION PROJECT (CREDIT 3209-YEM)**

**February 22, 2006**

*Sector, Thematic and Global Evaluation Division  
Independent Evaluation Group*

## Currency Equivalents (annual averages)

*Currency Unit = Yemeni Rial (YR)*

1994	US\$1.00	YR 103
1995	US\$1.00	YR 115
1996	US\$1.00	YR 135
1997	US\$1.00	YR 135
1998	US\$1.00	YR 135
1999	US\$1.00	YR 147
2000	US\$1.00	YR 152
2001	US\$1.00	YR 165
2002	US\$1.00	YR 176
2003	US\$1.00	YR 178
2004	US\$1.00	YR 184
2005	US\$1.00	YR 190

## Abbreviations and Acronyms

CAS	Country Assistance Strategy
CWRAS	Country Water Resources Assistance Strategy
ERR	Economic Rate of Return
FAO	Food and Agriculture Organization
GSCP	Groundwater and Soil Conservation Project
ICR	Implementation Completion Report
IEG	Independent Evaluation Group
KfW	German Aid Agency
LWCP	Land and Water Conservation Project
NWRA	National Water Resources Authority
NWSA	National Water and Sanitation Authority
NWSSIP	National Water Sector Strategy and Investment Program
O&M	Operations and Maintenance
PPAR	Project Performance Assessment Report
PSP	Private Sector Participation
PMU/PIU	Project Management/Implementation Unit
Sana'a WSSP	Sana'a Water Supply and Sanitation Project
SBWMP	Sana'a Basin Water Management Project
SURDU	Southern Uplands Rural Development Unit
Taiz WSPP	Taiz Water Supply Pilot Project
UFW	Unaccounted for water
UWSS	Urban Water Supply and Sanitation Sector
UWSSP-APL	Urban Water Supply and Sanitation Project – Adjustable Program Loan
WRM	Water Resources Management

## Fiscal Year

Government: January 1 – December 31

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**IEG Mission: Enhancing development effectiveness through excellence and independence in evaluation.**

### About this Report

The Independent Evaluation Group assesses the programs and activities of the World Bank for two purposes: first, to ensure the integrity of the Bank's self-evaluation process and to verify that the Bank's work is producing the expected results, and second, to help develop improved directions, policies, and procedures through the dissemination of lessons drawn from experience. As part of this work, IEG annually assesses about 25 percent of the Bank's lending operations. In selecting operations for assessment, preference is given to those that are innovative, large, or complex; those that are relevant to upcoming studies or country evaluations; those for which Executive Directors or Bank management have requested assessments; and those that are likely to generate important lessons. The projects, topics, and analytical approaches selected for assessment support larger evaluation studies.

A Project Performance Assessment Report (PPAR) is based on a review of the Implementation Completion Report (a self-evaluation by the responsible Bank department) and fieldwork conducted by IEG. To prepare PPARs, IEG staff examine project files and other documents, interview operational staff, and in most cases visit the borrowing country for onsite discussions with project staff and beneficiaries. The PPAR thereby seeks to validate and augment the information provided in the ICR, as well as examine issues of special interest to broader IEG studies.

Each PPAR is subject to a peer review process and IEG management approval. Once cleared internally, the PPAR is reviewed by the responsible Bank department and amended as necessary. The completed PPAR is then sent to the borrower for review; the borrowers' comments are attached to the document that is sent to the Bank's Board of Executive Directors. After an assessment report has been sent to the Board, it is disclosed to the public.

### About the IEG Rating System

The time-tested evaluation methods used by IEG are suited to the broad range of the World Bank's work. The methods offer both rigor and a necessary level of flexibility to adapt to lending instrument, project design, or sectoral approach. IEG evaluators all apply the same basic method to arrive at their project ratings. Following is the definition and rating scale used for each evaluation criterion (more information is available on the IEG website: <http://worldbank.org/oed/eta-mainpage.html>).

**Relevance of Objectives:** The extent to which the project's objectives are consistent with the country's current development priorities and with current Bank country and sectoral assistance strategies and corporate goals (expressed in Poverty Reduction Strategy Papers, Country Assistance Strategies, Sector Strategy Papers, Operational Policies). *Possible ratings:* High, Substantial, Modest, Negligible.

**Efficacy:** The extent to which the project's objectives were achieved, or expected to be achieved, taking into account their relative importance. *Possible ratings:* High, Substantial, Modest, Negligible.

**Efficiency:** The extent to which the project achieved, or is expected to achieve, a return higher than the opportunity cost of capital and benefits at least cost compared to alternatives. *Possible ratings:* High, Substantial, Modest, Negligible. This rating is not generally applied to adjustment operations.

**Sustainability:** The resilience to risk of net benefits flows over time. *Possible ratings:* Highly Likely, Likely, Unlikely, Highly Unlikely, Not Evaluable.

**Institutional Development Impact:** The extent to which a project improves the ability of a country or region to make more efficient, equitable and sustainable use of its human, financial, and natural resources through: (a) better definition, stability, transparency, enforceability, and predictability of institutional arrangements and/or (b) better alignment of the mission and capacity of an organization with its mandate, which derives from these institutional arrangements. Institutional Development Impact includes both intended and unintended effects of a project. *Possible ratings:* High, Substantial, Modest, Negligible.

**Outcome:** The extent to which the project's major relevant objectives were achieved, or are expected to be achieved, efficiently. *Possible ratings:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, Highly Unsatisfactory.

**Bank Performance:** The extent to which services provided by the Bank ensured quality at entry and supported implementation through appropriate supervision (including ensuring adequate transition arrangements for regular operation of the project). *Possible ratings:* Highly Satisfactory, Satisfactory, Unsatisfactory, Highly Unsatisfactory.

**Borrower Performance:** The extent to which the borrower assumed ownership and responsibility to ensure quality of preparation and implementation, and complied with covenants and agreements, towards the achievement of development objectives and sustainability. *Possible ratings:* Highly Satisfactory, Satisfactory, Unsatisfactory, Highly Unsatisfactory.



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<p>This report was prepared by Keith Oblitas, Consultant who assessed the projects in July 2005. The report was edited by William Hurlbut, and Soon-Won Pak provided administrative support.</p>
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## Principal Ratings

### Land and Water Conservation Project (Credit 2373-YEM) 1992-2000

	<i>ICR*</i>	<i>ICR Review*</i>	<i>PPAR</i>
Outcome	Satisfactory	Moderately Satisfactory	Satisfactory
Sustainability	Likely	Unlikely	Likely
Institutional Development Impact	Modest	Modest	Modest
Bank Performance	Satisfactory	Satisfactory	Satisfactory
Borrower Performance	Satisfactory	Satisfactory	Satisfactory

### Taiz Water Supply Pilot Project (Credit 2913-YEM) 1996-2001

Outcome	Unsatisfactory	Unsatisfactory	Unsatisfactory
Sustainability	Unlikely	Unlikely	Unlikely
Institutional Development Impact	Negligible	Negligible	Modest
Bank Performance	Satisfactory	Unsatisfactory	Unsatisfactory
Borrower Performance	Satisfactory	Unsatisfactory	Unsatisfactory

### Sana'a Water Supply and Sanitation Project (Credit 3209-YEM) 1999-2003

Outcome	Satisfactory	Moderately Satisfactory	Moderately Satisfactory
Sustainability	Likely	Unlikely	Unlikely
Institutional Development Impact	Modest	Modest	High
Bank Performance	Satisfactory	Satisfactory	Unsatisfactory
Borrower Performance	Satisfactory	Satisfactory	Satisfactory

\* The Implementation Completion Report (ICR) is a self-evaluation by the responsible operational division of the Bank. The ICR Review is an intermediate Independent Evaluation Group (IEG) product that seeks to independently verify the findings of the ICR.

## Key Staff Responsible

### Land and Water Conservation Project (Credit 2373-YEM)

<i>Project</i>	<i>Task Manager/Leader</i>	<i>Division Chief/ Sector Director</i>	<i>Country Director</i>
Appraisal	Rahul Raturi	Ngozi Okonjo-Iweala	Ram K. Chopra
Completion	Manuel Schiffler	M. Salah Darghouth	Mahmood Ayub

### Taiz Water Supply Pilot Project (Credit 2913-YEM)

Appraisal	Mario Zelaya	Sonia Hammam	Inder K. Sud
Completion	Manuel Schiffler	Emmanuel Forestier	Mahmood Ayub

### Sana'a Water Supply and Sanitation Project (Credit 3209-YEM)

Appraisal	Amir Al-Khafaji	Jean-Claude Villiard	Inder Sud
Completion	Somin Mukherji	Emmanuel Forestier	Mahmood Ayub



## **Preface**

This is the Project Performance Assessment Report (PPAR) of three projects in the Republic of Yemen: the Land and Water Conservation Project, the Taiz Water Supply Pilot Project and the Sana'a Water Supply and Sanitation Project.

The Land and Water Conservation Project was approved in May, 1992 for an IDA Credit of US\$32.8 million (Cr. 23730). In 1995, due to slow project implementation, US\$5.5 million of the Credit was cancelled and physical targets reduced, but without changing the project objectives or components. At project closure, 99 percent of the reduced Credit had been disbursed. The project was closed in December 2000, 18 months behind schedule.

The Taiz Water Supply Pilot Project was approved in September 1996 for an IDA Credit of US\$10.2 million (Cr. 29130) of which US\$8.5 million was disbursed. The project was closed in December 2001, 18 months behind schedule.

The Sana'a Water Supply and Sanitation Project was approved in May 1999 for an IDA Credit of US\$25.0 million (Cr. 32090) of which US\$22.7 million was disbursed. The project was closed in June 2003, 9 months behind schedule.

The report presents the findings of: (i) an IEG mission to Yemen in July 2005, including visits to project sites and discussions with government officials and agencies, project directors and staff, beneficiaries, key donors, and academia; (ii) discussions with Bank task managers and other staff in Washington and Yemen; and (iii) review of the projects' implementation completion reports, appraisal reports, legal documents, sector reports and other relevant material. The collaboration of all persons met is gratefully acknowledged.

The three projects were selected because: first, they provide the possibility of assessing different approaches to conserving Yemen's fast depleting groundwater resources - Yemen's most critical water sector issue - including differences between the rural and urban sectors; and, second, in the urban water sector, to assess experience in reforming the corporate management of water agencies. The PPAR will also be used as background in IEG's forthcoming Country Assistance Evaluation for Yemen.

Following standard IEG procedures, the draft PPAR was sent to the borrower for comments before being finalized. No comments were received. In accordance with the Bank's disclosure policy, this final report will be available to the public following submission to the World Bank's Board of Directors.



## Summary

This Project Performance Assessment Report reviews three projects in Yemen's water sector; one rural and two urban. The Land and Water Conservation Project (LWCP) was approved in 1992 and closed in 2000. The Taiz Water Supply Pilot Project (Taiz WSPP) was approved in 1996 and closed in 2001. The Sana'a Water Supply and Sanitation Project (Sana'a WSSP) was approved in 1999 and closed in 2003. This cluster assessment of three separate, but related projects revealed a large, growing and common problem – that Yemen's water resources are being seriously mined and that the Bank, until recently, had been too focused on immediate needs and neglected long-term sustainability of water resources management.

Bank lending for Yemen's water sector began in 1973, and it was not until LWCP, the Bank's 19<sup>th</sup> water sector project (approved nearly 20 years after Board approval of the first water project), that attention was paid to groundwater depletion. And then the subsequent two projects, Taiz WSPP and Sana'a WSSP, continued to contain no features for sustainable groundwater management.

Several shortfalls contributed to the neglect of groundwater management. There was a project rather than program approach to the sector, no significant sector work until 1997, and a tendency to approach water from a single sector perspective without considering the linkages between urban, rural and other uses. There was no articulated strategy, and little consideration of future needs. It would seem that projects, especially in the urban sector, were primarily infrastructure focused, with only limited attention to institutional reform. In summary, until the last several years, there was: *a lack of prioritization, a lack of sector work, a lack of cross-sectoral coordination, and a lack of forward planning.*

**The Land and Water Conservation Project** was the only one of the three projects to focus on water resources management, and was the first Bank project to do so. The project piloted technologies to conserve rural water and land and forest resources. Its most important achievement was to successfully pilot an advanced groundwater irrigation technology which saved about 25 percent of water. Given the water crisis, the project was highly relevant. Efficacy was substantial as it broadly achieved its main physical objectives, but implementation was inefficient as management costs were significantly higher than planned. Taking all three of the above factors into account overall outcome was satisfactory. The project had an effective large scale training program in the new technologies, but otherwise did not strengthen institutions, and institutional development was modest. Sustainability is rated likely as Government commitment to the LWCP technology is evidenced by the launching since LWCP closure of two follow-on projects. Staff continuity has also been better than expected. Bank and Borrower performance were both satisfactory.

**The Taiz Water Supply Pilot Project** was hastily prepared as an emergency project to increase water supply to Taiz city. Due to overoptimistic assumptions without the needed hydrological data, actual water supply provided by the project was only one-third of the appraisal estimate. The project contained the highly relevant objective to pilot

compensation to farmers for groundwater extracted from their land. However, rather than using a water market approach, compensation was based on one-time investments which failed as continuous incomes were not achieved. Preparation for private sector participation made no headway. The outcome for Taiz was unsatisfactory. Some strengthening of the institutions involved was achieved and institutional development is rated modest. Prospects for sustainability are improving as a result of better water management and a strengthened water agency, but several more years of positive progress are appropriate before the present unlikely rating could be considered for upgrading. Both Bank and Borrower performance were unsatisfactory.

**The Sana'a Water Supply and Sanitation Project's** primary objectives to increase water supply and sewerage for Sana'a city were largely accomplished. The project's main achievement was to transform a Government water agency into a corporation and to improve managerial, technical and financial performance. It led the way for corporatization and improved efficiency in other towns. Institutional development is rated high. However, this strong corporate management achievement was not accompanied by any water resources management activities. This lacuna brings down an otherwise highly relevant and well performing project to a moderately satisfactory assessment for outcome. Sustainability is assessed as unlikely, given Sana'a's continuing rapid drawdown of its groundwater resources. Bank performance, which was good in most aspects, is downgraded from satisfactory to unsatisfactory, as the Bank's lack of focus on groundwater management followed repeated advice that this issue needed attention. The borrower's performance is rated satisfactory because the corporate reforms required politically difficult decisions.

The four key lessons are:

**I. Identifying and tackling the dominant issue(s) is key to a program's relevance and outcome:** The dominant issue is the depletion of Yemen's water resources. The situation was known some time back. The appraisal report for the first Sana'a water project, approved in 1974, commented that the groundwater table was depleting by three meters per year. Amongst others, IEG commented on the need for groundwater resources management in project performance assessment reports in 1984 and 1998. The latter report was one year before Sana'a WSSP was approved.

**II. A comprehensive strategy is essential:** A strategic analysis and program approach were largely absent in Yemen's water sector for the first 20 years of the Bank's involvement. A substantially non-responsive series of projects was the result. If sector analysis had been done and a comprehensive strategy developed earlier, the groundwater issue and other needs such as institutional and policy reforms, would likely have received attention earlier.

**III. The water sector requires multi-sectoral approaches:** Until recently, cross-sectoral planning and coordination between the rural, urban and other water using sectors was largely absent in Yemen. This caused disjointed and sometimes conflicting water management, and likely contributed to Government's and the Bank's limited attention to comprehensive strategic needs.

**IV. Rural-urban water markets need to be developed:** Expanding urban demand will increasingly need rural-urban transfer of water through an equitable mechanism. Formal water markets have not yet been developed in Yemen. One option may be to use and help expand the already thriving informal water market of water transported by tanker truck. Key adjustment needs would include establishing water rights and a regulatory system to limit water abstraction to sustainable yield, perhaps largely self-monitored and regulated by rural communities. Piloting of practical options should begin now.

**Recent Initiatives:** In the last several years the Bank and Government have taken a more dynamic approach to the water sector. A comprehensive water sector strategy has been prepared by the Bank and was issued in April 2005, based on substantial sector work and dialogue with Government. The Government also produced a strategy paper in 2005. Both reports put priority on groundwater management. New and much more relevant projects are also commencing, such as the Sana'a Basin Water Management Project and the Groundwater and Soil Conservation Project. Greater emphasis is also being paid to institutional reform in the urban water sector, although water resources management still needs to be integrated. While these recent initiatives have not yet been proven, the way forward looks more promising. The key challenge now is to *implement* the new strategy. Given the initiatives underway and anticipated, regular stock-taking of achievements and future needs would be desirable.

Vinod Thomas  
Director-General  
Evaluation

## 1. Yemen's Water Crisis

1. Yemen is one of the most water constrained countries in the world. Water availability per capita is 130 cubic meters per year, 10 percent of the average for the Middle-East, and only two percent of the world average per capita consumption.<sup>1</sup> Of most concern are the trends in water use. With no significant perennial sources of surface water, Yemen relies almost exclusively on exploitation of groundwater. Water is taken from the shallow aquifers which are rechargeable, and increasingly from deeper aquifers which are not. In large parts of Yemen, water from the shallow aquifer is abstracted at well over the recharge from the limited rainfall. Thus, pumping is substantially from the deep (fossil) aquifers which are depleting rapidly. As these deep aquifers cannot be recharged, pumping is essentially a mining operation. The rate of depletion has accelerated over the last three decades for two reasons. First, while farmers, using shallow dug-wells, had traditionally used groundwater at about the rate of natural recharge, this changed when tube-well technology and pump-sets were introduced in the early 1970s. The number of agricultural tube-wells, and, consequently, the rate of rural groundwater abstraction, has grown rapidly. Nationally, the number of wells is now estimated at some 50,000, with 8,000 in the Sana'a basin alone. Second, a high urban population growth rate estimated at about seven percent per annum is greatly increasing urban water demand.

2. The overall result is that, throughout Yemen, groundwater levels are falling, and particularly rapidly in heavily populated areas. The Sana'a and Taiz basins, the sites of two of the projects in this review, are among the faster depleting aquifers. Urban water supply is critically short. For instance, piped water is distributed in Sana'a only once every four days, and in Taiz every 20-30 days. In Sana'a basin, the groundwater table is falling by about six meters per annum, and rural and urban tube-wells are constantly being deepened. These trends are compounded by highly inefficient rural and urban use. Water losses ("unaccounted for water") in urban water supply are typically 40 to 50 percent, while, with irrigation efficiency averaging only 40 percent, losses for agriculture are about 60 percent. Nationally, water abstraction now averages about 125 percent of natural recharge.

3. The IEG mission's discussions with Government officials, and review of available literature and statistics, found that water use for irrigation is currently nearly 90 percent of total water use. Agricultural use has increased by about 5 percent per annum. In 1990, agricultural consumption had reached 130 percent of Yemen's renewable water resources, and has since increased to 150 percent. The rapid growth over the last 15 years in the cultivation of qat, highly profitable for the farmer but also a high water consuming crop<sup>2</sup>, has been one of the influencing factors in the growth of rural water

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1. This is equivalent to 365 liters/capita/day considering domestic, agricultural and all other uses. In comparison, the average domestic water consumption in the USA (without including agricultural and other uses) is 696 liters/capita/day; and in Australia it is 350 liters/capita/day (Source: US Environmental Protection Agency, 2003).

2. Qat, consumed by chewing the leaves, is a mild narcotic. Use of Qat has grown rapidly, and is now a commonplace habit in Yemeni households, especially among men. Social and economic repercussions

consumption. Urban water demand is growing even more rapidly than rural use. It was less than 10 percent of renewable water in 1990, and is projected to be more than 20 percent by 2010.

4. Continuation of these trends will have serious impacts on Yemen's social fabric and economy. As water scarcity grows, irrigation, rural incomes and access to drinking water will diminish. This will cause hardship in rural areas; in particular, for the poor, women and girls. The poor have more limited access to groundwater than farmers with pump-sets. For women and girls, distance and time to sources of water for drinking and domestic use are getting longer. This also affects education of girls as they may be held back from school to assist with the increased effort required to fetch water. For the rural population as a whole, large scale migration to towns is likely, with attendant urban unemployment and other social problems. This will also aggravate the already critical urban water shortages.

5. The two most recent reports on Yemen's water sector; the "Country Water Resources Assistance Strategy ("CWRAS", Middle East and North Africa Region, MENA); and Government's "National Water Sector Strategy and Investment Program" (NWSSIP), both issued in April 2005, highlight groundwater depletion as Yemen's most critical water sector issue. Thus, in its first paragraph, the CWRAS comments "*Yemen is entering a water crisis that ranks amongst the worst in the world, With the continued mining of groundwater in all regions of Yemen, some areas will certainly lose their economic viability and even their drinking water supplies, causing displacement and resettlement.*" Likewise, Government's NWSSIP comments "*Yemen is approaching a water crisis unless actions are taken to reduce unsustainable use of water resources*" The Bank's 1996 and 2002 Country Assistance Strategies (CAS) and the 2002 Poverty Reduction Strategy Paper (PRSP) also emphasize groundwater management as the key water sector need (Annex G). Similar views on the paramount importance in the water sector of groundwater management were expressed to the IEG mission by bilateral agencies such as the Netherlands and Germany (KfW), both significantly involved with Yemen's water sector. Thus, the commonly held view is that groundwater management needs to be the primary yardstick for assessing activities in the water sector. This yardstick is used to assess the relevance and efficacy of the three projects evaluated.

6. The new strategies, while welcome, nevertheless raise a question concerning why it has taken so long to develop a strategy fully recognizing the groundwater depletion issue. Groundwater depletion in Yemen has been observable for at least 30 years and is even commented on in the Bank's appraisal report for the first water sector project in Yemen: the first Sana'a project approved in FY74. The appraisal report commented that the groundwater table was lowering by some three meters per year. Further, IEG had recommended tackling groundwater depletion in 1984 and 1998. But, as discussed in Annex E, except for water projects approved since 2003, such recommendations have been ignored. Both the Bank's and Government's new strategies only refer to water resources management as a recently developing issue. Thus, Yemen is not "entering" or "approaching" a water crisis. It is well into that crisis and has been there for some time.

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include depletion of family finances for more necessary expenditures and, probably, a reduction in effective work productivity. The issue of Qat is, however, beyond the scope of this PPAR.

Finally, now that a strategy has been articulated, the key test of commitment, and success, will be for Government to *implement* the measures contained in the strategy and for Bank projects to assist implementation of these actions and investments.

7. For evaluating the three projects, two questions are particularly relevant:

- *Does the Project contribute to mitigating unsustainable depletion of groundwater resources?*
- *Does the project contribute to improving the effectiveness, efficiency and sustainability of urban water agencies to provide consumer responsive water and sanitation services?*

8. The first question is applicable to all water uses: irrigation, urban, drinking water, sanitation, industries, environmental needs and other uses. Actions that respond to this question are referred to in this report as part of the “*Water Resources Management (WRM) Agenda.*” Bank and Yemeni literature indicate a variety of WRM measures to mitigate groundwater depletion, on both the rural and urban side. Most are “demand management” activities rather than the currently predominant “supply side” approach of finding and exploiting new water aquifers. Measures available include: reducing pumping and enhancing rural water productivity through better conveyance technology; increasing irrigation efficiency through improved application such as pressure irrigation (e.g. drip, sprinkler); diversification to less water using crops; using improved agronomic practices requiring less water; reducing urban water conveyance and distribution losses; reducing groundwater pollution from domestic and industrial waste; groundwater recharge techniques such as using check dams, vegetative bunding and vegetation cover (forestry, agro-forestry, managed pasture grazing); wastewater management; water recycling; roof top water harvesting; improved capture of spate water (flood runoff from rainfall); reducing groundwater pollution; price adjustments (e.g. removing subsidies on diesel fuel) and other economic instruments to reduce water demand; laws and regulations to control well drilling and rates of use; community self management of water resources; multi-sectoral basin planning and management; watershed management; publicity campaigns; and other measures.

9. For the urban sector, the second question is also relevant as it corresponds to the Bank’s urban water supply and sanitation (UWSS) objectives in Yemen. Features aimed for are: strong, decentralized and autonomous water corporations; financial viability; competent management and trained staff; transparent processes; responsiveness to stakeholders; efficient water conveyance and distribution; and mitigation of adverse local environmental and social impacts. Private sector participation is also often aimed for to help achieve UWSS objectives more efficiently. These objectives will be referred to collectively as the “*Corporate Management Agenda.*”

## 2. The Three Projects

10. The projects assessed are: (i) the Land and Water Conservation Project (LWCP); (ii) the Taiz Water Supply Pilot Project (Taiz WSPP); and (iii) the Sana'a Water Supply and Sanitation Project (Sana'a WSSP).

11. These projects were chosen because they provide a diversity of sector experience and interlinked issues. Interesting features include: (i) the distinctly contrasting designs and experience between the two urban projects, and between them and the rural project; (ii) differences between the three projects in responsiveness to the WRM and corporate agendas; (iii) the linkage between the rural and urban water sectors; and, (iv) the pioneering by each project of a new direction: LWCP in groundwater management; Taiz WSPP in attempting a form of water market; and Sana'a WSSP in urban sector reform.

12. The respective Development Objectives of the three projects are in the Ratings Section and the Project Components and Costs are at Annex C.

### **THE LAND AND WATER CONSERVATION PROJECT (FY92)**

13. LWCP was the first project in Yemen that focused on *water resources management*, pioneering new techniques for conserving irrigation groundwater. The project comprised three major elements: a water management component primarily for reducing water losses in groundwater irrigated agriculture; a forest and land management component; and, institution strengthening through consultancy assistance and training.

### **The Taiz Water Supply Pilot Project (FY97)**

14. Taiz WSPP was an emergency project, prepared in four months and responding to Taiz city's extreme water shortage. Piped water was available only once every 40 days. The project was the first in Yemen to attempt to compensate farmers for the groundwater abstracted from their land. Taiz WSPP comprised: pumping equipment for two wells; conveyance pipes to the city; drilling exploratory wells; a "compensation-package" for the rural communities expected to have their groundwater depleted by the project's abstraction; and studies to prepare Taiz for private sector management in a second phase project.

### **THE SANA'A WATER SUPPLY AND SANITATION PROJECT (FY99)**

15. Sana'a WSSP supported the first attempt to implement Government's new *corporate reform agenda* for the urban water supply and sanitation sector. The agenda's central feature was to convert the regional branches of the centrally managed National Water and Sanitation Authority (NWSA) into autonomous "Local Corporations." The new agencies were to become financially autonomous; to improve technical efficiency; and to improve management in all respects. Sana'a WSSP involved, in the project parts of the city: investment in the water distribution network; installation of sewers; provision of additional water supply through drilling new boreholes in and around the city; providing piped conveyance; provision of technical assistance for institutional capacity building; and funding to prepare for private sector participation and a follow-on project.

16. **Overall Bank Lending:** The situation of the projects within the overall Bank lending program in Yemen is presented at Annex D. LWCP (FY92), was the 19<sup>th</sup> Bank water sector project, and the 4<sup>th</sup> agricultural water (irrigation) project. Taiz WSPP (FY97) and Sana'a WSSP (FY99) followed several years later. The first of the two urban projects evaluated - Taiz WSPP - commenced 23 years after Bank lending for Yemen's water sector commenced, and was the Bank's 12<sup>th</sup> project in the urban water supply and sanitation (UWSS) sector.

### 3. Monitoring & Evaluation & Fiduciary Issues for the Three Projects

#### M&E DESIGN, IMPLEMENTATION AND UTILIZATION

17. **M&E in Project Design:** For all three projects, monitoring indicators were established during project design, but only the Sana'a WSSP appraisal report specifically related these to the project objectives through a log frame analysis. The monitoring indicators of all of the projects tended to be on physical achievements, with only limited reference to outcomes. None of the projects contained estimated costs of M&E in the appraisal report.

18. **M&E in Implementation:** Dedicated M&E units were not established for any of the projects. Data was collected by operational staff as part of their reporting requirements. This data was systematically collected as it is found in project and agency documents, but the ICRs do not indicate the collection methodologies.

19. **M&E Utilization:** LWCP's monitoring data helped inform the Mid Term Review exercise when cuts in component size were decided. The Sana'a and Taiz corporations have found a M&E process to be useful for monitoring performance and making decisions relating both to enhancing efficiency and to expansions of services. The IEG mission found that Sana'a has performance and production data over a number of years and uses this for monitoring efficiency and setting annual objectives and plans.

#### OTHER ISSUES (SAFEGUARDS, FIDUCIARY, UNINTENDED IMPACTS-POSITIVE AND NEGATIVE)

20. The Taiz and Sana'a projects were rated environment category B, while LWCP was rated C. Government prepared an Environmental Impact Assessment (EIA) for Sana'a WSSP, but no formal report was prepared for Taiz.WSPP. For Taiz, a social issue was the welfare of the communities affected by the well-fields, and a "compensation" package was included in the project.

21. The key environmental issue for the projects – and the key issue for the water sector as a whole - was the respective projects' impacts on groundwater resources. The Staff Appraisal Report for Taiz WSPP did not address groundwater depletion, though the project's support for NWRA's groundwater monitoring activities was a positive contribution. Sana'a WSSP's EIA hardly discussed the groundwater issue, though some project actions such as the sewage network were beneficial, and measures to mitigate

localized issues – cesspit removal, disposition of dried sewage sludge and hazardous chemicals – were included. As a Category C project, LWCP did not prepare a formal EIA. However, the appraisal report and project design were strongly focused on environmental management and particularly on water resources management. Overall, the three projects, particularly the urban projects, could have benefited from a more systematic environmental assessment.

22. Measuring environmental impact was generally weak. LWCP had the most environment related monitoring indicators, but they tended to be physical (trees planted, irrigated area under piped delivery systems, etc). A number could have been further developed. Thus, the key question for water saving with piped delivery is whether less water is pumped or whether the same quantities are extracted furnishing a larger irrigated area, but this was not assessed through systematic survey work. Evaluation of such impacts has had to be largely from interviews with project management staff. Similarly, for Taiz WSPP, survey data on how the incomes of the rural communities in the well-fields had been affected was not found by the IEG mission.

## 4. Ratings

### THE LAND AND WATER CONSERVATION PROJECT

23. The table below summarizes the outcome ratings discussed in the subsequent text:

**Table 1: Development Objectives and Outcome for LWCP**

<i>Development Objectives</i>	<i>Relevance</i>	<i>Efficacy</i>	<i>Efficiency<sup>3</sup></i>
To strengthen sustainable agriculture and assist in better managing water resources through:			
Institutional and technical developments in irrigation and forestry	High	Substantial	
Initiating a program of water use monitoring and regulation in the agriculture sector	High	Modest	
Improving the efficiency and water management of controlled and small-scale spate irrigated agriculture	High	Substantial	
Conserving key indigenous woodland areas, accelerating tree planting and extending soil and water conservation	High	Substantial	
Pilot actions to help in establishing an approach for watershed management, including rehabilitation of abandoned terraces	High	Modest	
<b>Outcome: Satisfactory</b>	<b>High</b>	<b>Substantial.</b>	<b>Modest</b>

24. **Relevance of LWCP: (Rating: High).** All of LWCP’s five Development Objectives were relevant in that they were facets of the same overall objective to, as stated in the appraisal report, “strengthen sustainable agriculture and assist in better managing water resources.” This was to be achieved by actions both in land and integrated water resources management. LWCP was the first project in Yemen for which WRM was extensively discussed in the appraisal report. The project’s particular relevance was in piloting a possible approach to reduce groundwater abstraction. This was through the project’s largest component which provided PVC pipe conveyance (as opposed to field channels) for on-farm irrigation. Water savings were about 25 percent.

3. Under IEG procedures, efficiency is rated for the project overall, and not by objective.

For more advanced farming, in addition to the pipe conveyance, on a small scale the project piloted application of various forms of pressure irrigation (sprinkler, drip, bubble). This is considered by technical specialists to have possibly saved up to another 25 percent of water. The groundwater results attracted considerable interest from Government, and created enthusiasm to proceed further, also supported under the Bank's new lending program.

25. **Efficacy of LWCP: (Rating: Substantial).** LWCP's first objective was achieved in that staff training was considerable and was reported to the IEG mission by former LWCP management, to have been generally of good quality. The mission was also advised that the technical skills that were acquired enabled implementation of the project's field activities, many of which were unfamiliar to project staff. Achievement was *substantial*. The project's second objective, to initiate water monitoring and regulation in the agriculture sector, meaning according to the project description in the appraisal report, the strengthening of groundwater monitoring, had only *modest* success. The number of monitoring wells established exceeded targets, but institutional capacity for measurement and dissemination was only partly strengthened.

26. The project's physical achievements against targets varied, but in most cases had a sufficiently sized achievement to enable field testing. The largest component in each of the land and water management parts of the project - forestry and groundwater irrigation, corresponding to the project's third and fourth objectives - was well implemented. One million seedlings were produced under the forestry component, the same as the appraisal target, and survival rate was satisfactory at 70 percent. In the groundwater component some 10,600 ha of piped conveyance irrigation were installed, less than the appraisal target of 14,350 ha but significantly more than the revised target at mid-term review of 8,500 ha, which accompanied the cancellation of US\$5.5 million. The IEG mission found that, subsequent to project closure, an additional 2000 ha of piped conveyance was achieved, using proceeds from the fund built up under the project through provision of the PVC piping. The achievements of both the third and fourth objectives were *substantial*. The project's last objective, to pilot approaches for watershed management including rehabilitation of abandoned terraces, is reported in the ICR as having had good participation by farmers but there is no data on overall achievements in the ICR and the appraisal report had no physical targets. In these circumstances, but given the reported good participation by farmers, efficacy is rated *modest*.

27. Much more difficult is to go beyond physical achievements to assess what the development impact of the various pilots was. Some inferences can be drawn from activities that have been continued. The Sana'a Basin Water Management Project (SBWMP, FY03) is implementing a number of the land management activities piloted under LWCP, but project field activities are still in early implementation. Of greatest interest is the water saving innovation described above that LWCP introduced for groundwater irrigation. This is now being scaled up under the Groundwater and Soil Conservation Project (GSCP, FY04), and as a major component in the Sana'a Basin project.

28. The IEG mission discussed with the project directors of these two projects how they felt their projects had improved on LWCP's original design. The main new features

are: community management and community monitoring of member activities; tripartite agreements between each farmer, the community organization and the government agency; and a technical advisory service for irrigation management. In part, this responds to one problem under LWCP which was that not all farmers decreased groundwater abstraction, and instead expanded irrigated area. The percentage of such farmers in the project was assessed to be small but no data was available. Several more years will be needed before the efficacy of these adjustments can be evaluated. However, the adaptations provide a good example of a process of learning and adapting based on experience, and they are summarized at Annex F.

29. Taking the successful achievement of most of LWCP's objectives, particularly as concerns the two largest field components, and the influence that LWCP has had on design of relevant follow-on projects, the overall efficacy of LWCP is rated *Substantial*.

30. **Efficiency of LWCP: (Rating: Modest).** The actual costs of all project components except water resources institutional strengthening fell compared with appraisal estimates, but this would primarily have been due to the progressive fall in the value of the Yemeni rial. The costs of institutional strengthening for the project's water resources program increased from the appraisal estimate of US\$5.6 million to US\$8.4 million at project completion. This represents 28 percent of actual project costs, though the mission was informed that part of this increase (amount not specified) was due to additional use of FAO technical assistance. Training and consultancy were in aggregate about the same as at appraisal, so the increased overheads appear very inefficient. The re-estimated ERR of LWCP at completion is 15 percent when only the costs and benefits of the watershed, groundwater and spate irrigation components are included (some 68 percent of total project costs). As at appraisal, ERRs for other components were not estimated. The reasons cited in the ICR are that some components such as forestry have externalities difficult to estimate. If these other components are included as costs in the ERR, but without estimating their benefits, the ERR falls to 10 percent compared with the opportunity cost of capital in Yemen of 12 percent. Given the benefits not quantified, this ERR calculation would be a conservative estimate. Nevertheless, taking into account the high costs of project management, the efficiency of LWCP is rated *Modest*.

31. **Outcome of LWCP: (Rating: Satisfactory).** LWCP was highly relevant in its objectives to conserve groundwater and land resources, thus tackling Yemen's major water sector issue. It largely achieved its objectives, though at high overhead costs. The upgraded rating from the ICR Review's moderately satisfactory is because LWCP's important impact on subsequent projects can now be taken into account.

32. **Institutional Development for LWCP: (Rating: Modest).** Training and technical assistance were substantial (about one third of project costs) and were key factors enabling the project's achievements, as the majority of activities were new to the extension staff. Training was reportedly sound. The use of a Project Management Unit (PMU) and seven field-based Project Implementation Units (PIUs), with staff seconded from the line agencies, was effective.<sup>4</sup> The IEG mission was informed that after closure

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4. There are mixed views on the utility of PMUs, both in Government and the Bank. One view is that in Yemen's still weak institutional capacity a PMU is essential to get projects implemented. Another view is

of LWCP the bulk of the seconded staff were re-absorbed by the Ministry of Agriculture and Irrigation, while most of the PMU and PIU staff continued their former LWCP support activities, financed from proceeds of the cost recovery fund. The mission was also advised that, subsequently, when the Groundwater and Soil Conservation Project commenced, about 60 percent of the former LWCP staff transferred to GSCP. This is better than anticipated at ICR stage, when a concern was that after project closure the low salary levels in government would result in substantial loss of trained staff. However, a permanent institutional structure has still not emerged, and IEG's "modest" institutional development rating in the ICR Review still appears appropriate.

33. **Sustainability for LWCP: (Rating: Likely).** In the ICR Review, IEG reduced the ICR Sustainability rating from likely to unlikely because: (i) the groundwater component was subsidized and dependent on government commitment to continue funding the program in a tight budgetary situation; and (ii) staff depletion was anticipated after project closure. The mission found improvement since then. First, government commitment to the groundwater program pioneered by LWCP is strongly evidenced by preparation and commencement of two successor projects since LWCP closure in FY01: SBWMP (FY03) and GSCP (FY04). For each of these two projects, the LWCP's advanced irrigation package is a primary component. Thus, sustained Government commitment and funding now appears more likely. Also, O&M is entirely funded by the farmers. Second, the substantial continuation of LWCP staff under the GSCP, enables more sustained technical support to the program than had been anticipated at project closure. Given these developments, the sustainability rating for LWCP is raised to *Likely*. Nevertheless, going beyond LWCP to the longer term program being initiated under SBWMP and GSCP, ultimate self reliance would be better assured if advanced irrigation systems did not depend on Government subsidies. Unsubsidized pricing would also provide more scope for the private sector to engage in provision and servicing of equipment.

34. **Bank and Borrower Performance for LWCP: (Ratings: both Satisfactory).** Bank preparation was overly ambitious in its many components and policy features. LWCP was really two projects: water/irrigation and forestry/land management. Combining these two ecologically linked, but physically and institutionally different activities complicated implementation. Adding to this difficulty, the forestry component contained a large number of sub-components. Nevertheless, the detail in the preparation helped to counteract this and the project's physical activities were largely achieved. Supervision was satisfactory initially and highly satisfactory in the final years. Government personnel worked hard to implement the project, a task that was not easy given the project's multiple components, wide geographic coverage and external disruptions.<sup>5</sup> Good project management and use of internationally recruited technical assistance in the project's later stages enhanced the project achievement. The Bank

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that PMUs, if they are outside the organic structure of government, are only temporary bodies, hence with little sustainable impact. These options will not be evaluated here.

5. Unification of North and South Yemen occurred in 1990, just before the project. During the project, the 1990/91 Gulf War affected Government and the economy, and the Civil War in 1994 brought most development activities to a halt (All these events were over by commencement of the Sana'a and Taiz projects).

adapted the project in line with changing circumstances. This included the sensible reduction of physical targets early in the project and again at mid-term review. Overall, Bank and borrower performances were *Satisfactory*. Similar ratings were made in the ICR and ICR Review.

## THE TAIZ WATER SUPPLY PILOT PROJECT

**Table 2: Development Objectives and Outcome for Taiz WSPP**

<i>Development Objectives</i>	<i>Relevance</i>	<i>Efficacy</i>	<i>Efficiency</i>
Mitigate the immediate water shortage in Taiz (by increasing supply by about 100%)	Modest	Modest	
Identify new water sources to avert a sustained water shortage crisis (to meet the needs of at least the year 2000 or about 550 liters per second)	Modest	Substantial	
Develop and test a process and institutional framework for decentralized water resources management (through the establishment of local community associations)	High	Negligible	
Promote private sector participation in the management of water and wastewater utility services (by entering into a management contract in the second phase of the Taiz Water Supply Project)	Negligible	Negligible	
<b>Outcome: Unsatisfactory</b>	<b>Modest</b>	<b>Negligible</b>	<b>Modest</b>

35. **Relevance of Taiz WSPP: (Rating: Modest).** Taiz WSPP had no features responding to either the WRM or corporate agendas and in these respects relevance would be negligible. However, account needs to be taken of the primary objective of Taiz WSPP to respond to Taiz’s critical water shortages on an emergency basis. The social and health impacts, especially for the poor, were known. Thus, relative to the water shortage and social and poverty reduction needs, also referred to in the Bank’s strategy papers, Taiz’s first objective – to enhance water supply and sewerage – was highly relevant, counteracting the project’s negligible relevance for WRM and corporate management reform. Taken together, overall relevance was *modest*. The project’s second objective - to identify new water resources (i.e. well sites) - was purely a supply side (exploitation) approach and without including a WRM focus; relevance was *modest*.

36. Taiz WSPP’s third objective was to develop a rural-urban water transfer system with compensation to farmers. While design features had major flaws, this first attempt in Yemen to move towards a water market was *highly* relevant as an objective. With urban population growth at some seven percent a year, water transfers to the towns will be increasingly essential. The last objective was to prepare for private sector participation. Institutionally, Taiz was not then at all ready for PSP, and preparing for such might have diverted attention from the already difficult water supply objective. The relevance of PSP for Taiz at that time was *negligible*.

37. **Efficacy of Taiz WSPP: (Rating: Negligible).** The project’s first and main objective - to quickly increase the city’s water supply - fell well short of the targeted increase. An increased supply of only about 40 liters per second was achieved. This is less than one-third of the targeted increase of 140 liters per second (l/s); no more than a (very) *modest* achievement.

38. Some progress was made on the project’s second objective: to identify additional water resources. The specific target of finding an additional 250 liters per second was not

met; only an additional 36 l/s was found. However, the number of observation wells nearly achieved appraisal targets, and these wells, and other infrastructure and equipment funded under the project, upgraded Taiz NWRA's capacity. Concerning the target, it was not possible at appraisal to predict available water, so the target was meaningless, and should not have been put in quantity terms in the first place. Given the capacity upgrade, which the IEG mission found had continued after the project, the efficacy of the project's second objective is rated *substantial*.

39. Taiz WSPP's third objective, which involved provision to rural communities of a package of investments in "compensation" for the abstraction of groundwater under their land, was competently implemented and much of the infrastructure is still functional; for instance, the mission found that 10 out of the 12 rural water supply and sanitation schemes are being well operated and maintained by the rural community. However, what ultimately matters is sustainable livelihoods, but these were adversely affected by the lowering of the groundwater table and its impact on irrigation. A one time infrastructure investment only partially achieves sustainable incomes. Accounts of the unrest during installation of the well-fields and the continuing dissatisfaction of the rural communities, which was confirmed during the mission's visit to Taiz, indicate that the compensation objectives were not achieved.<sup>6</sup> Thus, while the relevance of a rural-urban water transfer mechanism is high, the efficacy of the Taiz WSPP attempt was *negligible*. In this connection, IEG strongly disagrees with the ICR's assessment. Page 12 of the ICR comments: "*The project did bring substantial benefits to both the rural population of Al Haima and Habir (at the well-fields) and .....*" This was far from the case. Additionally, a view commonly encountered by the mission was that the Taiz failure had actually set back the prospects for developing formal water markets as both government and the rural population now distrust any such initiative.

40. Taiz WSPP's last objective was to promote private sector participation. The first drafts of the study included in the project to assess private sector participation possibilities were inadequate, and at the Bank's request the study was dropped. Efficacy was *negligible*.

41. **Efficiency of Taiz WSPP: (Rating: Modest).** Actual project costs of Taiz WSPP were about the same level as appraisal estimates, except for the costs of the water sources component which were lower than appraisal estimates. A significant chance for increasing water provision to the city simply by replacing a leaking pipe (para 50) was not seen at appraisal but was later implemented during project execution. The ICR estimates a 20% ERR for the project's main component, city water supply. The calculation uses the reduced quantities of water actually supplied, the primary factor which reduced the appraisal estimated ERR of 55 percent. However, as with the appraisal estimate, the ICR's estimated ERR is sensitive to the assessed economic value of piped water, assumed in the ICR to be half the price paid to water vendors selling water transported by tanker trucks. The basis for this assumption is not provided, casting

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6. To this day, the concerned villagers are reported to be highly dissatisfied with the reduced groundwater table. Also, from reports at the time of installing the well and conveyance infrastructure, there were cases of refusal to allow construction, and the army had to be called in at one stage. Only through the persuasion of the Governors of the two Governorates and extensive other dialogue was construction able to proceed.

some doubt on the usefulness of the project's estimated ERR. Thus, cost-effectiveness may be a better indicator of efficiency. As actual water delivery was less than one-third of appraisal estimates, but investment costs were the same, efficiency is rated *modest*.

42. **Outcome of Taiz WSPP: (Rating: Unsatisfactory).** Taiz WSPP was highly relevant in responding to Taiz city's water crisis, and in the attempt to provide compensation to farmers. But, without WRM measures, relevance is reduced. Achievement of objectives fell well short of targets, and without a commensurate reduction in costs. The ICR and ICR Review also rated outcome as unsatisfactory.

43. **Institutional Development for Taiz WSPP: (Rating: Modest).** Taiz WSPP's arrangements for coordination between institutions were weak. There were, effectively, three separate sub-projects under different agencies, each with a separate special account and project management unit and each operating largely independently of the others. The National Water and Sanitation Authority (NWSA) handled the engineering works, the National Water Resources Authority (NWRA) handled groundwater studies, and the Southern Uplands Rural Development Unit (SURDU) was in charge of the rural community's compensation package. Implementing the project through the relevant line agencies rather than creating new entities was sound. However, NWSA, which was intended to play the coordination role, was ineffective, and a multi agency project steering committee met only twice.

44. Nevertheless, the IEG mission found that all three of the agencies involved were strengthened, but to varying degree. For NWSA and SURDU, the primary benefit was in the strengthening of staff capabilities through working with the project's consultants. The majority of the project's NWSA staff were subsequently reabsorbed into the Taiz WSS corporation. SURDU was abolished after the project, a national rather than project level decision. However, the mission was advised that most of the SURDU staff were also absorbed into the agencies appropriate to their specialization, mostly to the Ministry of Agriculture and Irrigation. A particular benefit was the participatory approaches the SURDU personnel learnt under the project, which were largely unfamiliar to the ministry.

45. NWRA Taiz was the agency most strengthened. It had only been established one year before the project and had difficulties initially due to excessive control by its central office. It also had difficulty getting its advice on its resources analysis taken into consideration by the overly supply oriented NWSA. This has progressively improved, though the mission observed that the Taiz water corporation (formerly NWSA's Taiz branch) still needed to more systematically take NWRA advice into its decision making. The staff of NWRA's Taiz branch participated with the consultants on groundwater monitoring, and with NWRA central in preparing a Taiz water management plan. This helped the Taiz branch staff to gain experience and capacity. The mission's visit to NWRA Taiz found that it had clear capabilities in groundwater hydrology and other WRM activities. NWRA Taiz has continued as a functional body after the project, and activities have expanded; for instance, in establishing additional groundwater observation wells. Taking the capacity development of all three institutions into account, especially NWRA, the further capacity improvements after the project, and the greater retention than expected after the project of staff from all three agencies (the ICR expected

substantial attrition), Institutional Development for Taiz WSPP is rated *Modest*, an increase from the assessment of negligible at ICR Review.

46. **Sustainability for Taiz WSPP: (Rating: Unlikely).** The IEG mission was shown data for the last several years indicating that at the reduced pumping rate from project facilities of 40 liters per second (planned was 140 l/s), the aquifer is not being drawn down further. Thus, unlike Sana'a, which has been pumping beyond sustainable yield, continued water supply for the Taiz project investments is more likely. The strengthened Taiz NWRA has also prepared a water plan and has increased the number of observation wells for water monitoring, demonstrating some seriousness now in groundwater management. Project infrastructure examined by the mission was in good order. Also, one pump had been replaced, and government/corporation funds had been used to purchase a new one, indicating commitment to continue to maintain and use the facilities. Taiz's water supply and sanitation corporation, formed in February 2001, near the end of the project period, has grown in strength. The mission's examination of the 2003 audited accounts for the corporation show a positive current revenues/costs ratio. These are very positive developments, and prospects for sustaining the project achievements have clearly improved since project closure. However, adjusting the ICR Review rating to likely would be premature as Taiz's progress would best be observed over several more years. The *Unlikely* rating at ICR review is thus retained.

47. **Bank Performance for Taiz WSPP at Project Preparation: (Rating: Highly Unsatisfactory).** Taiz WSPP's design was poor, reflecting the haste with which this emergency project was prepared. The rushed preparation of the project – in four months from appraisal to Board and without any preparation missions - while with the best of intentions, contributed in Taiz's case to serious shortcomings.<sup>7</sup> In particular, these were: (i) the substantial shortfall in water delivery due to assumptions on water availability without the needed hydrological investigations; (ii) the poorly conceived and inadequate compensation package for the rural communities affected by the project; and (iii) the complicated institutional design resulting in coordination problems between the implementing agencies.

48. A number of additional observations can be made. First, the means to quickly enhance water availability might be questioned. Demand management interventions were not considered even though water losses were high. Unaccounted for water was nearly 50% and reducing this might have offered a larger and quicker payoff. Also, the very beneficial change in the infrastructure component made during supervision - to replace the corroded and leaking Al Hayma-Taiz conveyance pipe, providing an additional 20% of water through reduced leakage - was an option missed at appraisal. Second, the possibility for a formal water market approach to rural – urban water transfer, which could enable continuous benefits to rural communities for provision of part of their

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7. It might, however, be commented that emergency projects are not necessarily lower performers than non-emergency projects. For Taiz WSPP, specific measures in project design might have been considered. For instance, flexibility could have been in-built to significantly adjust the project during implementation. Water availability and the compensation package could have been reassessed before or very early in project implementation. Flexible funding for examining and including demand side measures during implementation might also have been considered.

water, could have been considered.<sup>8</sup> The “compensation” model chosen at project design had little chance of success. Third, there were several activities in the project which had low relevance to the emergency water supply objective. For instance, the PSP study and the Hadramawt study (in another region) were worthy, but including such extra activities detracted from the main objective. A simple design, focused exclusively on Taiz’s water crisis, might have enabled the water supply component to be better prepared. Finally, there were a number of unrealistic assumptions on the timing of project activities. For instance, an assurance was obtained from Government that NWSA would prepare management contract documents for private sector participation for its Taiz branch by end January 1997, and issue an ICB announcement by end March 1997. Project approval was, respectively, only 4 and 5 months earlier than these dates.

49. **Bank Performance for Taiz WSPP during Implementation: (Rating: Satisfactory).** Supervision tried to retrofit actions to resolve these problems, but the original design made this difficult. Supervision was thorough, and included many more visits to Taiz than conveyed in the record of official supervision missions. Task management from Yemen was effective. The task team introduced a number of good adaptations from the original design, and more focus on participatory approaches, institutional and management areas, and water resources management. The independent Mid Term Review mission concluded that the project was well supervised, a view that IEG confirms. However, one important omission was that a formal restructuring of the project including its Development Objectives was not undertaken, even though the project was in fact substantially revised. IEG assesses projects based on the original DOs, unless revised during implementation, when both the original and revised objectives are taken into account. The lack of revision makes a more favorable assessment of the project difficult. Given the overall supervision performance, a satisfactory assessment for implementation is appropriate. However, taken with the highly unsatisfactory project design, overall Bank performance is assessed as *Unsatisfactory*. This rating is the same as in the ICR Review which downgraded the ICR’s assessment of satisfactory.

50. **Borrower Performance for Taiz WSPP: (Rating: Unsatisfactory).** Project preparation by Government and the implementing agencies shared a number of the problems noted above for the Bank assessment. In implementation, counterpart funding was sometimes delayed, there were coordination problems between the three agencies, and initial lack of clarity on the compensation arrangements. Nevertheless, achievements were made and performance improved during implementation. Further, the continued institutional developments after project closure are encouraging. However, taken with the weak preparation performance, borrower performance is rated as (marginally) *unsatisfactory*, the same as in the ICR Review, which was a downgrade of the ICR’s satisfactory assessment.

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8. Preparation time would have needed to be substantial, as water markets require careful and location specific preparation, including extensive dialogue between all parties concerned. If well designed, they can provide win-win situations where rural communities get fees significantly higher than the value of their water in irrigation, and the urban utility can buy or seasonally rent water at prices below consumer willingness to pay.

## THE SANA'A WATER SUPPLY AND SANITATION PROJECT

**Table 3: Development Objectives and Outcome for Sana'a WSSP**

<i>Development Objectives</i>	<i>Relevance</i>	<i>Efficacy</i>	<i>Efficiency</i>
Address emergency sewer installation and water network rehabilitation needs in Sana'a	Substantial	Substantial	
Increase the availability of urgently needed potable water in the city	Negligible	Substantial	
Improve the efficiency of water and wastewater services in the city in a physically and financially sustainable manner	High	High	
Prepare the sector for significant private sector participation	Modest	Substantial	
<b>Outcome: Moderately Satisfactory</b>	<b>Modest</b>	<b>Substantial</b>	<b>Substantial</b>

51. **Relevance of Sana'a WSSP: (Rating: Modest).** Sana'a WSSP's first objective - to enhance sewerage and water networks - was *substantially* relevant in responding to Sana'a's water shortage as it would improve services and water conveyance efficiency, hence enabling water savings. The second objective, to increase water supply through further groundwater exploitation, was relevant in its water supply objectives, but as it contained no attempt to better manage groundwater resources, meaning that the project actions would inevitably deplete the water resources, the objective is rated *negligible*. The third objective to improve the efficiency of water services is rated *highly* relevant as it directly supported the corporate improvement agenda for the Sana'a water agency and was a pioneer for reforms in other water agencies (refer below). The final objective was to prepare for private sector participation. The objective was very relevant for the longer term, but proved unrealistic in the short term. The corporation had not yet gained a level of financial and technical capacity to attract potential private sector partners (para 60). Thus, the relevance of PSP at that time was *Modest*.

52. Taking account of the contrasting relevancies of Sana'a WSSP's objectives, overall relevance was *Modest*, a balance between extremes in the evaluations above. Some features in the opposite polarities of Sana'a WSSP's relevance - excellence in the *corporate reform agenda* but minimal in *water resources management* - are highlighted below:

- The Pioneering of Water Agency Reform:** Sana'a WSSP was prepared in the 1997-99 period, based on close dialogue between Government and the Bank. In April 2000, Government converted the Sana'a branch of NWSA into a corporation: the Sana'a Local Water Supply and Sanitation Services Corporation (SLWSSC). This was followed by others: in August of the same year Aden NWSA branch was corporatized, followed by Hodeidah in January 2001, and subsequently by most of the other major cities in Yemen. The IEG mission found that a common view within government was that Sana'a had helped pave the way in two respects: first, as an example to politicians that corporatization could be done; and, secondly, as a model to help practical implementation. The Sana'a WSSP dialogue and funds also supported preparation of the subsequent Urban Water Supply and Sanitation Project Adjustable Program Loan (FY03), which further develops the new corporate management approach, covering additional cities.
- The Neglect of Groundwater Depletion.** Neither Sana'a WSSP nor Taiz WSPP contained objectives that would have contributed to improved groundwater

management. Instead, the two projects followed the typical UWSS approach in Yemen of exploiting additional water supply through new tube-wells. Abstraction would continue until the aquifer was depleted, after which new well-fields would be found for similar unsustainable exploitation, thus ignoring Yemen's overarching water sector issue. For Taiz, this gap is partly understandable given the project's emergency nature, but Sana'a WSSP could have done more.

53. Several observations regarding Sana'a WSSP's neglect of groundwater management are of interest. The project tackled unaccounted for water, sewerage, and cess-pools. These actions were all appropriate, but the major strategic issue was not tackled. Meanwhile, wells in and around Sana'a were running dry, with pumping going well beyond sustainable yield. The Sana'a WSSP appraisal report mentioned an environmental assessment, which was also summarized in an annex. Three "major" environmental issues were discussed, but not groundwater management possibilities. Thus, IEG disagrees with the assertions in both the appraisal report and the ICR that Sana'a WSSP was consistent with CAS objectives. Both the 1996 and 2002 CAS' refer to water *sustainability* as their key objective, and thus relevancy must be substantially measured against this.

54. Some observers have mentioned other agencies or projects that they consider to be responsible for taking care of the groundwater problem; for instance, NWRA, which, however, is a resource assessment entity and not an implementing agency. Under Government regulations, groundwater management is NWRA's mandate; but NWRA has no resources to do this. This is a case where resolution with government on changing the responsibility for Sana'a groundwater management to the Sana'a corporation would have been a possible solution. Leaving responsibility for groundwater management to, effectively, no agency, was not a solution. Reference might also be made to the Sana'a Basin Water Management Project which commenced just after Sana'a WSSP ended. SBWMP is indeed specifically targeted to the better water management of the Sana'a basin, but it does not have the purpose, or capacity, to redress major environmental problems specifically caused by other agencies, especially on the scale caused by Sana'a. The better approach is for each water program implementer to deal directly with the environmental problems that it is causing.

55. **Efficacy of Sana'a WSSP: (Rating: Substantial).** Three of Sana'a WSSP's components addressed the first two objectives of Sana'a WSSP; investment in sewerage, water networks and water supply. These physical objectives were on balance achieved, though with uneven implementation between components. Water connections (5000 versus 18,000 planned) were significantly below target, but the larger sewerage component connected 33 percent more households compared with the planned 23 percent increase. The IEG mission's visit to the area where sewerage had been installed. - Akama - showed very satisfactory achievement, and highly satisfied residents. Photographs examined showed that, beforehand, the streets had been open sewers. On other project components, demolition of cesspools was approximately on target: 3000 compared with 3100 planned at appraisal. As concerns the third large component, water supply, additional water from the project wells was 33% of the city's former total supply, compared with an appraisal target of 20 percent. During the project period a number of older wells had to be shut down due to either collapse of the aquifer or the need for major

maintenance. The net result was an increase in Sana'a's water supply of only 13 percent, though the project infrastructure was not responsible for the resource depletion from other infrastructure. There was, nevertheless, some gain: piped water became available every four days, as opposed to the pre-project situation of once a week.

56. On water distribution, the ICR found that government statistics showed an *increase* in unaccounted for water (UFW). However, examination by the IEG mission suggests that the most probable cause was a faulty initial estimate due to there being virtually no meters before the project. The project works would have reduced UFW, though it is not possible to gauge by how much. Considering the overall achievements of these three components, efficacy was *substantial* for the projects first two objectives.

57. Sana'a WSSP's third objective was to improve the efficiency of water and wastewater services. This was achieved on both financial and technical indicators, and the mission found a further improvement since project closure in Sana'a corporation's financial situation. The number of water and sewage connections had also grown since closure. The Sana'a corporation's contribution to corporate reform elsewhere is an important achievement not anticipated at appraisal, and also not noted in the ICR. The Efficacy of the third objective was *high*.

58. **Private Sector Participation:** Sana'a WSSP's last objective – preparation for private sector participation – was a more realistic goal than in the case of Taiz, due to the greater capacity and hence attractiveness of the Sana'a water corporation. Nevertheless, the privatization goal proved elusive. The project's objective of preparing for PSP was achieved, but tendering under the follow-on UWSS-APL was not successful. A lease contract was aimed for, and to this effect, invitations were launched in 2002, but no offers were received. In retrospect, aiming for any form of private sector participation beyond a management contract was probably not realistic in Yemen at that time. The Sana'a corporation's unsuccessful first PSP attempt led to re-thinking of the approach to PSP and a management contract was then aimed for. This is still the objective but has not yet been achieved, although in the mission's meeting with the Sana'a corporation, there was a view that, with its further improved financial situation, the corporation may now be ready for PSP interest. This would be a landmark as there is still no PSP in Yemen's UWSS sector. Nevertheless, the Sana'a WSSP's privatization efforts, continued under the UWSSP- APL, have had positive impact. Sana'a corporation has gained experience in preparation for private sector interest, and the project's objective to *prepare* for PSP can thus be considered to have had *substantial* efficacy.

59. **Efficiency of Sana'a WSSP (Rating: Substantial).** The physical achievements of Sana'a WSSP were on balance at appraisal targets, while costs were below appraisal estimates. The ICR's estimated ERRs were 32 percent for the city water network, 27 percent for additional water supply and 25 percent for sewerage. These three components made up 71 percent of project costs. The analysis methodology is the same as in the appraisal report and appears sound.

60. **Outcome of Sana'a WSSP (Rating: Moderately Satisfactory).** Sana'a WSSP was highly relevant in corporate management aspects, but not in groundwater management. Balancing these, with greater weight given to the relevance of groundwater

management compared to corporate achievements, overall relevance was modest. However, Sana'a WSSP largely achieved its objectives and implemented well. Overall, the outcome of Sana'a WSSP is rated *Moderately Satisfactory*, the same as in the ICR Review.

61. **Institutional Development for Sana'a WSSP: (Rating: High).** NWSA's Sana'a branch became a corporation during the project, a significant step that required considerable preparation; legally, financially and administratively. The technical and financial capacity of the Sana'a Local Water Supply and Sanitation Corporation (SLWSSC) was progressively strengthened. By the end of the project, the corporation's current revenues could cover O&M and administrative costs. In 2004, the year after project closure, water sales, water connections and sewerage connections all increased further, and additional increases are projected for 2005. The PSP objective was an ambitious expectation given the stage of development of SLWSSC at that time. Nevertheless, the preparation for possible PSP served to focus management attention on key improvement areas. Given the significantly improved financial situation and performance of SLWSSC, Institutional Development is rated *High*, a large increase from the assessment of modest at ICR and ICR Review. The upgrading is due to the continued improvements in the corporation's efficiency since project closure and because of the IEG mission's additional assessment of the project's important role in the formation and institutional strengthening of water corporations in other cities.

62. **Sustainability for Sana'a WSSP: (Rating: Unlikely).** The Sana'a Local Water Supply and Sanitation Corporation could be considered sustainable in that it has achieved financial viability and a measure of technical and managerial competency, and that these aspects have further strengthened since project closure. This improvement represents good performance in corporate agenda aspects.<sup>9</sup> Whereas the ICR assessed the corporation's sustainability as unlikely, IEG now considers this to be likely. However, Sana'a WSSP's groundwater availability is not sustainable under current practices. The corporation informed the mission that abstraction of groundwater in and around Sana'a was 1.5 times recharge, and the water table was declining at about 6 meters per annum. The wells now being drilled by SLWSSC are going to depths of over 200 meters. Increased water supply from additional water mining is substantially counteracted by other wells going dry. Sustainability is rated *Unlikely*, as in the ICR and ICR Review, but now due to the WRM sustainability issue rather than due to corporate management concerns.

63. **Borrower Performance for Sana'a WSSP: (Rating: Satisfactory).** At the beginning of preparation it took about a year for government to embrace a reformist approach to sector management, but thereafter Government actively promoted the project and was a strong partner in preparation,. It was subsequently an active implementer of the project promoting significant institutional changes. The transition to a corporation and the tariff increases were politically difficult but were nevertheless implemented, and the corporation's management was progressively improved. While Yemen neglected

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9. Under the UWSSP-APL, SWSLC will receive continued support, with the objective of further improving the corporation's efficiency, and the aim also of attracting private sector participation. There are, thus, good prospects that the corporation will further strengthen.

water resources management, borrower performance may (just) be maintained at the *Satisfactory* level because of the additional factor that politically difficult actions were undertaken. The ICR and ICR Review also rated borrower performance satisfactory.

64. **Bank Performance for Sana’a WSSP: (Rating: Unsatisfactory).** Project preparation helped sustain the Bank’s increased policy dialogue with Government. The appraisal report is a thorough document, and strong in corporate management aspects. The detail indicates the care with which the project was prepared. Implementation readiness was good: When implementation began (Effectiveness), three out of the four civil works contracts had been awarded. Supervision was also good, and Sana’a office staff, with their close contact with the borrower, further strengthened supervision. Clearly, Bank performance was very good in promoting the corporate agenda. However, groundwater management – Yemen’s most important water sector need - was ignored. Thus, in WRM aspects Bank performance was highly unsatisfactory, particularly given the extensive advice that had been provided in the past (refer below and to Annex E). Hence, notwithstanding Sana’a WSSP’s very good corporate management aspects, overall Bank performance is reduced to an *Unsatisfactory* rating. This is a downgrading of the satisfactory rating at ICR and ICR Review, due to the greater emphasis that the Bank’s current strategy places on Yemen’s primary water issue.

#### **THE LIMITED LEARNING BY THE BANK**

65. The inattention of Sana’a WSSP and earlier projects to Yemen’s groundwater depletion issue raises an additional concern in that, as described in Annex E, learning was very limited over a long period. The first Sana’a water project was approved in FY74. The groundwater issue was known then and is mentioned in the appraisal report. There had been a chain of operational experience and IEG observations on the WRM needs for Yemen’s UWSS projects since then. LWCP had also preceded Sana’a WSSP, and this contained substantial discussion on WRM. Yet, until LWCP - the Bank’s 19<sup>th</sup> water sector project in Yemen and nearly 20 years after the first project - there had been no significant attempt in Bank projects to address groundwater management. Unfortunately, Sana’a WSSP, approved by the Board seven years after approval of LWCP, continued this omission.

## **5. Lessons**

66. Sana’a WSSP’s success in helping to pioneer the establishment of water sector corporations and to improve corporate management was an important contribution in the urban water sector. However, the main lessons from assessing the three projects relate to water resources management. The issues underlying the four lessons below have substantially contributed to the lacuna regarding groundwater management, and to the lack of attention to other related institutional and policy needs. They may also have relevance to other countries with similar gaps. The lessons relate to: *a lack of prioritization, a lack of sector work, a lack of cross-sectoral coordination, and a lack of forward planning:*

### **Lesson 1: Identifying and tackling the dominant issue(s) is key to a program's relevance and outcome**

67. There is need to identify and prioritize the issue or issues that really matter: in Yemen's case, the groundwater depletion issue. It took the Bank nearly 20 years and 20 projects to start to tackle groundwater depletion. Had groundwater depletion been prioritized earlier, Yemen would be in much better position than it is today. Tackling groundwater depletion has become increasingly difficult over time: the technical problems are greater with deeper water tables; the number of agricultural tube-wells has mushroomed, the habits and perceived acquired rights of farmers have become entrenched; and urban demand has expanded rapidly. Mitigating the problem would not have been easy even 20 years ago, but the complexities and costs of mitigation today are likely to be vastly greater. For both the Bank and Government, a clear and urgent need is to integrate groundwater resources management into project design in *all* water sectors, whether they be projects for rural, urban, power, industry or other sectors.

### **Lesson 2. A comprehensive strategy is essential**

68. A strategic analysis and program approach was largely absent in Yemen's water sector for the first 25 years of the Bank's involvement. The largely non-responsive succession of projects was the result. If a comprehensive strategy had been developed earlier, the groundwater issue would likely have received attention earlier. The corporate management agenda, only effectively introduced under the Sana'a WSSP, might also have been promoted in earlier projects. The Bank's water program in other aspects might also have been more relevant: in institutional change, pricing policy, legislation, regulation and other water related aspects of Yemen's economy and socio-political structure.

### **Lesson 3: Multi-sectoral approaches and better coordination are needed**

69. In the case of Yemen this was largely absent. A great improvement was made in 2003 when a Ministry of Water and Environment was created and most water agencies were transferred to be under this ministry. However, irrigation, the largest user of water, remains under the Ministry of Agriculture and Irrigation. In the Bank, rural and urban water are typically in different departments. Such arrangements can be manageable if good inter-linkages exist, but this was not the case in Yemen. Irrigation has tended to be seen by agricultural agencies as an input to farming, without broader perspective of the needs of other sectors, while urban water agencies have tended to treat water as a resource to be exploited, with little consideration of sustainability. Such dichotomies are still ongoing. Sana'a water corporation focuses on water abstraction without consideration for management of the water resources, while the Sana'a Basin Water Management Project tries to find ways to conserve and replenish water.<sup>10</sup>

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10. Just as multi-sector approaches need to be applied to water management, water also enters into similar multi-dimensional needs for other issues. For instance, the cultivation and consumption of Qat is now a large part of agricultural area and is significantly used by adults, especially men. Amongst poorer households Qat can consume a large part of family income, limiting other expenditures such as on food, clothing and schooling. Qat, with consumption typically starting in the early afternoon, has also been cited as contributing to lower working hours. Resolving such issues would likely involve multi-sector actions

#### **Lesson 4: Rural-urban water markets need to be developed**

70. Expanding urban demand will increasingly need rural-urban transfer of water through an equitable mechanism. Formal water markets have not yet been developed in Yemen.<sup>11</sup> One adaptation from the usual model may be to use and help expand the already thriving informal water markets of private truckers (such vendors provide 60 percent of Sana'a's water). Key adjustment needs would include establishing water rights and a regulatory system to limit water abstraction to sustainable yield, perhaps largely self-monitored and regulated by rural communities. Looking ahead, piloting of practical options should begin now.

### **6. The Way Forward**

71. While it has taken an extraordinary length of time for the Bank and Yemen to begin reorienting approaches to better tackle the strategic needs of Yemen's water sector, a major move forward has occurred over the last several years. Early elements of change are found in the three projects themselves: LWCP piloting rural groundwater conservation, Sana'a WSSP beginning more fundamental institutional reforms in the urban sector, and Taiz WSPP providing a first and learning experience in attempting compensation for rural-urban water transfer. In FY98, the first significant Bank report on Yemen's water sector was produced; entitled "Towards a Water Strategy." The major changes, however, have been since 2000.

72. Bank and Government strategy work significantly expanded after 2000, in particular over the last two years, and resulted in sector strategy papers issued in 2005 by both Government and the Bank. These are the first comprehensive strategies produced for Yemen's water sector, and they broadly harmonize in discussion of issues and strategy. The new strategy is beginning to be mirrored in the new projects. The two most recent water sector projects: the Sana'a Basin Water Management Project (FY03) and the Groundwater and Soil Conservation Project (FY04) are both focused on the water resources management agenda. The Urban Water Supply and Sanitation APL (FY03) is promoting the urban corporate reform agenda, and if coupled with a greater WRM focus, can make a major difference in the urban sector. The Rural Water Supply and Sanitation Project (FY02) promotes water conservation as well as rural water services. Another positive initiative is that a cross-sectoral water team has been established between the rural and urban units of the MENA region.

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including in social outreach, education, regulation, prices and incentives, agriculture, irrigation and other interventions.

11. Typically, such formal water markets would be based on establishing "win-win" situations for both rural and urban communities (i.e. prices for farmers greater than the value of water for its highest irrigation usage, and prices for urban consumers lower than the water utility's prices). Such markets would need other accompanying features such as regulation of water extraction and quality, features to protect social welfare, and, probably, community self monitoring and management. Development experience indicates that water markets need careful, practical and highly participatory preparation, specifically designed to the particular needs and culture of the country and locality concerned.

73. The new directions are increasingly encompassing the first three major lessons: (i) the key issue – groundwater depletion – has been put at the center of activity; (ii) the program now has an articulated strategy; and, (iii) a more multi-sectoral approach is emerging, though this is not yet strongly evident in action. The performance of the new generation of projects has yet to be demonstrated. As they are innovative, they are also risky (several of these projects are currently having start-up problems<sup>12</sup>). But in their conceptual directions, they are much more relevant than the supply side and infrastructure dominated projects of the past.

74. A core need, however, will be to implement the new strategy. Beyond individual projects, broad and often difficult sector changes will be needed; likely in policies, legislation, regulation, pricing, institutions and other measures. Carrying out the strategy is now the challenge.

75. “The Way Forward” is the cover title for Government’s new strategy paper, NWSSIP, and may be an apt expression for the new approach that both the Bank and Government have articulated. The current strategic framework and the new generation projects are promising. Taken together, and, *if implemented*, the new approach offers a much more positive prognosis for the way forward: the management into the future of Yemen’s water resources.

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12. Several of these projects currently have problematic implementation performance. While possibly to be expected at the beginning of projects forging new directions, these implementation difficulties will need to be resolved for the projects to usefully pilot the innovations being promoted.

## Annex A. Basic Data Sheet

### LAND AND WATER CONSERVATION PROJECT (CR. 2373-YEM)

#### Key Project Data (amounts in US\$ million)

	Appraisal estimate	Actual or current estimate	Actual as % of appraisal estimate
Total project costs	47.6	30.1	63
Loan amount	32.8	28.8	88
Cofinancing	3.2	n.a.	
Cancellation		SDR 3.7	

#### Cumulative Estimated and Actual Disbursements

	FY93	FY94	FY95	FY96	FY97	FY98	FY99	FY00	FY01	FY02
Appraisal estimate (US\$M)	0.3	3.5	10.7	19.11	27.5	32.3	32.8	32.8	32.8	32.8
Actual (US\$M)	0.0	0.5	1.8	11.5	15.3	19.0	24.6	27.8	28.3	28.5
Actual as % of appraisal	0	14	17	60	56	59	75	85	86	87
Date of final disbursement:										

#### Project Dates

	Original	Actual
Initiating memorandum		10/31/1989
Appraisal		5/17/1991
Board approval		5/28/1992
Effectiveness	5/14/1993	
Closing date	6/30/1999	12/31/2000

#### Staff Inputs (staff weeks)

	Staff Weeks	US\$ ( '000)
Preappraisal	87	237
Appraisal/Negotiations	53	165
Supervision	150	444
ICR	15	64
Total	305	910

## Mission Data

	<i>Date (month/year)</i>	<i>No. of persons</i>	<i>Specializations represented</i>	<i>Implementation Progress</i>	<i>Development Objectives</i>
Identification/ Preparation	Oct 1989-June 1990		E, C, F, A,		
Appraisal/ Negotiations	May 1991- March 1992		E, C, F, WS,		
Supervision 1	July 1992	2	E, C	HS	HS
Supervision 2	Feb 1993	1	C	S	S
Supervision 3	Oct. 1993	3	A, E, C	S	S
Supervision 4	April 1994	2	E, C	S	S
Supervision 5	Oct. 1994	3	A, C, E	S	S
Supervision 6	Aug. 1995	1	E	U	S
Supervision 7	Apr. 1996	2	E(2)	S	S
Supervision 8	Oct. 1996	3	A(2), E	S	S
Supervision 9	Jul. 1997	4	A(2), C, E	S	S
Supervision 10	Feb. 1998	4	E(3), C	S	S
Supervision 11	Oct. 1998	5	E (2), OM, C	S	S
Supervision 12	Mar. 1999	2	E, O	S	S
Supervision 13	Aug. 1999	3	E, N, O	S	S
Supervision 14	Apr. 2000	2	E, O	S	S
Supervision 15	Oct. 2000	2	E, O	S	S
Completion (ICR)	Feb 2001	4	E (2), O, C	S	S

Specializations Represented: A=Agriculturalist; O=Operations Officer; C=Economist; E=Engineer; F=Financial Analyst; WS=Water Resources Specialist; V=Environment; L=Legal; S=Social Scientist; N=Natural Resources Management Specialist

## Other Project Data

Borrower/Executing Agency:

### *FOLLOW-ON OPERATIONS*

<i>Operation</i>	<i>Credit no.</i>	<i>Amount (US\$ million)</i>	<i>Board date</i>
Groundwater and Soil Conservation Project	Cr. 3860	40.0	Feb 26 2004
Sana'a Basin Water Management Project	Cr. 37740	24.0	June 3 2003

## TAIZ WATER SUPPLY PILOT PROJECT (CR. 2913-YEM)

### Key Project Data (amounts in US\$ million)

	<i>Appraisal estimate</i>	<i>Actual or current estimate</i>	<i>Actual as % of appraisal estimate</i>
Total project costs	11.08	9.30	84
Loan amount	10.20	8.50	83
Cofinancing	-	-	
Cancellation		1.50	

### Cumulative Estimated and Actual Disbursements

	<i>FY97</i>	<i>FY98</i>	<i>FY99</i>	<i>FY00</i>	<i>FY01</i>	<i>FY02</i>	<i>FY03</i>
Appraisal estimate (US\$M)	3.5	8.5	10.0	10.2	10.2	10.2	10.2
Actual (US\$M)	0.3	2.9	3.9	5.0	6.7	8.2	8.4
Actual as % of appraisal	8	34	39	49	66	80	82
Date of final disbursement:							

### Project Dates

	<i>Original</i>	<i>Actual</i>
Initiating memorandum		04/04/1996
Appraisal		4/12/1996
Board approval		09/03/1996
Effectiveness		02/24/1997
Closing date	06/30/2000	12/31/2001

### Staff Input Costs (US\$ '000)

	<i>US\$'000</i>
Identification, Preparation, Appraisal and Negotiations	130.6
Supervision	565.2
ICR	20.0
Total	715.8

Staff weeks not available

## Mission Data

	<i>Date (month/year)</i>	<i>No. of persons</i>	<i>Specializations represented</i>	<i>Implementation Progress</i>	<i>Development Objectives</i>
Identification	Feb 1996	1	C		
Appraisal, Negotiations	April 1996	4	E, L, C, S		
Supervision 1	Jan. 1997	2	C (2)	S	S
Supervision 2	June 1997	3	C, S, H	U	U
Supervision 3	Oct. 1993	4	E, S, C(2)	U	U
Supervision 4	March 1998	4	E, O, C, S	S	S
MID-TERM REVIEW	July 1998	3	E, C, F, S	S	S
Supervision 5	Dec. 1998	5	O, H, S(2), E	S	S
Supervision 6	April 1999	3	O, W, S	U	S
Supervision 7	Sept. 1999	3	F, O, S	U	S
Supervision 8	March 2000	8	F, O, S, F, H, MNSID, MNSRE, WS	S	S
Supervision 9	Jul. 2000	1	C	S	S
Supervision 10	Dec. 2000	3	F, O, C	S	S
Supervision 11	May 2001	1	F	S	S
Completion	Nov. 2001	3	F, O, C		

Specializations Represented: O=Operations Officer; C=Economist; E=Engineer; F=Financial Analyst; WS=Water Specialist; V=Environment; L=Legal; S=Social Scientist; H=Hydrogeologist; WID=Gender Specialist; D= Disbursement Specialist; P=Procurement Specialist; MNSID=Sector Manager (infrastructure); MNSRE=Sector Manager (rural/environment);

## SANA'A WATER SUPPLY AND SANITATION PROJECT (CR. 3209-YEM)

### Key Project Data (amounts in US\$ million)

	<b>Appraisal estimate</b>	<b>Actual or current estimate</b>	<b>Actual as % of appraisal estimate</b>
Total project costs	28.0	24.6	88
Loan amount	25.0	22.7	91
Cancellation	-	-	

### Cumulative Estimated and Actual Disbursements

	<b>FY00</b>	<b>FY01</b>	<b>FY02</b>	<b>FY03</b>	<b>FY04</b>
Appraisal estimate (US\$M)	8.0	15.8	22.8	24.7	24.7
Actual (US\$M)	9.3	14.0	18.2	21.2	22.6
Actual as % of appraisal	116	88	80	86	91
Date of final disbursement:					

### Project Dates

	<b>Original</b>	<b>Actual</b>
Initiating memorandum		12/01/97
Appraisal		2/10/99
Board approval		5/13/99
Effectiveness	8/01/99	6/30/99
Closing date	9/30/02	6/30/03

### Staff Inputs (Staff Weeks and Costs)

	<b>No. of Staff Weeks</b>	<b>US\$'000</b>
Identification/Preparation	96	336
Appraisal/Negotiation	33	115
Supervision	113	397
Total	242	848

### Mission Data

	<b>Date (month/year)</b>	<b>No. of persons</b>	<b>Specializations represented</b>	<b>Implementation Progress</b>	<b>Development Objectives</b>
Identification/Preparation	March 1995 to Dec. 1998	N/A	F, E, O, WS, L, SM		
Appraisal/Negotiations	February 1999 to March 1999	N/A	O, C, E, F, L, D, SM		
Supervision 1	July 1999	5	O, SM, WS, C, E	S	S
Supervision 2	June 2000	4	F(2), E, F, V	S	S
Supervision 3	July 2001	4	F, E, C, O	S	S
Supervision 4	June 2002	2	F, O	S	S
Supervision 5	Nov. 2002	3	F(2), O	S	S
Supervision 6	May 2003	3	F(2), C	S	S

Specializations Represented: O=Operations Officer; C=Economist; F=Financial; E=Engineer WS=Water Resources Specialist; V=Environmental Specialist; SM=Sector Manager; L=Legal; Disbursement Officer

**Other Project Data**

Borrower/Executing Agency:

***FOLLOW-ON OPERATIONS***

<b><i>Operation</i></b>	<b><i>Credit no.</i></b>	<b><i>Amount (US\$ million)</i></b>	<b><i>Board date</i></b>
Urban Water Supply and Sanitation - APL	Cr. 3700	130.0	Aug 1 2002

## Annex B. Project Components and Costs

Project Components	Estimated Costs at Appraisal (US\$ million)	Actual Project Costs (US\$ million)	Actual as Percent of Appraisal Estimate
<b>Land and Water Conservation Project</b>			
1. Institutional Strengthening: Water Resources (for project related individuals/entities in the Ministry of Agriculture and Irrigation, NWRA and the project implementation units)	5.6	8.4	149
2. Institutional Strengthening : Forestry (mainly for staff of the General Directorate of Forestry and Desertification Control)	4.1	3.6	87
3. Spate Irrigation (improving irrigation systems supplied through diversion of water from occasional rain induced flash floods)	6.0	3.7	62
4. Groundwater Irrigation (improving the efficiency of groundwater distribution through pipe conveyance)	18.8	7.4	39
5. Agricultural Development (project related agricultural extension)	1.5	1.6	107
6. Project Implementation Units	4.5	2.2	49
7. Land Conservation/Afforestation (various techniques including tree planting, woodland management, sand dune fixation)	4.2	1.7	41
8. Watershed Management (piloting new watershed and terrace land and water management practices)	2.8	1.4	50
Total	47.5	30.0	63.0
<b>Taiz Water Supply Pilot Project</b>			
1. Well Field Development infrastructure for development of exploitation wells and transmission piping)	5.4	5.3	98
2. Rural Infrastructure (as compensation for rural communities affected by the project's water exploitation)	2.2	2.6	118
3. Water Exploitation Studies (groundwater studies for future exploitation)	2.3	1.4	61
Total	9.9	9.3	94.0
<b>Sana'a Water Supply and Sanitation Project</b>			
1. "Water Resources" (well field development)	7.6	5.8	76
2. Water Supply and Distribution (improving the city's water distribution network)	4.9	3.7	75
3. Sewerage (mainly for a sewage network in Sana'a's Akama area)	7.7	8.0	104
4. Technical Assistance and Capacity Building (for Sana'a corporation)	5.3	4.5	84
5. Preparation of Possible Future APL	2.5	2.6	104
Total	28.0	24.6	88.0



## Annex C. Bank Financed Water Projects in Yemen

(chronologically, starting with the most recent projects)

<b>Project Name</b>	<b>PO Number</b>	<b>Approval Date</b>
<b><u>ACTIVE PROJECTS:</u></b>		
Groundwater and Soil Conservation	PO74413	Feb 04
Sana'a Basin Water Management	PO64981	June 03
Urban Water Supply and Sanitation APL	PO57602	Aug 02
Taiz Mun. Devt. and Flood Protection	PO70092	Nov 01
Rural Water Supply and Sanitation	PO05906	Dec 00
Irrigation Improvement	PO62714	Sept 00
<b><u>CLOSED PROJECTS:</u></b>		
<b><u>Sana'a Water Supply and Sanitation</u> ***</b>	<b>PO05907</b>	<b>May 99</b>
Emergency Flood Rehabilitation	PO48522	Dec 96
<b><u>Taiz Water Supply Pilot</u> ***</b>	<b>PO43367</b>	<b>Sept 96</b>
<b><u>Land and Water Conservation</u> ***</b>	<b>PO05836</b>	<b>May 92</b>
Tarim Water Supply	PO05884	June 90
Taiz Flood Disaster Prevention & Mun. Devt.	PO05884	June 90
Emergency Flood Reconstruction	PO05896	Dec 89
All Mukalla Water Supply	PO05893	Jul 88
Greater Aden Water Supply II	PO05876	Oct 86
Seiyun Regional Water Supply	PO05872	Nov 83
All Mukalla Water Supply Rehab.	PO05864	June 81
Wadi Beihan Agricultural Development	PO05862	May 81
Greater Aden Water Supply	PO05861	June 80
Wadi Tuban Agricultural Development	PO05855	Feb 78
Tihama Development	PO05775	Jan 80
Ibb & Dhamar Water Suppl. & Sanitation	PO05776	Sept 79
Wadi Rima Irrigation	PO05768	May 78
Sana'a Water Supply and Sanitation II	PO05767	Dec 76
Hodeidah Water Supply.	PO05761	June 75
Southern Upland Rural Development	PO05759	May 75
Sana'a Water Supply I	PO05758	Jan 74
Tihama Development Project	PO05755	May 73

Note 1: \*\*\* and underline indicates PPAR Project.

Note 2: The agricultural projects listed here are designated as water projects if irrigation is a substantial part of the project.



## **Annex D. Water Resources Management: The Need to Learn (Sana'a Water Projects from 1974)**

While overall performance of the Sana'a Water Supply and Sanitation Project has been assessed moderately satisfactory, this rating comprises two performance areas with distinctly contrasting achievement. Actions to strengthen the new Sana'a water corporation and the accompanying policy and institutional dialogue were pioneered by Sana'a WSSP and were excellent, but water resources management, specifically groundwater management, was very weak. The lacuna on the WRM side is notable for a long track record of prior experience and advice on WRM and is worth illustrating,

In the Sana'a WSSP appraisal report three main sector issues are presented (page two) of which the third is the water scarcity issue. However, the subsequent project strategy contains no reference to water resources management. In the environmental assessment section it is first stated that "there are no know major environmental issues in the project." Subsequently, two important local environmental issues are, appropriately, discussed: wastewater disposal and sludge re-use. But not the overarching and much more fundamental groundwater depletion issue. Then, the project design and implementation exacerbates the issue: by indiscriminate pumping beyond sustainable yields. The risks section contains no reference to depleting groundwater. Finally, the Summary of Environmental Assessment at Annex 9 repeats the quote above and presents the "three main environmental issues." These are cesspit removal and sewage disposal, dried sewage sludge, and disposal of hazardous chemicals. After discussing these, there is then a discussion of other environmental issues, including, for instance, noise and air pollution during construction, but not water resources management. Throughout the appraisal report, the overarching groundwater depletion issue was substantially ignored.

The concern here is that the learning process regarding the environment and the groundwater depletion issue was not integrated, despite a long history of experience, awareness and advice including advice from IEG. Sana'a WSSP was preceded by two earlier Sana'a UWSS projects. The first Sana'a Water Supply Project (FY74) was clear in acknowledging the groundwater issue, commenting that the Sana'a water table was declining by about 3 meters/year. IEG did an audit of the project (December 1984, Report No. 5402). IEG considered that the project had been generally successfully implemented. But it strongly commented on the need for improved water resources management. It concluded that: "*A proper assessment of aquifer yields is imperative .....*" In December 1998 another IEG audit was done (Report No. 7553), this time on the Second Sana'a WSSP. It commented (para 19) that: "*There is a serious and progressive decrease in the yield of a number of production wells due to the over-pumping of the aquifers and the design capacities are no longer relevant.*" In para 24 it says: "*In considering IDA's role in the water supply sector in particular and in the YAR in general, the issue of water resource management deserves special attention.* Later in the 1998 PPAR (para 4.02) it is stated that "*management of water resources in YAR with special emphasis on the Sana'a basin needs to be improved.*"

Some 25 years passed from the beginning of the first Sana'a water project to approval of Sana'a WSSP. But the groundwater depletion issue, and the continuous depletion and collapse of well sites due to indiscriminate pumping without managing recharge, was neglected.



## Annex E. Learning from Experience: Adaptations in the Groundwater Conservation Program

The Groundwater and Soil Conservation Project (GSCP, ongoing, FY04) has adapted the initial approach to agricultural water saving pioneered under LWCP. The technical features of the water conservation package are broadly similar: use of PVC piping to convey water (as opposed to use of open field channels). For more advanced farmers, the use of pressure irrigation (drip, sprinkler, bubble) systems to irrigate the crop is an option. Both the conveyance pipe and the irrigation system save on water by about 25% each, thus, combined, with about 50 percent water saving. GSCP has adapted the approach based on the LWCP experience. As GSCP is still in early stage it is too soon to assess the success of the adaptations. However, a learning process has been employed: based on their experience, the project implementers have adjusted in areas where they considered improvements in the LWCP approach needed to be made. Below are the principal changes made.

LWCP	GSCP
Multi-component project, with several agencies involved, and including policy/legislation objectives	Simple project. Focused on scaling up the groundwater package only
No irrigated agriculture extension – farmers not using system optimally	Provides extension services
Individual farmer approach	Farmers must be in an irrigation association (community support and self monitoring)
No conditions for participation	Farmer must agree (in a signed agreement between the farmer, the association and the government agency) not to expand irrigated area (thus, water savings only).
No accompanying public awareness program	Major public outreach program to disseminate water saving awareness



## **Annex F. Water Sector Focus in Yemen Strategy Documents**

**Yemen, Country Water Resources Assistance Strategy (CWRAS, March 2005):** This very recent document – also referred to as the “Water CAS” - is the Bank’s first comprehensive water sector analysis in Yemen and was prepared in close partnership with Government. The Water CAS places groundwater depletion as the primary issue needing attention.

**The National Water Sector Strategy and Investment Program, 2002-2009 (NWSSIP, March 2005):** The Yemen Government’s “NWSSIP” was published at approximately the same time as the Bank’s Water CAS, and preparation also involved a degree of mutual interaction between Government and the Bank. This was Government’s first water sector strategy document and is a watershed achievement in that it put water conservation and development centrally in Yemen’s development strategy. Preparing this, which also involved substantial discussion in Yemen’s Cabinet, was one of the first actions of the newly created Ministry of Water and Environment.

**The 2002 CAS:** Environmental sustainability, including water, is one of the four main objectives of the 2002 CAS, which states as a core objective: “*Ensuring Environmental Sustainability* – policies and investments for water sustainability, watershed stability and soil conservation .....” The 2002 CAS highlights exhaustion of groundwater and the need for an integrated donor strategy for water. It also proposes sector work to prepare a Water Sector Reform Strategy and specifies three water sector projects to begin in the CAS period; a Sana’a Basin Water Management Project, a Groundwater and Soil Conservation Project and an Urban Water and Sanitation Project (APL). (All of these objectives are now under implementation)

**Poverty Reduction Strategy Paper (2002):** The PRSP discusses the water sector, mentions water in several sections and includes in one section a good discussion of water issues. But water is not treated as a dominant issue and is not in the PRSP’s “main axes” and objectives. The Bank commentary mentions water, but it also does not highlight water as a major area for assistance.

**Yemen, Towards a Water Strategy (1997):** This was the Bank’s first sector report on Yemen’s Water Sector. It was particularly significant, especially at that time, as the dominant focus of the report is on groundwater resources management.

**The 1996 CAS:** In terms of the degree to which water scarcity is discussed relative to discussion of other issues, the 1996 CAS places greater emphasis on the water sector than the 2002 CAS. Promotion of sustainable natural and human resource development, including a focus on water, is one of the CAS’ three main objectives. The CAS also proposes preparation of a water sector strategy.