



Support to Rural Water Supply and Sanitation in Dhamar and Hodeidah Governorates, Republic of Yemen

Buitenlandse Zaken
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Preface

Support to water supply and sanitary facilities has been a priority for Netherlands development co-operation for many years. For the current policy on development co-operation, the Millennium Development Goals are the guiding principle. These include the target, to halve, by 2015, the proportion of people in 1990 without sustainable access to safe drinking water and basic sanitation.

The purpose of the support to water supply and sanitary facilities goes beyond sustainable access: it is intended to reduce the burden of water collection (typically a task of women and girls); improve health; raise school enrolment and attendance; improve livelihoods and ultimately reduce poverty.

The Policy and Operations Evaluation Department (IOB) of the Netherlands Ministry of Foreign Affairs has initiated a series of impact evaluations of Netherlands supported water supply and sanitation programmes. There is consensus worldwide on the impacts of programmes for water supply and sanitary facilities; conventional evaluation studies do not, however, normally quantify these. In the impact studies a combination of quantitative and qualitative methods and techniques have been used. With the series of studies IOB wishes to explore how the magnitude of the effects of these programmes can be measured.

In May 2007 a first report on Water Supply and Sanitation Programmes in Tanzania, Shinyanga Region was published. The second in the series is this impact evaluation of Support for Rural Water Supply and Sanitation (SURWAS) projects in Dhamar and Hodeidah Governorate in Yemen. The Netherlands supported projects started in 1982 and ended in 2001. The approach developed by the SURWAS projects is reflected in current rural water supply policy, sector programme and projects. The SURWAS projects provided a good opportunity to study long term impact and draw lessons for policy and policy implementation.

The focus of the study is on the effects of support provided to water user communities on the population in the two governorates and on the contribution of policy and institutional arrangements to sustainable results.

Rita Tesselaar of IOB was responsible for this evaluation. The main consultants involved were Chris Elbers, Associate Professor in Economics, and Stephen Turner, Sr. Consultant Resource Development, of the VU University Amsterdam. The pilot testing and implementation of the community and household survey, Focus Group discussions, collection of school and health data, as well as arrangements for water quality tests, were done by a team from the Yemen Society for the Development of Women and Children SOUL, in collaboration with Tobias Lechtenfeld of the VU University Amsterdam.

A reference group consisting of Eng. Mr. Adulla Badr of the General Authority for Rural Water Supply Projects (GARWSP), Mr. Sami Saeed of UNICEF country Office Yemen, Dr. Ms. Christine Sijbesma of the IRC International Water and Sanitation Centre, Mr.D. van Ginhoven and mr. R.Swinkels of the Ministry of Foreign Affairs, provided comments and advice on the report. The study also benefited from support and advice provided by the thematic specialists of the Netherlands Embassy in Sana'a, mr. Ton Negenman and mr. Mohamed Al-Aroosi.

Thanks are due to all respondents in the impact evaluation. These include: members of water user committees and households; the Branch offices of GAWRSP in the two governorates, the chairperson of GARWSP, officials of other concerned authorities, Ministries and donor agencies. Special thanks are also due to Mr. Abdul Wali El Shami who has been a very helpful resource person for the research team during the preparatory mission for the impact study.

IOB bears responsibility for the contents of the report.

Bram van Ojik
Director Policy and Operations Department

Contents

Preface	1
Tables	7
Figures	9
Abbreviations	11
Main findings, lessons and issues	13
1 Background of the evaluation and methodology	29
1.1 Reason for and purpose of the evaluation	29
1.2 Evaluation questions	30
1.3 Focus and methodology	31
1.4 Structure of the report	35
2 The project context: the Republic of Yemen and the Governorates of Dhamar, Hodeidah	37
2.1 Demography, society and culture	37
2.2 Natural environment	39
2.3 Government and politics	42
2.4 Economy and poverty	43
2.5 Health and nutrition	44
2.6 National policy and institutional context	45
2.7 Netherlands policy and support to rural water supply and sanitation	48
3 Support to Rural Water Supply in Dhamar and Hodeidah Governorates	53
3.1 Objectives	53
3.1.1 SURWAS IV	53
3.1.2 SURWAS V	54
3.2 Approach	55
3.2.1 SURWAS IV	55
3.2.2 SURWAS V	57
3.3 Inputs	61

3.3.1	SURWAS IV	61
3.3.2	SURWAS V	61
3.4	Activities	62
3.4.1	SURWAS IV	62
3.4.2	SURWAS V	63
3.5	Outputs	64
3.5.1	SURWAS IV	64
3.5.2	SURWAS V	65
3.6	Beneficiaries	66
3.6.1	SURWAS IV	66
3.6.2	SURWAS V	67
3.7	Costs	68
3.7.1	SURWAS IV	68
3.7.2	SURWAS V	69
3.8	Summary	70
4	Survey results and impact Analysis	73
4.1	Introduction	73
4.2	Access to improved water sources	77
4.3	Water quality and quantity	78
4.4	Access to improved sanitation and hygiene practices	85
4.5	Impact on health	87
4.6	Time use for water collection and use of time savings	91
4.7	School attendance, graduation and female participation	96
4.8	Conclusions	102
5	Institutional strategy, current arrangements and sustainability	105
5.1	Introduction	105
5.2	Approach to the assessment	105
5.3	SURWAS institutional strategy at community and local levels	106
5.4	SURWAS institutional strategy at national level	109
5.5	Current national institutions and programmes	112
5.6	Devolution and decentralisation	119
5.7	Current governorate and district institutions	122
5.8	Current community institutions	124
5.9	Institutions for water resources management	140
5.10	The influence of institutional strategies on SURWAS achievements	142
5.11	Sustainability of services	146
5.12	Summary and conclusion	149

Annexes

Annex 1	Terms of reference	153
Annex 2	List of survey villages	167
Annex 3	Balance between scheme and no-scheme village households within the household survey	173
Annex 4	Focus Group Discussions	175
Annex 5	Institutional assessment: list of interviews	177
Annex 6	References	179

Tables

Table 1	Coverage of rural households with safe water supplies, 2002-2007
Table 2	List of survey villages
Table 3	List of survey households
Table 4	Sampled households and water schemes
Table 5	The taste of the water
Table 6	The appearance of the water
Table 7	Households reporting kidney stones
Table 8	Water test results Hodeidah, fall 2007
Table 9a	Water test results for primary sources in Dhamar, fall 2007
Table 9b	Water test results for secondary sources in Dhamar, fall 2007
Table 10a	Primary water sources and home-kept water (Hodeidah)
Table 10b	Primary water sources and home-kept water (Dhamar)
Table 11	Daily use of scheme water (average number of litres per capita per day)
Table 12	Toilets in scheme and no-scheme villages
Table 13	Malodorous toilets
Table 14	Flush toilets
Table 15	Self-reported disease prevalence compared (between Ramadan 2006 and fall 2007)
Table 16	Reported changes in disease prevalence (within last 10 years) compared
Table 17	Distances (straight line) in km from mosque to primary and secondary water sources
Table 18	Family members who <i>occasionally</i> fetch water (percentages of households)
Table 19	Family members who <i>regularly</i> fetch water (percentages of households)
Table 20	Women or girls who go regularly
Table 21	More time available due to water schemes

Table 22	Main activities for which available time was used (percent of households reporting)
Table 23	Graduation and enrolment statistics
Table 24	Graduation and female share of student population, percentages
Table 25	Effect of water schemes on proportion of female students (fixed effects, unbalanced panel)
Table 26	SURWAS and other schemes operational and inoperative, Hodeidah and Dhamar
Table 27	SURWAS and other schemes with and without committees, Hodeidah and Dhamar
Table 28	SURWAS and other schemes with and without General Committees, Hodeidah and Dhamar
Table 29	Local Council support for water schemes
Table 30	Community contribution to water scheme construction
Table 31	Community contribution to scheme construction
Table 32	Use of water meters
Table 33	Ways of charging for unmetered water
Table 34	Charging policy for poor households and (occasional) provision of free water
Table 35	Action taken when water fees are not paid on time

Figures

- | | |
|----------|--|
| Figure 1 | Reduction of diarrhoea as a result of water supply, sanitation and hygiene improvement |
| Figure 2 | Dhamar, proportion of female students over total attendance population (1991-2006) |
| Figure 3 | Hodeidah, proportion of female students over total attendance population (1996-2006) |

Abbreviations

BO	Branch Office
DGIS	Netherlands Directorate-General for International Co-operation
EKN	Embassy of the Kingdom of the Netherlands
EPA	Environmental Protection Authority
FAO	Food and Agriculture Organisation of the United Nations
GAREWS	General Authority for Rural Electricity and Water Supply
GARWSP	General Authority for Rural Water Supply Projects
GDP	gross domestic product
HDPE	high density polyethylene
HOD	Health Office Dhamar
IFAD	International Fund for Agricultural Development
IHE	UNESCO-IHE Institute for Water Education
JAR	Joint Annual Review
KN	Kingdom of the Netherlands
LCCD	Local Council for Co-operative Development
LCD	Local Council Department
m	metre
mm	millimetre
MDG	Millennium Development Goal
NGO	non-governmental organisation
NWRA	National Water Resources Authority
NWSSIP	National Water Sector Strategy and Investment Plan
O&M	operation and maintenance
OECD	Organisation for Economic Co-operation and Development
PAWS	Programme Aid to the Water Sector
PIU	Project Implementation Unit
PMA	Planning and Management Advisory Unit
PRA	participatory rural appraisal
PWP	Public Works Project
RWSD	Rural Water Supply Department

RWSSP	Rural Water Supply and Sanitation Project
RY	Republic of Yemen
SFD	Social Fund for Development
SPU	Social Participation Unit
SRWSD	Support Rural Water Supply Department Project
SURWAS	Support for Rural Water Supply Project
SWAP	sector wide approach
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFPA	United Nations Fund for Population Activities
WHR	Women, Health and Research
WSC	Water and Sanitation Committee
WUA	Water User Association
WUG	Water User Group

Main findings, lessons and issues

Introduction

In 2007, the Policy and Operations Evaluation Department of the Netherlands Ministry of Foreign Affairs (Dutch acronym: IOB) initiated an impact evaluation of the Netherlands support to rural water supply and sanitation programmes in Yemen, covering the period since 1990. This impact evaluation is the second in a series of impact studies of Netherlands-supported programmes for water supply and sanitary facilities in selected countries.

Yemen and the Netherlands adopted the Millennium Development Goals (MDGs). The MDG drinking water and sanitation target is a shared policy priority'. The Netherlands has supported rural water supply in Yemen for many years. In 1982, it was decided to merge two Dutch-funded projects: a technical assistance project aimed at strengthening the Rural Water Supply Department (RWSD) and a project supporting the completion of water supply schemes in the Dhamar area. The Netherlands' focus on Dhamar was initially aimed at helping to relieve the suffering caused by the devastating earthquake that hit that Governorate on 13 December, 1982.

The first three phases of what has become known as SURWAS (Support for Rural Water Supply Project) were implemented in 1983-1985, 1985-1987 and 1988-1991, respectively. Use was made of already existing boreholes (drilled by the rural water authority concerned). Support typically consisted of supply and installation of a water pump, engine, pipes, fittings, a tank or reservoir and metered yard connections. During these three phases, water supply schemes were completed in 59 villages, benefiting approximately 70,000 people.

¹ In September 2000, 186 UN member States adopted the Millenium Development Goals (MDGs). One of its targets is to 'halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation'.

After 1991, two more phases of SURWAS were implemented. From 1996, the focus of the project gradually shifted from Dhamar to Hodeidah Governorate and in 2001 the final phase was ended. During Phases IV and V, SURWAS put increasing emphasis on the roles and responsibilities of user institutions at community level with regard to the construction and operation of water supply institutions. Sanitation and hygiene awareness and measures were also more thoroughly built into each community water scheme, as well as measures to strengthen the role of women. Phase V further included a component to strengthen the planning and management capabilities of the General Authority for Rural Electrification and Water Supply (GAREWS), which was responsible for rural water supply from 1992 to 2001.

Between 2001 and 2007, the Netherlands provided most of its support to rural water supply and sanitation through the Public Works Project, through technical assistance to GARWSP and the World Bank Rural Water and Sanitation Supply Project and, since 2005 after an initial cutback of support, through programme aid to the water sector.

Yemen has been reforming its water policy, law and institutions since the mid-1990s. Two key concerns have driven these reforms: a perceived crisis of water resource availability and management and the need to enhance the delivery of basic water services to the rural poor. The establishment of the Ministry of Water and Environment in 2003, bringing together the General Authority for Rural Water Supply Projects, the Environmental Protection Authority and the National Water Resource Authority, was a major institutional step. The new Ministry accelerated the process of policy and institutional reform by developing a National Water Sector Strategy and Investment Plan linked to the Millennium Development Goals.

IOB opted to focus its evaluation study on the longer-term impact up to 2008 of the two later phases of SURWAS, implemented between 1991 and 2001. The study focuses on the project's impact on access to and use of water and sanitation facilities, on hygiene practices and, subsequently, on the target population's health and livelihoods. The study also includes an assessment of the contributions the institutional strategy pursued by SURWAS and current policy and institutional arrangements have made to the achievements and sustainability of community-based services. The purpose of the series of studies is to account for support provided and, based on findings, identify lessons for policy development and implementation for development partners concerned.

The methodology for the evaluation is a combination of quantitative and qualitative methods and techniques. The main data-collection techniques for the impact analysis were a household-level survey and Focus Group Discussions conducted in a sample of 1) villages with a SURWAS-supported water scheme, 2) villages with a water scheme that is not supported by the project and 3) villages with no scheme. The sample includes a selection of villages with water schemes implemented after 2001. In addition, the impact analysis also draws on results of tests on the quality of drinking water both at the source and point of use, and education data.

Main findings

- 1) *The total number of beneficiaries of the SURWAS water supply schemes between 1991 and 2008 is estimated at approximately 170,000 people, in line with targets. The coverage in beneficiary villages is close to 100%.*

The total number of beneficiaries of Phase IV is uncertain, but the first 30 schemes completed are reported to have served 42,379 people, exceeding the target of 29,000. With 88,500 people reported to have been served by 2001 and capacity for a design population of 130,000 by 2010, SURWAS Phase V met its rather broad target of 75,000 - 100,000 people. This allowed most of these people to switch from unsafe to improved sources of drinking water. Data on costs are ambiguous, but the most accurate estimates available point to a total per capita investment cost of approximately EUR 72 for phase IV and EUR 80 for phase V (including all contributions but excluding the cost of drilling the well)²³

Criteria for the selection of beneficiary villages, as listed by GAREWS, were the availability of a developed water source (usually a deep well), settlement size (above 300) and the community's ability and willingness to participate and contribute approximately 30% of the project costs. As such, beneficiary selection had a political dimension, with certain communities benefiting from their leaders' connections and capacities, whereas others suffered because of local strife or lack

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- 2 The costs of drilling a borehole depend on the depth of groundwater, geology formations of the area and accessibility of the site and available data suggest that the costs can vary as much as between approximately US\$15 and US\$45 per capita. Due to the remoteness and difficult accessibility of sites, in many areas of Yemen the only option for transporting water from the borehole to the village or to a cluster of villages is a pipes system.
 - 3 In international literature on cost-effectiveness of water, sanitation and hygiene promotion interventions, the cost of a house connection is set at an average of US\$150 per capita and of a public water point at US\$40 per capita. However, local conditions such as size of the community to be served and the presence of suitable aquifers, can cause substantial variations in unit cost (Cairncross and Valdmanis, 2006).

of leadership. Survey data suggest that living conditions of villages selected for SURWAS support and other villages in the sample are very similar.

If a water scheme exists in a village it is accessible to the vast majority of households. Survey data suggest that households are rarely excluded from access. The general principle is that nobody should be excluded from a community water supply by their poverty. Approximately one third of the committees in the sample indicated that very poor households are charged less for their water and just under half said that at least some such households were allowed free water.

The project provided a modest contribution to the coverage of the population with safe water supplies in the two governorates. The total number of beneficiaries equals approximately 6.5% of the current rural population in the two Governorates. Nevertheless, the contribution is remarkable considering that, although not all measurements of water supply coverage are reliable, according to the best available statistics, the overall percentage of the rural population in Yemen with access to an improved water source declined in the 1990s and subsequently rose from 26 % in 2002 to 47% in 2007.

- 2) *Eighty-five percent of the SURWAS-supported water supply schemes in the sample were operating at the time of the survey. The continued existence of a community water committee is significantly related to whether the scheme is still functioning. Costs and charges vary.*

Of all the 108 water supply schemes in the sample, 92 (85%) still functioned, including a number of recently established schemes as well as much older ones. Seven years after SURWAS V ended, 85% of the 55 SURWAS-supported water supply schemes in the sample – many over ten years old by now – are still functioning. Among 108 communities, 30% of the schemes without a water user committee no longer functioned, compared to 11% of those with a committee.

The SURWAS strategy, in combination with traditionally strong community leadership and organisation, resulted in a significant number of strong community water management institutions and a clear sense of user responsibility for operation and maintenance. Thanks partly to SURWAS, the communities surveyed in both governorates have (most) of the administrative and technical capacity required for the day-to-day management of their schemes.

People in Dhamar must pay much more for their water than those in Hodeidah, as water must be drilled from deeper wells and often pumped substantial distances

uphill from the well to the village tank. Charging systems vary and evidence suggests that charges are higher in SURWAS schemes than in other schemes. Water meters for connected households are significantly more common among SURWAS schemes (70% of responding communities) than among non-SURWAS schemes (47%). In many cases committees pay salaries to certain of their members, including most pump operators, meter readers and fee collectors and a small number of chairmen. Seventy-one of 93 responding committees answered they still used the original pumps; but very few have, or can expect to have, enough money for replacement of their pump or major rehabilitation of their scheme.

- 3) *On most measures water quality is fair, especially in Dhamar. However, some contamination with E.coli bacteria was found in primary water sources and, more so, in water stored by households. Available data point to an increasing level of water consumption in SURWAS-scheme villages, especially in Hodeidah.*

On most tests, the majority of primary water sources in villages with or without a scheme have results that fall within WHO guidelines for drinking water quality. However, some contamination with E.coli bacteria was found in about half of the primary water sources. Fluoride and calcium content is excessive in more than 80% of the villages. The quality of primary water sources is markedly better in Dhamar than in Hodeidah. It was also found that the majority of households store water in some way or other. Comparing samples of stored water with direct samples from primary sources indicates a much higher incidence of E.coli contamination in stored water.

Data from water meter readings and user charges point to increased consumption of water in SURWAS scheme villages. This increase is more significant in Hodeidah than in Dhamar, presumably (mostly) as a result of higher temperatures and availability of water sources in Hodeidah.

- 4) *Households in scheme villages are more aware of sound sanitation and hygiene practices and have more and better latrines, although there is ample scope for further improvements.*

The SURWAS approach in phases IV and V included hygiene education campaigns at schools and for women and men, covering the disposal of human waste, waste water and garbage and other pollution concerns, construction of public latrines in schools and mosques and household latrines in some villages. Phase V included household latrine construction in six villages serving approximately 15,000. These latrines were constructed at an approximate cost of €257 each, half of which was made up of community contributions of materials and labour.

Only a limited number of households report recalling hygiene awareness campaigns, but these households are from many villages, especially from Hodeidah villages with SURWAS schemes. Only two of the surveyed water committees reported a hygiene promoter among their membership and there is little sign that committees are active in this regard. Nevertheless, households from water scheme villages have better awareness of sanitation and hygiene practices, particularly if they recall hygiene awareness campaigns. Households from scheme villages also have significantly more latrines (61.9%) as compared to villages with no water scheme (48.5%). In addition, households in villages with water schemes generally have more modern water containers and cleaner toilets. However, the findings on water quality show that in many cases hygienic water storage is still a major issue.

5) *Communities with a water scheme show less (self-reported) incidence of disease and more favourable health trends.*

Households were asked about the incidence of a number of water-related diseases and sanitation and hygiene conditions, both in the year before the survey and over the last ten years. Comparing recent incidence of diseases between villages, all self-reported illness records indicate that incidence is lower in households in scheme villages. Disease incidence in connected households is significantly ($p=0.10$) lower for diarrhoea, abdominal pains, bilharzia, typhoid and malaria. As for changes over the last ten years, households connected to a water scheme reported a more favourable change in incidence for most diseases. However, this does not necessarily represent a drop in disease incidence. In fact, households in most communities report increased incidence of abdominal pain, bilharzia, typhoid and yellow eyes. Still, an increase in incidence is reported less often by connected households. This suggests that for a number of diseases water schemes did not so much improve the health status, but rather prevented further deterioration.

All these results control for differences between locations and therefore indicate an association with the presence of water schemes rather than other variables. One of the possible alternative explanations of differences in health and health trends between connected and non-connected households is higher hygiene awareness in villages with schemes. Indeed, both the presence of water schemes and hygiene awareness activities appear to have an impact. On the other hand, higher hygiene awareness is associated with higher reported incidence of malaria and diarrhoea (presumably as the result of better knowledge). Therefore, the main explanation of differences in health and health trends is whether a household is connected to a water scheme.

- 6) *Introduction of house connections has led to considerable time savings. Men and boys benefited slightly more from these time savings than women and girls.*

Based on GPS data it is estimated that connected households on average save a trip distance of 350m (straight line) for SURWAS schemes and 550m for non-SURWAS schemes. Distances to secondary sources are much larger in most cases. Respondents in Focus Group Discussions confirmed the reduction in time needed to fetch water. In most cases, it is women and girls who fetch water regularly. Men and boys are also involved in this activity but more in villages without a water scheme and less on a regular basis. Survey results indicate that men and boys benefit slightly more from time savings as compared to women and girls. Both sexes use this time gain differently. The time gain was used for going to school (boys and, to a lesser extent, girls), play (boys), firewood collection (girls, women), field work (boys, girls, men, women) and other house work (women, girls).

- 7) *Time savings have led to higher school attendance. Communities with a water scheme have a higher proportion of girls in school.*

Household survey data suggest that more than half of the time gain for boys is used for going to school, as compared to only a quarter for girls. This finding is confirmed in Focus Groups Discussions. Analysis of school records suggests that presence of water schemes is associated with a higher proportion of girls in school. In Hodeidah the proportion of girls in the school population of village primary schools is 8 percentage points higher for locations with a SURWAS water scheme (controlling for time and village differences). A similar effect is visible in Dhamar for non-SURWAS schemes (4 percentage points). The data suggest that the impact takes time to materialize. The proportion of girls increases at a slow rate. Higher enrolment of girls could be the effect of a reduction in time spent on fetching water, but also of other factors, such as availability of water and sanitation facilities in schools.

- 8) *The SURWAS community-based strategy is reflected in national water policy and institutional arrangements but only partially in current capacity.*

SURWAS approaches to user participation and responsibility were reflected in the strategy and structures of the then General Authority for Rural Electricity and Water Supply. The local institutional policy developed by SURWAS is also clearly reflected in current policy and institutional arrangements and is endorsed by the General Authority for Rural Water Supply Projects established in 2002 and brought under the Ministry of Water and Environment after the latter's creation in 2003. Partly due to SURWAS it is now generally accepted by government and donor agencies in Yemen that representative community committees help to plan rural

water schemes, raise community contributions towards construction costs, operate schemes, collect user fees and take responsibility for maintenance. The World Bank Rural Water Supply and Sanitation Project launched in 2001 considers itself to have inherited much of the SURWAS approach and to be maintaining it now.

Decades of Dutch and other support enabled the central agency to develop substantial competence. GARWSP has managed to inherit much of this competence. However, it has not been strong on the social side. Social facilitation and corresponding expertise were built up by SURWAS but tended not to be sustained after project support had ended.

- g) *GARWSP has not continued SURWAS' belated efforts to integrate hygiene and sanitation in institutional development, which included measures to strengthen the role of women.*

Change in Netherlands policy led to an abrupt ending of SURWAS V in 2001, 18 months after the start of the component aiming to strengthen GAREWS' capacity for an integrated water supply, sanitation and hygiene promotion approach. Efforts to include hygiene and sanitation in institutional development and public awareness raising had not been adequately institutionalised by that stage and were not continued.

Measures to enhance the role of women included the employment of female staff, awareness raising and participation of women in hygiene and sanitation promotion. Even though sanitation and hygiene promotion was the only part of the sector in which Yemeni culture allows some modest opportunities for women to play anything approaching a consultative or leadership role, SURWAS has not achieved any sustained results with regard to gender in institutional development. None of the water user committees has a single female member. Despite their traditional responsibilities and concerns regarding water and sanitation, and despite the honour and respect they are accorded by Yemeni culture, women have little or no voice in the planning and management of the sector at community level. GARWSP, however, is making efforts to appoint female staff to its headquarters and Branch Offices.

The current NWSSIP stipulates that sanitation components will be obligatory in future projects and that hygiene education targeting women will be an integral part of each project/scheme. This goal has not yet been realised.

10) *Institutional arrangements become less clear moving up from water user to national level.*

At the community level in the scheme villages the roles and responsibilities of all institutions involved are clearly defined. People understand the blend of indigenous and project-promoted approaches initiated by SURWAS and since replicated by other agencies.

The Local Government Law of 2000 launched a fundamental devolution to strengthen local authorities for local development and service delivery. GARWSP has not devolved its functions or resources, though it is engaged in a process of decentralisation to stronger Branch Offices at Governorate level and the Ministry of Finance has promised to consider the transfer of GARWSP investment budgets to its Branch Offices with effect from 2009. Branch Offices are committed to working with Local Councils that now provide much of the liaison between communities and GARWSP, as well as growing amounts of funding for rural water schemes.

Although the institutional outlook on these levels is promising, it is premature to conclude that evolving roles are fully understood by all, or that structures have the capacity to perform adequately in the long term. The trend is evident, however, and is expected to be beneficial, linked as it is to governorate institutional reforms towards democratisation and efficiency. The relationship between the technical service role of GARWSP and the planning, facilitation and monitoring roles of Local Councils is also becoming clearer to all parties (communities, Councils and General Authority Branch Offices). GARWSP is working more closely with Local Councils, as provided for by the Local Government Law. However, the performance of this triangular relationship remains variable in practice.

At the national level, roles and responsibilities are less clear. Clarity is emerging, at least in theory, as the institutional confusion of the early part of the decade is dispelled. In practice, however, there is continuing dissent about the appropriate balance between institutional development and delivery on the ground. The Netherlands remains clear about its strategy and emphasis and continues to support the core role and development of GARWSP just as SURWAS supported its predecessor. Other agencies confirm the central role of GARWSP but prefer parallel delivery mechanisms in the short to medium term. Meanwhile, much of the institution building efforts are currently devoted to water resource management through NWRA and a planned hierarchy of user representative structures. However vitally important water resource management may be in Yemen, it is not

yet clear how GARWSP, NWRA and respective user/consumer institutions are to interact. Thus, collaboration in practice is not yet assured though mechanisms for joint planning and action by GARWSP and NWRA are included in current work to update the NWSSIP.

- 11) *Although the community-based institutional strategy has significantly contributed to the sustainability of SURWAS-supported and other water supply schemes, long-term sustainability is not assured.*

The continued operation of the water supply systems that SURWAS helped install is largely attributable to the durability of the community institutions that manage them. The achievements of these institutions are the result of a successful combination of the principles instilled by the project and the values and structures inherent in Yemeni society. Despite these achievements, however, there are signs of a certain level of institutional erosion at community level. Institutional sustainability cannot be taken for granted. The community institutions have acquired most of the skills required to perform their functions in the long term, but, like pumps and pipes, these need ongoing maintenance. This maintenance is rarely provided, even though Local Councils are meant to take on at least part of the responsibility for providing institutional support. A factor that has affected water supplies in certain cases is local conflict. As can be expected everywhere, frictions and disputes do arise and occasional outside support continues, quite reasonably, to be necessary.

Evidence from this study suggests that many of the water committees are able to fund routine maintenance, but that few, in the current situation, are able to pay for the major renovations that become necessary after a decade or more. Most SURWAS schemes are presently reaching that age. Evidence also suggests that only one third of the current committees, all of them of SURWAS schemes, received some form of training to manage and/or maintain the schemes, indicating that projects have largely relied on existing capacities.

At all levels, effective monitoring and follow up of issues is a key ingredient for sustainable operations. Current arrangements do not make adequate provision for long-term results-based monitoring and consequent action. When issues arise at local level, it is usually up to users and their local leadership to lobby for attention at higher levels. Despite a certain amount of progress in database development and plans for further improvements to information and monitoring systems, GARWSP does not yet have a full picture of all rural water schemes that it is supposed to be monitoring and supporting. The developing role of Local

Councils in monitoring and follow-up support should help to promote infrastructural and institutional sustainability. However, developing the strong local government that sustainable rural water supply requires will take a long period of commitment and effort.

Lessons

Key lessons drawn from the findings are:

- 1) The overarching lesson of this study is positive. Community-based rural water supply and sanitation programmes can provide real benefits and rural communities in Yemen, like elsewhere around the world, are able to manage their water supplies efficiently, effectively and sustainably. They can display clarity of purpose and an understanding of roles and responsibilities, which is often lacking at higher levels. The continued operation of the water supply systems that SURWAS helped install is largely attributable to the durability of the community institutions that manage them. At the same time, they cannot manage these systems independently of local and central government. Like rural communities everywhere, they need the assurance of ongoing institutional support. It is unreasonable and unrealistic to suppose that for rural community services ‘sustainability’ means complete independence of national and local government.
- 2) Institutional issues are often the most fundamental determinants of viability and sustainability in rural water supply. Analysis of schemes supported by SURWAS and others in Dhamar and Hodeidah suggests that three sets of factors shape these institutional determinants.
The first is communities’ political will and ability to govern themselves and their local services. Thanks partly to SURWAS, the communities surveyed in both governorates have (most) of the administrative and technical capacity required for the day-to-day management of their schemes. But when local strife makes ordinary governance and service functions impossible for community institutions, village water supplies will obviously fail – or cannot be installed in the first place. It is clear that rural water supplies require institutional as well as technical maintenance. The former is at least as important as the latter. Gradual institutional erosion is evident in the community structures promoted by SURWAS because little or none of the required institutional maintenance is currently provided.
Secondly, the local government context and framework are all-important for the sustainable development of primary services at community level. If

Yemen's local government reforms succeed, strong and competent Local Councils will be well placed to provide the institutional and political facilitation that GARWSP is unable to offer and to perform a substantial part of the institutional and financial monitoring that is currently lacking. The scale of this challenge should not be underestimated. In Yemen, as elsewhere, effective local government reform will take a long period of consistent effort and resourcing.

Thirdly, the sustainability of SURWAS outcomes and the viability of community-managed rural water supplies also depend on clarity, capacity and consistent commitment at central government level. The current split between support for GARWSP and implementation through alternative structures is confusing and slowing institutional development at the centre, though it accelerates field delivery.

SURWAS experience shows the importance of finding a balance between support for field delivery and support for the institutional development of an agreed central agency. An emerging challenge is to maintain an appropriate balance – and effective linkages – between effort and institution building for water resource management and pro-poor concern for enhanced domestic water supplies and their management by user communities.

- 3) SURWAS experience also shows that it takes time to build effective community institutions for sustainable rural water supplies. It is a real challenge to maintain the required level of capacity and effort for this purpose through national agencies without donor funding at field level. So far, this challenge has not been met successfully in Yemen. Part of the problem concerns the transformation of a technical agency such as GARWSP into an agency with adequate social and institutional capacities. Clarity and efficiency must be enhanced to improve the technical agency's interactions with agencies that focus more on governance and social issues. In Yemen, the roles of and links with local government are gradually becoming clearer; less has been done to explore the potential of NGOs and the private sector.
- 4) Events around the closure of SURWAS in 2001 repeat another familiar lesson: that development projects in many sectors take too long to develop an appropriate balance between technical, social and institutional strategies and resources and then close before that balance has been adequately consolidated. They also illustrate the common irony of the sudden interruption of strategic development focused on local issues due to unrelated changes in the donor agency's global policy.
- 5) A well-known lesson that also emerges from this study concerns the importance of adequate monitoring, record keeping and archiving.

Obviously, the quality of an evaluation largely depends on the quality of monitoring and the availability of past data and reports. Although SURWAS established baseline and monitoring arrangements, it did not succeed in institutionalising them. Now, it is no longer possible to recover any baseline data and few structured monitoring activities are presently carried out. GARWSP ascribes this problem largely to the fact that neither it nor the Ministry of Water and Environment has offices or representation at the level of Local Councils, as some other agencies have. An additional lesson is that hardware and software cost of water and sanitation interventions need to be monitored and documented separately. Meanwhile, although the Netherlands Embassy monitors the rural water sector thoroughly, old documentation on SURWAS is difficult to trace. Like other impact evaluations, this one has been hindered by inadequate archiving of progress and monitoring reports and the premature destruction of some of these materials.

Issues

The main issues that arise from the findings are:

- 1) Continuing lack of access to safe water sources of some communities: in rural Dhamar and Hodeidah governorates, the continuing lack of access to safe water sources in some communities remains a key issue. This may be due to their remoteness, inaccessibility and small settlement size, the inefficiency or under-resourcing of the agencies set up to support them to improve their domestic water supplies, or to local political factors such as inept or corrupt leadership or conflicts that preclude development action.
- 2) Ongoing subsidy to rural water supply: another key issue concerns the need for clearer policy on ongoing subsidy to rural water supplies. The current principle is that the government contributes to the costs of the installation (up to the distribution lines) and expects users to pay for house connections and water meters, depending on what they can afford. Users are also expected to cover all operation and maintenance costs. However, there is no clear policy on how to sustain services financially, based on information on investment, operation and maintenance costs, including replacements, and differences between communities in their ability to pay for replacements.
- 3) Availability of groundwater: the ongoing mining of groundwater for agricultural purposes puts pressure on the availability of safe water for the basic water needs of an increasing part of the population. An important issue is the monitoring of water levels with appropriate equipment to help take timely action.

- 4) Safety of water: apart from the existing monitoring arrangements, which are inadequate, measures to ensure water safety at point of use are not in place.
- 5) Hygiene and sanitation: integrated water supply, hygiene and sanitation strategies remain a major challenge. GARWSP and its partners are now taking action to achieve the required integration of water supply, hygiene and sanitation activities at community level. Linked to this issue is hygiene and sanitation training for both men and women. Otherwise, women's burden may become heavier, whereas men and boys are not addressed regarding their roles and behaviour in relation to good hygiene.
- 6) Women's participation and benefits: a related issue is the participation of women in the planning and management of rural water and sanitation. Different agencies and individuals hold differing views on how to engage with Yemeni culture with regard to gender issues in the sector. This study's findings suggest that the almost total exclusion of women from the sector imposes real costs on them as individuals and on rural society as a whole.
- 7) Institutional development: local government reform is clearly a major issue for sustainable rural water supply and sanitation in Yemen. There are promising signs of constructive engagement between community institutions, Local Councils, the governorates and central agencies, including GARWSP. At this early stage, success is not guaranteed. New layers of institutional complexity have been introduced to respond to Yemen's grave water resources crisis. The challenge is to prevent institutional overload and to link rural water supply and water resource management issues and emerging structures with local government and the community bodies that manage domestic water supplies.

At national level, two related issues stand out. The first concerns the continuing decentralisation and development of GARWSP: building its capacities (notably at Branch Office level, by enhancing its social and institutional skills), as well as its resources and procedures. A strong central agency for rural water supply remains essential for the kind of community-managed systems that have been successfully promoted in Yemen. The second issue is the continuing dissent among funding agencies in Sana'a about delivery mechanisms for support to rural water supply and sanitation. Does the current messy compromise between emphasis on GARWSP's lead role and delivery through a number of parallel systems offer the most effective balance between central capacity building and field implementation? At issue is how much external support should be focused on building central capacity, at the expense – as some would argue – of urgently needed delivery in the field. More could probably be achieved if these agencies' strategies were better harmonised.

- 8) Capacity building of Water User Committees: the findings point to a lack of capacity building both in terms of coverage (less than one third of the current committees received some form of training), completeness and effectiveness (e.g. attitudes and skills on sanitation and hygiene promotion, transparency and accountability, gender) and sustainability (of both water resources and finances).
- 9) Result-oriented monitoring, reporting and follow up of issues: current arrangements are inadequate. GARWSP has not been able to maintain the systems introduced by SURWAS, although it is making efforts to improve its monitoring and data management. It undertakes financial monitoring and monitoring of physical progress during construction of schemes and is presently starting a nationwide system inventory. As noted above, local government reform (and expanding capacity for data management, notably in Hodeidah) presents a new opportunity to review all roles and responsibilities in this regard.

1 Background of the evaluation and methodology

1.1 Reason for and purpose of the evaluation

In 2007, the Policy and Operations Evaluation Department initiated an impact evaluation of the Netherlands support to rural water supply and sanitation programmes in Yemen, covering the period since 1990. This impact study is the second in a series of impact studies of Netherlands-supported programmes for water supply and sanitary facilities in selected countries.

Yemen and the Netherlands have adopted the Millennium Development Goals (MDGs). The MDG water and sanitation target is a shared policy priority. The Netherlands has supported the water sector in Yemen for many years. In 1982, it was decided to merge two Dutch-funded projects: a technical assistance project aimed at strengthening the Rural Water Supply Department (RWSD) and a project supporting the implementation of water supply schemes in the Dhamar area. The first three phases of what has become known as SURWAS (Support for Rural Water Supply Project) were implemented in 1983-1985, 1985-1987 and 1988-1991, respectively. Since 1990 two more phases of SURWAS have been implemented, one between 1991 and 1996 and the other between 1996 and 2001. Between 2001 and 2004 the Netherlands provided support to rural water supply and sanitation primarily through the Public Works Project and technical assistance to GARWSP and the World Bank Rural Water and Sanitation Supply Project and, since 2005, by means of programme aid to the water sector.

IOB opted to focus its impact study on the longer-term impact up to 2008 of two subsequent phases of SURWAS, implemented between 1991 and 2001. The project provides a good opportunity to study longer-term impact. This study focuses on the project's impact on the target population's living conditions and on policies and institutional arrangements. In addition, it aims to provide insight in the

contributions that the SURWAS institutional strategy and the evolving policy and institutional context have made to the sustainability of services at the local level up to 2008.

The purpose of the series of impact studies is to account for support provided and, based on findings, identify lessons for policy development and implementation for development partners concerned at the national, governorate and local level. Thus, it provides input for periodic policy review. The terms of reference were prepared in consultation with the General Authority for Rural Water Supply Projects (GARWSP) and the Embassy of the Kingdom of the Netherlands. The terms of reference for the impact evaluation are attached as annex 1.

1.2 Evaluation questions

The key questions addressed are:

Problem and context

- 1) What have been the key aspects of the problems addressed by, and the context of, Netherlands-supported water supply and sanitation activities in Yemen since 1991?

Project description

- 2) What were the objectives of Phases IV and V of the SURWAS project?
- 3) What approach was adopted during Phases IV and V of SURWAS in order to meet these objectives?
- 4) What inputs were provided during these two phases of the project?
- 5) What activities/interventions were undertaken during Phases IV and V of SURWAS?
- 6) What were the outputs (water supply schemes, sanitary facilities and hygiene and sanitation promotion) of these two phases and were targets achieved?
- 7) Who were the beneficiaries of Phases IV and V of SURWAS?
- 8) What were the total costs, user contributions, water charges and costs per beneficiary of Phases IV and V of SURWAS?

Outcomes and impact

- 9) What has been the change in the number of people with access to an improved water source since 1991?
- 10) Do certain households in the target community lack access to the water supplied?
- 11) How has the quality and quantity of the water consumed changed?
- 12) What has been the change in the number of people with access to an improved sanitary facility ?
- 13) What has been the effect on hygiene awareness and improvement of practices?
- 14) What have been the effects on the health of the population?
- 15) What have been the effects on time use for collection of water?
- 16) Has productive use been made of the time saved and/or improved water availability?
- 17) What has been the effect on school attendance, graduation and female participation?
- 18) What positive and/or negative unintended effects occurred?

Institutional strategy, current arrangements and sustainability of services

- 19) Is the institutional strategy developed by SURWAS reflected in current policy and institutional arrangements?
- 20) Are institutions' roles and responsibilities now clearly defined?
- 21) Are institutions' roles and responsibilities adequately understood and fulfilled by beneficiaries and other stakeholders?
- 22) Do the relevant institutions have the capacity to perform the required functions in the long term?
- 23) Do institutional arrangements include adequate provisions for result-based monitoring?
- 24) Have monitoring and follow-up support arrangements promoted the sustainability of infrastructure and institutions?
- 25) How do the project's institutional strategy and current arrangements affect achievements and sustainability of services?

1.3 Focus and methodology

The study covers the period since 1991 up to 2008. The selection of effect and explanatory variables for the impact analysis has been determined by a review of

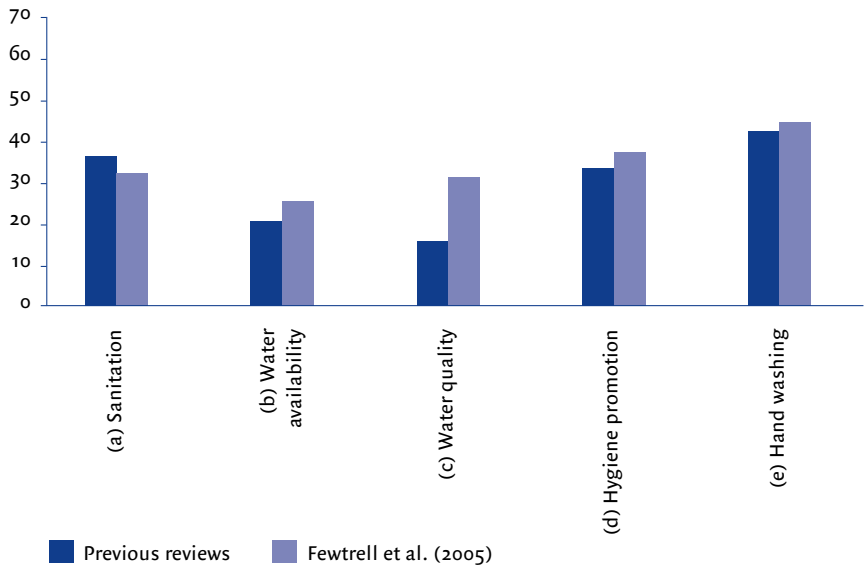
literature, policy and project documentation, interviews with key informants in Yemen and a field visit to a number of project areas.

The impact study primarily focuses on the following domains of impact:

- Access and use of improved water sources and sanitary facilities; hygiene awareness and practices;
- Health improvement: reduced incidence of diseases related to water (water-borne, water-washed and water-related), sanitation and hygiene;
- Time spent on water collection and use of time savings with regard to:
 - School attendance, graduation and female participation;
 - Livelihood – subsistence and income earning use of time savings.

International studies show that improvement of water and sanitation does not automatically improve people’s health: it is important to add a hygiene education component in order to guarantee that it has a positive impact on people’s health. This is illustrated in the figure below.

Figure 1 *Reduction of diarrhoea as a result of water supply, sanitation and hygiene improvement (Fewtrell et al., 2005)*



According to figure 1, washing hands correctly on critical moments is one of the most effective hygienic interventions, resulting in a 42% to 47% reduction of diarrhoea. Increased use of safe drinking water helps to reduce the intake of dangerous pathogens existing in the water. At the same time, the expected increase of water quantities facilitates the improvement of sanitation and hygienic practices. The adoption of hygienic practices by all family members, including hand washing, access to and use of adequate sanitation facilities and access to sufficient water of good quality, is essential. Another major issue relating to people's health is the removal and safe deposit of human faeces (rich in pathogens) by means of an adequate sanitation infrastructure (latrines and water closets). The correct use of these facilities, by members of the family in particular and the community in general, significantly reduces the load of pathogens in the environment. It is therefore important that hygiene and sanitation practices are included in the impact analysis.

Reduction of time and energy spent on water collection and taking care of ill people (in particular for those who prepare food and take care of children), reinforces the positive effects of good health in the families. In addition, time savings leave time for all kinds of activities that directly impact people's well-being, such as providing food and attending school.

To distinguish between impact as a result of the SURWAS project and the effects of factors unrelated to the project a household survey was undertaken among a total of 1651 households in villages with and without SURWAS supported water supply schemes. The aim was to match villages with a SURWAS scheme with a village with a non-SURWAS water scheme and a nearby village without a water scheme. The sample covers almost 90% of the villages with SURWAS schemes in Dhamar and Hodeidah.

According to available documentation from past projects, baseline data for future impact measurement have been collected. However, it has not been possible to track these data for the sampled schemes. Without baseline data the evaluator is severely handicapped. However, it has been possible to measure changes and attribute them to the project based on a combination of self-reported changes and education data.

The statistical impact evaluation compares changes over time (such as in health and education) between SURWAS-supported communities and non-SURWAS communities and between households connected to a water scheme and non-connected households. Differences in changes, however, need not reflect the

introduction of a SURWAS-supported water supply scheme: the three types of communities may well differ in other respects. Regression methodology was used to control (to the extent feasible) for such other differences and their effects on the observed impacts. In order to accomplish this, it attempts to solve the attribution problem by eliminating the effects of other differences between the communities. This is possible only to the extent that such other differences are actually observed in the survey. Accordingly, unobserved differences may remain as possible confounding factors. In the regression analysis this problem is addressed by relating changes in outcomes (such as changes in school enrolment) to changes in policy variables (e.g. the introduction of the water supply scheme).⁴ This technique controls for unobserved differences between communities, provided these remain constant over time. Chapter 4 explains the topics covered by the survey and the data analysis techniques applied in further detail.

The institutional strategy assessment focuses on the extent to which the SURWAS institutional strategy and current policy and institutional arrangements have contributed to the achievements and sustainability of services at the local level. The assessment was conducted in three ways:

- available documentation was reviewed. As other evaluators of long-term Netherlands-funded programmes have experienced, part of the relevant documentation could no longer be traced. This is partly due to the decentralisation of Dutch development co-operation from The Hague to embassies, which scattered a number of archives. The introduction of new computer systems has also made it more difficult to find old documents. Finally, destruction of older archives removes virtually all trace of earlier activities;
- the main field survey included a number of questions about institutional performance;
- a separate mission was fielded to investigate institutional issues in more depth, by means of interviews and visits to Sana'a, Dhamar and Hodeidah as well as visits to a total of 14 water schemes in both governorates.

The impact evaluation was a joint effort of the Policy and Operations Evaluation Department of the Netherlands Ministry of Foreign Affairs (IOB), the Amsterdam Institute for International Development (AIID) and the Yemen organisation Soul

4 This is called fixed-effects estimation. For further details on this methodology see W.H. Greene, *Econometric Analysis*, New York, Macmillan 1993, ch. 16.

(Society for the development of Women and Children). SOUL implemented the field survey and Focus Group Discussions in collaboration with a researcher from the VU University Amsterdam/AIID.

1.4 Structure of the report

In chapter 2, the study begins with a context analysis of rural water supply and sanitation programmes in Yemen and specifically in the governorates of Dhamar and Hodeidah. Chapter 3 describes the SURWAS operations in Phases IV and V. The analysis and findings regarding the project's impact on the target population are presented in Chapter 4. Chapter 5 presents the findings of the assessment of the institutional strategy and evolving policy and institutional arrangements and their effects on the achievements and sustainability of local-level services. Above, the report began with a synthesis chapter on the main findings, lessons and issues.

2 Project context: Dhamar, Hodeidah and the Republic of Yemen

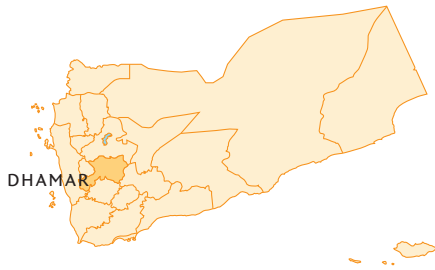
2.1 Demography, society and culture

In 2006, the Republic of Yemen had a population of 21.6 million, unevenly spread across a national area of 528,000 square kilometres. Its population is predominantly rural; 26% is considered urban. The population growth rate remains high at 3.1%. The country is divided into 20 governorates; the capital city, Sana'a, with a population of 1.75m and an annual growth rate of 5.6% in 2004, constitutes a separate municipality. Governorates are subdivided into districts, of which there are a total of 333 in the country.

The governorate of Hodeidah, extending from the coastal plains of the Tihama region into the central mountain massif, was Yemen's second most populous governorate in 2004, with a population of 2.16m and an annual growth rate of 3.3%. The governorate of Dhamar lies east of Hodeidah and south of Sana'a and is largely mountainous, with a smaller population of 1.34m and a similar growth rate of 3.1% (in 2004).

There are important cultural differences between these two governorates. Rural people in the Tihama are generally considered to have a more placid agrarian outlook; administrators and institutions in the port city of Hodeidah are keen on modernisation and progress and are pushing ahead fast with such innovations as a computerised database for the governorate.

The population of villages in the rugged mountains of Dhamar have what outsiders would consider a typical Yemeni reputation of strong tribal values, occasional local conflicts and an independent and sometimes hostile attitude to higher



Location 14° - 15° latitude 34:30° - 44:50° longitude, around 100 Km ff the capital Sana'a bounded by governorates of Sana'a (north), Ibb (south), Al Beidha and part of Sana'a (east), Hodeidah and part of Sana'a (west).

Population: 1,330,108 (2004) at 6,8% of the total Yemen population. The annual growth rate is at 3.04%

Area: 7586 km2

Administrative division: Dhamar is divided into 12 districts ruled by local councils.



Location: Hodeidah is located west of the republic of Yemen at longitude 42° - 43° east and latitude 14° - 16° north. It is 226 km away form capital Sana'a, and is bounded by (parts of) the governorates Ibb, Dhamar, Sana'a, Rayma, Mahweet, Hajja from the east. Hajja from the north, Taiz from the south, and the Red Sea from the west.

Area: 117,145 km2

Population (2004 census): 2,157,552, with an annual growth rate of 3.25%

Administrative division: Hodeidah is divided into 26 districts, ruled by local councils that contain 583 men and 3 women.

authority and the outside world. The challenges of community institution building, for such purposes as the governance of water supplies, are particularly severe in this governorate.

In Yemen, the social framework for rural water supply and sanitation is dominated by the country's strong Islamic tradition and by its complex political history (section 2.3). Two features stand out. First, although the central state may be weak, community leadership and organisation are often strong. Rural people have clear concepts of how local society should be organised and administered. Even though the reality is sometimes one of local strife between clans, families, leaders or communities, which may hinder or completely obstruct development initiatives at community level, these fundamentally clear concepts provide a solid foundation for user management of water schemes where politics permit. This social asset links to another: the tradition of literacy and record keeping, which means that at least some people in each community are competent in the documentation and accounting that any kind of primary service provision requires.

The second prominent feature concerns gender. Despite their responsibilities and concerns regarding water and sanitation and despite the honour and respect they

are accorded by Yemeni culture, women have little or no voice in the planning or management of the sector at community level. SURWAS and other projects have made various efforts to build a stronger role for women, but these have generally proved unsustainable in the cultural and social context of Yemen.

2.2 Natural environment

Yemen's natural environment spans the hot coastal plains of the west and south, the extensive central mountain ranges and the desert that makes up the majority of the nation's territory in the east. The country is formally divided into five major land systems, of which two are of particular concern in this context: the hot, humid coastal plain of the Tihama and the Yemen Highlands, which range between 1,000 and 3,760m above sea level and run parallel to the Red Sea adjacent to the Tihama (World Bank, 2000: 1). The Tihama land system occupies the western part of Hodeidah governorate. The Yemen Highlands, which have a more temperate climate, include eastern Hodeidah and most of Dhamar governorate.

An estimated 3% of the national land area is considered suitable for agriculture. A further 40% comprises grazing land and some forest cover; the remaining 57% is desert. Wadis dissect the highlands and afford some space for farming, which is aided by regular orographic rainfall caused by the Indian Ocean monsoons as they move across the mountains. Annual precipitation in this zone ranges between 400 and 750 mm, whereas the Tihama only receives about 200 mm per year.

Yemen is one of the oldest irrigation civilizations in the world where dam irrigation and rainwater harvesting techniques were developed when Rome was still an undrained marsh and America a trackless waste.

In recent times, the country has fallen into a water crisis characterised by very rapid mining of groundwater, extreme water supply shortages in the major cities, and limited access of the population to safe drinking water.

The main causes of the water crisis are familiar from other countries of the Middle East: rising demand as population grows and market-led agriculture develops; groundwater exploitation getting out of hand; and a framework that has promoted expansion rather than efficient use and sustainable management.

Yemen, however, stands out amongst countries in water crisis... in no country in the world is the rate of exhaustion of aquifers proceeding so fast, in no country in the world is the capital city of the nation literally going to run out of water in a decade.

World Bank, 1997: i.

In 2000, the annual water use has been estimated [as] exceeding by more than one third the annual renewable freshwater resources [use was 3.4 billion m³, while annual renewable resources were 2.5 billion m³] ... This means that there is an annual water deficit of about one billion cubic metres (20% of which is in Sana'a basin alone). This water deficit will increase year after year due to population growth, water demand growth and growing competition for water resources, as long as irrigation efficiency remains low.

Notwithstanding... scepticism about the accuracy of the above figures or estimates of annual recharge rate, water use and extraction rates, the overall picture is clear: Yemen is facing an exacerbating imbalance between water supply and water demand, especially affecting groundwater. The water crisis is starting to take a catastrophic nature in a number of basins where aquifers are depleting very fast...

Republic of Yemen, 2005: 6.

The people of Yemen must rely on a combination of surface water and groundwater resources for their domestic, agricultural and industrial needs. Approximately 45% of the nation's agriculture is fed by rainfall, with the remaining 55% dependent on either irrigation with groundwater or seasonal flooding (Al-Asbahi, 2005:3). Domestic water supplies come almost entirely from groundwater in the Hodeidah and Dhamar governorates on which this study focuses, although some water harvesting takes place in Dhamar, which is a viable option for mountain areas with adequate rainfall.



Mountain area

Estimates of the total amount of renewable water available per year range between 2,100 and 2,500 million cubic metres (World Bank, 2000: 1 and Al-Asbahi, 2005: 1). Based on 1997 population data, the World Bank calculated that the total amount of renewable water available was 130 m³ per capita, compared with a global average of 7,500 m³ and an average of 1,250 m³ for the Middle East and North Africa. Al-Asbahi (2005:4) calculated an annual availability of 125 m³, which he described as “below the water poverty line”. He estimated a total annual water deficit of 900 million m³, which is met from deep aquifers that are rarely recharged and are falling at between one and seven metres per year.

For many years now, analysts have therefore described Yemen as being in severe water crisis (see box above). Agriculture uses the vast majority of the country’s water: an estimated 93% in 2000 (Al-Asbahi, 2005: 4). However, with rapid urbanisation, domestic and industrial demand are rising fast and are currently being met from the steadily sinking aquifers. Predictions of doom for the Sana’a basin have recently been revised and it is now anticipated that the rapidly expanding capital city can be supplied for at least another 25 years – partly because irrigated agriculture will start to become uneconomic as water levels drop further. Overall, however, “the race to the bottom of the aquifers is continuing at an exasperating speed” (EKN, 2005: 4).



Agricultural well, Haninah, Hodeidah Governorate

2.3 Government and politics

The Republic of Yemen has now been in existence for 18 years. It was formed in 1990 through the unification of the previously separate states in the north and the south of the country. These two states had different political heritages: the north was more orientated towards the West, the south aligned with the socialist bloc during the Cold War. In addition to the predictable challenges of moulding one state from two, this differential has implications for service provision. The socialist heritage in the south reportedly leads to a more passive attitude in this regard, with the expectation that government should and eventually will provide what the people need.

In 2006, the World Bank reported that Yemen was a ‘fragile state’, “i.e. among a group of countries whose policies and institutions are weak, making them vulnerable in their capacity to deliver services to citizens, control corruption or provide for sufficient voice and accountability; and there are risks of conflict and political instability. Within the typology of Fragile States, Yemen exhibits most of the characteristics of a gradual reformer” (World Bank, 2006b: 1). In addition to the civil war of 1994, a number of more recent internal conflicts have taken place. At the time of this study, outbreaks of violence were continuing in the Saadah governorate in the north of the country.

Apart from its reported political fragility, Yemen is also weak from the perspective of national institutions and governance. The state has limited control over its citizens’ behaviour and its institutions’ ability to deliver services is limited. The recent Poverty and Social Impact Analysis of Yemen’s water sector reform programme identified “a public sector characterised by [a] notable array of institutions... but exercising scant actual control over water resources... [and] private agriculture which exercises almost complete control over the water resource” (World Bank, 2007: 6). This has two implications for the domestic water supplies with which this study is concerned. First, and despite much current effort to improve water resource governance, the state and its institutions have little control over the depletion by irrigated farmers of the resources necessary to meet basic human needs. Secondly, the development of the central state agency for rural water supply has had a long and difficult history, with much still to be done before the sector is managed efficiently and effectively.

Against this background of a weak central state, traditional local institutions and leaders have long dominated the structure and functioning of rural society and

have played prominent roles in the systems of patronage, influence, bargaining and strife within which the provision of primary services has been negotiated. This crowded and contentious political landscape is now slowly changing through a process of local government reform that is shifting significant power and resources from the centre to the governorates and districts. Reinforced Local Councils are starting to play stronger roles in the provision, management and monitoring of primary services. As this study will show, however, the rural water supply sector is less directly affected by these reforms than some other sectors.

2.4 Economy and poverty

Yemen is the poorest country in the Middle East and is classified as one of the world's 49 least-developed countries, with 42% of the population living below the national poverty datum line (UNFPA, 2008). Its GDP was estimated at US\$ 52.5 billion in 2007. The economy is heavily dependent on oil, which is estimated to provide 27% of GDP and 90% of merchandise exports. However, an economic reform programme aimed in part at diversification away from oil was launched in 2006. Services generate 38% of GDP, agriculture 15%, manufacturing, utilities and construction 10% and government services 10% (World Bank, 2006b: 9). Although agriculture contributes no more than 15% of GDP, it employs approximately 55% of the economically active population. Qat is the major cash crop. Though it uses only 15% of the cultivated land, it generates approximately a third of agricultural GDP (*ibid.*: 9-10) and is a major consumer of groundwater pumped for irrigation. Annual GDP growth was calculated at 4.4% in 2000, 4.6% in 2005 and fell to 3.3% in 2006.

Yemen ranks 153 out of 177 countries on the 2007/08 Human Development Index. Based on a 2005/06 household budget survey, a recent Yemen Poverty Assessment found that, at that time, seven million poor people, or approximately 35% of the population, "could not satisfy their basic food and non-food needs. Using the food poverty line, overall poverty is estimated at 12.5%, representing almost 2.9 million individuals who cannot even satisfy their basic food needs" (RY, UNDP and World Bank, 2007: 24). The study also found that poverty in Yemen is deeper and more severe than in other Middle East and North African countries. Poverty is less widespread in Dhamar and Hodeidah governorates than in certain other parts of the country: in both, the proportion of poor people falls into the 25-35% range. In Yemen generally, rural areas are poorer than urban ones: they have 74% of the national population, but 84% of the poor (*ibid.*: 25).

...there is clearly an anti-poor disparity between better off and poorer Yemenis (both rural and urban) in terms of both access to water and the price paid for it. The vulnerability of poorer people is clearly greater, and the share of their income directed to getting adequate water is higher... rural areas in general face more difficult access to potable water and higher costs.

World Bank, 2007: 5.

The 2007 Poverty and Social Impact Analysis of the water reform programme emphasises that “water problems are an important component of poverty in Yemen” (World Bank, 2007: 4). This echoes the concerns of the National Water Sector Strategy and Investment Programme (NWSSIP) about the links between poverty and access to water (RY, 2005: 8). Currently, an estimated 47% of the rural population have access to safe domestic water, with 20% having access to adequate sanitation facilities. The study argues that the ability to pump groundwater is a major differential between poorer and better-off farmers, with the former often obliged to share water sources. This differential is widening as the costs of pumping from steadily sinking aquifers increase.

2.5 Health and nutrition

Poor health is another key dimension of Yemen’s poverty. It is linked in important ways to the inadequacy of water supplies. Water borne-disease, which is particularly dangerous for young children, is widespread. In many poor rural communities sanitation facilities are minimal, which means that defecation in the open is the only option for much of the population. Women may typically go out to relieve themselves only at night, which causes significant health problems for some of them. Many of the latrines that do exist are poorly constructed and maintained. Leakage from latrines into the groundwater or the village environment is another widespread health hazard. Mortality of children aged under five is twice that of other countries in the Middle East and North Africa and half of that mortality is caused by diarrhoea (World Bank, 2007: 4). Infant mortality decreased from 81 per 1,000 live births in 2000 to 76 in 2005 and life expectancy at birth rose from 59.3 to 61.7 years over the same period. However, in 2003 maternal mortality remained at 366 per 100,000 live births; 46% of children were underweight according to the 2003 Family Health Survey and 23% of newborn babies in that year had low birth weights. UNFPA data show that 31% of children under five are severely stunted and that 37% of the population are undernourished. Not surprisingly, analysis shows that poverty is clearly associated with these problems. The urban-rural differential

is particularly marked in the statistics on severe stunting of children (RY, UNDP and World Bank, 2007:10). In 2006, the World Bank concluded that “the health status of the Yemeni population is poor as measured by all conventional indicators and Yemen is not on track to achieve health-related MDGs... Outcomes in rural areas are much worse than urban areas” (World Bank, 2006b:12).

2.6 National policy and institutional context

Yemen has been reforming its water policy, law and institutions since the mid-1990s (World Bank, 1997). Two key concerns have driven these reforms (see box): the perceived crisis over water resource availability and management and the need to accelerate the delivery of basic water services to the rural poor. The focus on these concerns has made water policy and programmes more pro-poor in a country where the vast majority of water use benefits a richer minority of irrigated producers.

Three severe water problems have developed in recent years:
...groundwater is being mined at such a rate that large parts of the rural economy could disappear within a generation.
...major cities have grown very short of water.
...many people, particularly the poor in the cities and the countryside, do not have access to safe water.

World Bank, 1997: 2-3.

In 1995, concern about dwindling groundwater resources and poor water governance led to two key developments: creation of the **National Water Resources Authority (NWRA)** and initial drafting of a new **Water Law** (EKN, 2005: 6-7).

NWRA, backed up by the Water Law (which was passed in 2002), was intended to achieve integrated water resource management through tools such as basin planning and a hierarchy of institutions representing water users. Established as “the sole agency responsible for water resources planning and management in the country” (EKN, 2005: 6), it had a slow start and has made only limited progress so far in controlling groundwater extraction. The **Water Law** “aims at regulating, developing and guiding the exploitation of water resources, protecting water from pollution, and improving water installation, functions and maintenance” (FAO, 2007). It provides for the registration of water rights and the licensing of groundwater extraction. Its implementation implies major governance challenges.



People at Madman Althanee must get water from a farmer's private well because the public scheme is often not working

Thus far, Yemen still displays “a public sector characterised by an impressive array of institutions... but exercising scant actual control over water resources; and a private agriculture which exerts almost complete control over the water resources... the behaviour of [irrigated] farmers is therefore critical to the success of the reform programme in water resources and irrigated agriculture. Management approaches have to be cooperative rather than controlling, particularly in the context of Yemen’s weak formal governance structures” (World Bank, 2007:vii).

Establishment of the **Ministry of Water and Environment** was a major institutional step forward for the water sector. The Ministry of Agriculture and Irrigation remains responsible for the 93% of Yemen’s water use devoted to crop production, but the Ministry of Water and Environment brings together GARWSP, the rump of the National Water and Sanitation Authority (much of whose urban work is now done by independent agencies), the Environmental Protection Authority and – critically – the National Water Resources Authority. Government’s purpose in creating this Ministry was “to reorganise the water sector and create an institutional structure for integrated water resources management adequately equipped with institutional and investment conditions to face the exacerbating water crisis in Yemen” (EKN, 2005:6).

Guiding principles for Yemen's water policy

Principles of good natural resource management

- Integrated water resource management and the basin management approach.
- Management of the resource for achieving efficiency and sustainability.

Social and economic principles

- Priority to domestic uses, with due consideration to equity and poverty aspects.
- Allocative efficiency, so that water can flow to the use that pays the highest return, respecting basic domestic water needs for the poor.
- Water supply concerns are to be balanced by demand management measures, including the use of economic incentives to reduce the demand.
- Enhancing national and household food security through market-driven growth rather than self-sufficiency.
- Fiscal, agricultural and trade policies to be factored into water sector policy.

Institutional principles

- Water sector governance and capacity building are considered a priority.
- Decentralisation, participation and user organisation are key policy principles.
- Role of the private sector is emphasised.
- Role of the public sector in financing is clearly defined.
- Regulatory function is separated from service delivery.

RY, 2005: 16.

The new Ministry accelerated the process of policy and institutional reform through the development of a **National Water Sector Strategy and Investment Plan (NWSSIP)**. This plan elaborated a water policy for Yemen (see box) and an implementation strategy linked to the Millennium Development Goals. NWSSIP gave top priority to the poverty alleviation function of rural water supply and sanitation, “considering the positive impact of access to drinking water on health, girls’ education and unemployment” (RY, 2005:28). It urged greater emphasis on “involving and organising local communities, adopting the demand responsive approach [which had been developed by SURWAS], improving field implementation of [rural water] schemes, supporting the establishment of NGOs which are active in this field and also by developing low-cost, appropriate technologies” (ibid.:6). Recognising that the MDG 2015 targets were impossibly high for Yemen, the NWSSIP set a target of delivering water services to 65% of the rural population by that date, with sanitation services to 52%. The World Bank summed up the NWSSIP’s rural reform strategies as involving “rapid expansion of coverage with a pro-poor bias... making services

inclusive, affordable and sustainable... [and] improving implementation” (World Bank, 2007:41).

Whereas the responsibility for urban water supply and sanitation has been delegated from the National Water and Sanitation Authority to a number of independent Local Corporations and Public Utilities, a single, central authority – **GARWSP** – still plays a key role with regard to rural water supply. According to Presidential Decree 60 (2002), its mandate “is to provide rural water supply services to the population of Yemen in settlements not exceeding 15,000 inhabitants” (EKN, 2005:8). Support for this obviously local service remains the responsibility of a central agency. Although, as chapter 5 will explain, GARWSP is in the process of decentralisation to stronger governorate-level Branch Offices, it is exempt from the provisions of local government legislation that require Local Councils to deliver most primary services.

2.7 Netherlands policy and support to rural water supply and sanitation

In 1989, the Netherlands Ministry of Foreign Affairs produced its first development co-operation policy document on drinking water supply and sanitary facilities. The document strongly endorsed an integrated approach in which improvements in water supply are linked to improvements in sanitation, drainage, solid waste disposal and hygiene behaviour. Furthermore, it emphasized the need for user participation, which was seen as an essential strategy for ensuring more appropriate technology choices, a greater sense of responsibility among users and, in the long run, devolution of operation and maintenance tasks. The memorandum underlined the importance of sustainability (MFAN, 1989a). In 1989, the ministry also published the policy document ‘Women, water and sanitation’ that specified the role of women in user participation with a view to arrive at better management and maintenance of facilities, safer hygiene behaviour and reduction of women’s workload (MFAN, 1989b). In 1998, the policy document ‘Drinking water supply and sanitation’ was published. The central principle for drinking water and sanitation laid down in this document was to ensure the sustainability of water supply and sanitation facilities by designing, implementing and operating facilities which are desired, and can be managed or co-managed, by users themselves (MFAN, 1998).

Since the end of the 1990s, the Netherlands has promoted a sector wide approach to development co-operation, including projects to improve water supply and sanitation. This implied a move away from the traditional project-based approach

(MFAN, 2002). In 2004, the Minister for Development Co-operation made a commitment to contribute to Millennium Development Goal 7, i.e. to ensure environmental sustainability by providing sustainable access to safe drinking water and basic sanitation to an additional 50 million people by 2015 (MFAN, 2005).

The Netherlands has supported the water sector in Yemen since 1982, starting in the Dhamar area. By the late 1990s it was a prominent donor in the Yemen water sector with a total funding equivalent of approximately EUR 5 mln per year. Practically all aid was project based. In 2002, the Government of the Netherlands considered withdrawing from the water sector. However, following the major policy and institutional reforms described in section 2.6, the Government of the Netherlands again became a prominent donor in 2005, as it increased its commitment to the present level of approximately EUR 7.5 mln a year. Between 2001 and 2004, the Netherlands mainly provided support to rural water supply and sanitation through the Public Works Project and in the form of technical assistance to GARWSP and the World Bank Rural Water and Sanitation Supply Project. Since 2005, it has primarily provided programme aid to the water sector. The GARWSP uses its funds to 1) construct rural water supply schemes that are handed over to local Water User Associations and 2) strengthen the branch offices of GARWSP. The shift from project support to sector programme support is in line with the broad Netherlands policy shift towards a sector wide approach to development co-operation.

The Netherlands' focus on Dhamar was initially aimed to help relieve the suffering caused by the devastating earthquake that hit that Governorate on 13 December, 1982. The first three phases of what has become known as SURWAS (Support for Rural Water Supply Project) were implemented in 1983-1985, 1985-1987 and 1988-1991, respectively. During these three phases, 59 water supply schemes were launched benefiting approximately 70,000 people. A substantial number of smaller activities were also undertaken, such as the establishment of connections between health units (clinics) and existing water supplies and the extension of existing schemes. The total Netherlands contribution to Phases I-III was f 22.5m (EUR 10.2m at the 2002 exchange rate). In 1990, an evaluation mission inspected 42 water systems installed during SURWAS Phases I-III. It found that 75% were functioning. The remainder were not, "mainly due to organisational problems on village level" (Kingdom of the Netherlands (KN) and Republic of Yemen (RY), 1993a:15).

As was shown in section 2.1, the population of Yemen was 21.6 million in 2006. This compares with 11.9m in 1990. For any country, this level of population growth

(3.8% p.a.) would pose substantial challenges to its domestic water supply. For Yemen, with its low rainfall and fierce competition for limited groundwater resources caused by a rapid expansion of irrigated agriculture, challenges have been greater still. The urbanisation process has continued, though at a modest pace: in 2006, 26.3% of the population was classified as urban, compared to 21.3% in 1990. Hodeidah governorate is more urbanised than Dhamar, with 27% of its people living in towns compared to 12% of Dhamar’s population. Due to its easier topography and agrarian landscapes, settlements are larger in Hodeidah: the GARWSP database of water schemes indicates that it has an average scheme population of 4,381, compared to 1,695 in Dhamar, which is largely mountainous. (It should be noted that a large number of schemes serve more than one settlement.)

Not all coverage figures for water supply and sanitation in Yemen are reliable. Recent efforts to standardise measurement criteria for inclusion in the 2004 Population, Housing and Establishment Census were unsuccessful. Consequently, the results of that census “do not provide useful information for NWSSIP monitoring” (RY, 2007:7). Water supplies provided by water harvesting schemes supported by the Social Fund for Development are not included in the safe water coverage data because of disagreement about the quality of such water. Not all measures of safe water supply coverage in Yemen are reliable, but according to the best available statistics the overall percentage of the rural population in Yemen with access to an improved water source declined during the 1990s, but subsequently increased from 26% in 2002 to 45.7% in 2007 (table 1). According to the Joint Annual Review 2008 carried out by government and donor agencies, considerable progress has been made over recent years in coverage of the rural population with safe water supplies. However, “sanitation coverage data for the rural areas are hardly available: it is therefore risky to assert the progress in coverage in this area” (RY, 2007:4).

Table 1 Coverage of rural households with safe water supplies, 2002-2007						
Year	2002	2003	2004	2005	2006	2007
% coverage	26.0	30.8	34.6	37.5	42.3	45.7
Annual increase (%)		4.8	3.8	2.9	4.8	3.4

Source: Joint Annual Review 2008

Against this background, two more phases of SURWAS were implemented between 1991 and 2001. Extension from Dhamar to include Hodeidah Governorate was under discussion since 1990 and took effect in 1995. Support for rural water supplies in Tihama was motivated by the following reasons: the poverty of the local population, the salination and pollution of shallow groundwater resources and the area's perceived lack of political influence in Sana'a, i.e. the difficulties faced by local leadership in securing central government support for water schemes (KN, 1993). This study focuses on the impact of SURWAS phases IV and V, which are described in detail in chapter 3.

3 Support to Rural Water Supply in Dhamar and Hodeidah Governorates

3.1 Objectives

3.1.1 SURWAS IV

Phase IV of SURWAS was undertaken on the recommendation of a positive evaluation of Phase III conducted in 1990. According to the project document for Phase IV of the Support Rural Water Supply Department Project (sic) (SRWSD), the **aims** of the project were to:

- 1) Provide a sustainable water supply and sanitation infrastructure in those villages where a reliable water source is available, cooperation of the beneficiaries can be expected and preferably in the catchment area of a primary health care unit.
- 2) Participate in the process of women development in the rural areas.
- 3) Ensure the cooperation and active participation of the LCCD [Local Council for Cooperative Development] and the beneficiary villages in project preparation, implementation, operation and maintenance.
- 4) Promote the [SURWAS] approach of implementing projects within the Rural Water Supply Department.

KN and RY, 1991: 6.

A number of **immediate objectives** were also stated:

- 1) To support the RWSD unit in Dhamar.
- 2) To analyse and fulfil training needs of Yemeni and expatriate staff, serving both long term needs to phase out expatriate assistance and short term needs to increase professional capability.

- 3) To support, preferably in cooperation with the HOD [Health Office Dhamar], the health education given by the male and female primary health care workers in villages where a water system is implemented and to give health education where health care workers are not available or not ready to cooperate.
- 4) To assist the HOD with the implementation of the training programme for primary health care workers on water and sanitation subjects.
- 5) To extend and intensify women's involvement in project implementation, through health education and exchange of information on the design, construction and operation of the water supply schemes.
- 6) To promote the implementation approach within the RWSD including health education and village participation.
- 7) To increase the sustainability of the implemented schemes by enhancing the training course on operation and maintenance for water supply systems operators... and assisting villages in system management, which will be monitored.
- 8) To develop a system for monitoring of completed water supply and sanitation systems and to record and feed back the experiences.
- 9) To develop a policy and an approach for sanitation improvements related to water use, waste water disposal, human waste disposal and solid waste disposal, with emphasis on education and demonstration.
- 10) To support the implementation of sanitation measures, taking into account village priorities and implications on the project in terms of manpower, funds and other resources.

KN and RY, 1991: 6-7.

3.1.2 SURWAS V

SURWAS V largely pursues the same **aims** as the previous phase, though with one additional element:

- to provide a sustainable water supply and sanitation infrastructure in the villages with an available and reliable water source, where cooperation of the beneficiaries can be expected and preferably in the catchment area of a primary health care unit;
- to participate in the process of women development in the rural areas;
- to ensure cooperation and active participation of the LCD [Local Council Department] and the beneficiary villages in project preparation, implementation, operation and maintenance;
- to promote the SURWAS approach of implementing systems within GAREW;
- to support the GAREWS head office in Sana'a and provide them with the tools needed for planning and day to day management.

KN and RY, 2002: 2.

Confusingly, the final project report from which the above is quoted continues by providing a number of lists: a long list of “specific objectives” defined at the start of Phase V, a list of initial project objectives that were “actualised” after the IWACO company had been commissioned to manage the project and a list of “reformulated” objectives:

- *implementation of integrated water supply and sanitation schemes in Dhamar and Hudaydah regions for approximately 75 to 100,000 people. These schemes will be constructed according to the system of village based preparation, implementation and operation which has been developed by the project in the previous phases and subsequently improved and adapted to the prevailing conditions in the rural areas;*
- *support to the GAREW with advice on the organisation structure and the decentralisation process, establishment of sector data and knowledge base and the development and transfer of improved project implementation methods;*
- *support to establish a permanent GAREW office in the Hudaydah Governorate.*

Ibid.: 3.

3.2 Approach

3.2.1 SURWAS IV

The overall approach of SURWAS IV was guided by its commitment to follow official Yemeni rural water supply development policy. The aim of this policy was to provide water supply systems to serve 85% of the rural population (KN and RY, 1996: 3).

In 1993, the SURWAS approach to developing village water schemes was described as comprising the following five steps:

- 1) **listing** of potential projects by the GAREWS; all potential projects must have a developed water source, usually a deep well;
- 2) **feasibility study** to establish if the intended project meets the following criteria: need; population >300; source adequacy; per capita cost <YER 1,500; site access; O&M capability; ability and willingness of the community to participate and contribute 30% of project cost;
- 3) **design** based on GAREWS design criteria, and aiming to promote the use of local building materials; in this phase any uncertainties on the use of the source must be removed. Also, a contract is to be agreed on the project between the village and the project, and co-signed by the LCCD, Governor, and GAREWS; the contract specifies the contributions to the project by the village and the SRWSD;



The technical challenges of reticulating water to mountain villages can be considerable

- 4) **implementation** of the project, with participation, in kind or cash, as agreed, by the village. The start of the implementation is conditional to site accessibility, and the supply of building materials by the community;
- 5) **operation** by the community starts after formally handing over the project, and completion of operator training (by GAREWS/WHO).

A project may be cancelled during step two, when it proves not to be feasible, or during step three, when either the water source or the contract cannot be secured. When during step four village contribution ceases and will not continue within one month after a warning, the project will be cancelled. When a project is cancelled, priority ranking and implementation schedules must be revised.

KN and RY, 1993b: 4.

Neither the evaluation report from which the above steps are quoted nor the SURWAS IV project document explicitly state the project's approach to user contributions, affordability or charges for water use, although the principles of user participation in design and construction and user responsibility for operation and maintenance are implicit in the statement of approach.

The Phase IV approach to hygiene and related sanitation issues was incorporated in a 'Women, Health and Research' (WHR) component. This component comprised:

- 1) field visits introducing the project's aims and WHR personnel to identify potential co-ordination aspects;
- 2) data collection of the village's existing situation and women's participating roles (part of the project feasibility study);
- 3) organise weekly hygiene education sessions at project villages for six to eight weeks in different water and sanitation subjects to male and female groups including children;
- 4) organise village cleaning days involving male and female groups;
- 5) involve the village Imam and influential people to support hygiene education and project activities;
- 6) train staff of other related projects for better co-ordination;
- 7) organise school water and sanitation hygiene education lessons;
- 8) develop hygiene education materials.

KN and RY, 1993b: 4-5.

3.2.2 SURWAS V

The villages in which SURWAS V installed water supply schemes and undertook hygiene programmes and (later) sanitation schemes were mostly selected by GAREWS (with the exception of projects in the town of Hais and three IFAD-supported schemes in the Rayma area).

The implementation method and principles of SURWAS V were basically identical to those used in SURWAS IV, except for technical adaptations reflecting the transfer of operations from Dhamar to Hodeidah. Initially, as in SURWAS IV,

the project's engineering staff conceived the water supply scheme, an agreement was established with the community defining their contribution for the implementation and the social staff had their own more or less separate activities concerning hygiene and health aspects.

Although the approach was based on community participation and project staff was highly committed to cooperate and work with the communities, there was a gap between the technical and social aspects of the approach. Also, training of the villagers in managing, operating and maintaining the facilities had some shortcomings. It resulted frequently in problems delaying the progress of the works and sometimes even jeopardising the completion of the scheme or its efficient operation. The scheme management committee was mostly composed of village leaders. The issue of sanitation was hardly addressed during this period.

KN and RY, 2002: 12.

In 1998, it was decided that a methodology was to be developed that could be applied across the rural water sector in Yemen. Key elements of this approach were to be the integration of water supply and sanitation, enhanced community participation and hygiene education (KN and RY, 2002: 5).

Following the revised implementation methodology, the community is involved in the initiation, the configuration and design of the water supply and sanitation schemes and is fully aware of the conditions of the implementation and operation of the facilities. The procedure to establish the Management Committee, transparent election procedures and the legal status of these committees has enlarged the control of the community on this committee...

Training programmes were developed for accounting, management and operation of the facilities and local plumbers and hygiene promoters...

Most important in this revised approach has been the integration of technical and social aspects. Since 1998 there has been intensive exchange of information and experiences between technical and social staff of the project which significantly raised the comprehension of these aspects and the understanding that most problems need to be solved commonly by technical and social staff.

Ibid.: 12-13.

Key elements of the social methodology included:

- baseline surveys intended to permit later assessment of impact. (although this study has been unable to trace or use such baseline data);
- pre-implementation and assessment by GAREWS and the project's Social Participation Unit (SPU), including a 'village walk' and socio-economic and hygiene studies based on PRA methods;
- selection and training of (female) Local Hygiene Promoters and Local Helpers;
- a school extension programme on water, hygiene and the environment;
- a hygiene promotion programme focusing on:
 - disposal of excreta and the dangers of contamination;
 - proper use, storage and transport of water;
 - hand washing;
 - communal sanitary conditions and safe disposal of waste water;
 - construction, use and maintenance of latrines;
- systematic follow-up, monitoring and evaluation procedures.

The hygiene promotion programme is largely focused on women. Structured monitoring by SURWAS of the results in communities undertaken in 2000 showed:

- Awareness and ability to state the 5 key health messages: increase by 40% to 60% of women
- Improvements were noted in reducing the amount of water used; covering and cleaning drinking water vessels, cleaning compounds and solid waste disposal, use of latrines or burying faecal matter, washing hands and use of soap.

The mission similarly observed improved hygiene behaviours compared to villages where there had been no intervention.

...One project intervention may not be enough to transform, for example, hand-washing practices. Keeping this in mind, the SURWAS SPU hygiene work appears to be of very high quality.

Klaassen et al., 2001: 14

As during Phase IV, it would appear that during SURWAS Phase V, no new boreholes were drilled. Instead, boreholes that already existed were equipped or renovated. In many cases, GAREWS had drilled these wells but had not completed the systems they were intended to serve.

The technical approach varied according to the types of water source available. In the coastal plains of Hodeidah, boreholes – typically at depths of 80-100m – were equipped with a pump powered by a diesel engine in a pump house. The water is pumped from the borehole into an elevated reinforced concrete reservoir. By means of a network of high density polyethylene (HDPE) pipes, it is then distributed to individual yard connections, each equipped with a water meter. In mountainous areas, including all of Dhamar Governorate, boreholes, pumps and pump houses are often necessary. Many of these are linked to a storage reservoir above the village by one or more booster pumps. Elsewhere, it has been possible to secure supplies from springs that feed a ground reservoir. From there, water is pumped up to a storage reservoir. In these areas metered yard connections are also the norm.

Although the project experimented with alternative technologies, notably solar power, it was reported that beneficiaries did not show great interest in these because the standard approach seemed reliable and sustainable (*ibid.*: 18).

Both technical approaches imply substantial local institutional development and capacity to manage pumps, pipes and reservoirs and operate meter reading, billing



Water tower

and accounting systems. A 2001 evaluation mission found that monthly meter reading and invoicing was functioning successfully (Klaassen *et al.*, 2001: 12-13). At a higher level, the SURWAS direct implementation approach was not replicable, as GAREWS would have to undertake all physical works through contractors (*ibid.*: vi).

In view of its argument that demand continues to outstrip the installation of new schemes, it is surprising that the 2001 evaluation argued that the water demand growth rate of 3.7% per year assumed in the SURWAS scheme design was unnecessarily high. It also suggested that the design consumption be reduced from 60 to 40 litres per person per day (Klaassen *et al.*, 2001: vi).

Focused sanitation activities did not emerge as part of SURWAS until 1999, with projects in two villages raising awareness on the importance of building and using latrines. Hand flush latrines were the standard model and the project contributed cement, steel, fittings, corrugated iron and funds for skilled builders. The community contributed locally available building materials and unskilled labour, notably for digging pits. Initially, the sanitation programme experienced many problems as the project and its community counterparts explored this sensitive issue. The projects progressed slowly and were expensive, partly due to procurement and construction delays. Various improvements were introduced during operations in subsequent

villages, such as intensified community awareness raising and participation and higher contributions made by SURWAS to employ skilled builders. Consequently, costs and construction time were reduced (KN and RY, 2002: 20-21).

3.3 Inputs

3.3.1 SURWAS IV

During Phase IV, the Netherlands funded some 25-30 staff for the project, including a Dutch team leader and, during a limited period, a health educationist and a mechanical engineer from the Netherlands. The project also funded the cost of employing local construction contractors for water schemes, the provision of project vehicles, staff housing, office equipment and operating costs. Another major input was equipment and other externally procured supplies used for the installation of water supply schemes. Netherlands funds also supported a number of short training courses for Dutch and Yemeni personnel.

GAREWS provided between 10 and 15 counterpart staff for the project, as well as office and workshop compounds and buildings in Dhamar and Hodeidah and test pumping equipment.

Communities receiving water supply schemes in the context of the project were required to contribute locally available building materials and labour. Cash contributions were also made in a number of cases.

3.3.2 SURWAS V

In general, the SURWAS V contribution to village water supply schemes comprised:

- supply and installation/construction of pump, engine, pipes, fittings, tank or reservoir;
- technical assistance and supervision during construction.

Community contributions typically comprised:

- local construction materials such as sand, stone and concrete blocks;
- construction labour and sometimes hire of a trench excavation machine.

Whereas the first phase of SURWAS V support to GAREWS included fielding a full-time adviser, the PMA was fully localised in the second phase, with GAREWS staff

constituting five Working Groups on different managerial and institutional issues. A part-time expatriate Adviser provided 11 weeks of inputs in 2000.

3.4 Activities

3.4.1 SURWAS IV

Phase IV is a continuation of Netherlands support to the Rural Water Supply Department that was initiated in 1983. It continued from June 1991 until 1996, with a number of interruptions and setbacks during the civil war in mid-1994 (when one of the project's offices was gutted by fire). Security problems also arose periodically in Dhamar Governorate, causing the project to scale down or stop its activities in several areas. A new project document was produced early in 1993 to cover the programme's extension to the Tihama coastal region and the western part of the Dhamar Governorate, in accordance with Yemeni policy to concentrate SRWSD operations in these areas. The extension was formally agreed in January 1994. After it was extended, SURWAS IV helped to establish a GAREWS Branch Office (BO) to cover western Dhamar and Hodeidah Governorates. The existing SURWAS office in the town of Dhamar remained the project's general headquarters.

The main project activity under Phase IV continued to be the construction of village water supply systems, according to the approach described above in section 3.2.2.

A 'sanitation programme' included hygiene education campaigns at schools and for women and men. These covered the disposal of human waste, waste water and garbage as well as other pollution concerns. A number of latrines were constructed as well. The 1993 evaluation report refers to private latrine construction in "some villages" (only two of these villages are named and it is possible that these latrines were constructed before 1990) and the construction of public latrines at schools and mosques, as well as public latrines for women.

A 1995 progress report provides an interesting summary of the kinds of work performed by the 'Women, Health and Small Scale Research' section. Staff visited each family individually to decide the best location for the water connection, to discuss how to prevent stagnant water and to follow up on earlier training sessions on hygiene and the relation between water and health. Households were offered trees and flowers that "made a proper connection". The team held discussions with local leadership about future project management and the election of water committees. "Due to cultural aspects, only men can be members of these

committees. With the women discussions were held and they were explained how these committees work” (KN and RY, 1995: 12). In several places, school tree planting and health education programmes were organised.

Also in 1995, SURWAS commissioned a two-week consultancy to review sanitation issues and strategies. Following field visits in Dhamar and Hodeidah Governorates, the mission concluded that low latrine coverage did not cause unhygienic conditions. It noted that in Dhamar latrines were constructed by households independently and that “therefore extension of the project for sanitation only is not deemed necessary”. In Hodeidah, it was found that “interest in sanitation improvement is high”. With regard to Dhamar, where the project no longer had a health education section, it only provided a few technical instructions to households on how to construct latrines in rocky areas. Referring to Hodeidah, it observed that “the project incorporates a sanitation component in all villages where water projects are carried out”, estimating that funds needed would amount to approximately 10% of the cost of the water supply component (Wegelin-Schuringa and Mohamed, 1995).

3.4.2 SURWAS V

Phase V saw the phasing out of SURWAS activities in Dhamar Governorate (originally planned for Phase IV) and a shift of focus to Hodeidah Governorate. Operations in Dhamar continued until 1998. In Hodeidah, activities started in 1996 and continued throughout Phase V, until 2001. (The 2001 project evaluation provides slightly different dates, claiming that activities in Dhamar continued until 2000 and that in Hodeidah schemes started in 1995.)

During the final phase of the project, the installation of village water supply schemes continued based on methods and technologies developed during earlier phases. Yet, as will be shown below, the approach was adjusted and systematised in 1999 in order to be broadly applicable nationwide.

Hygiene education programmes were an important part of the project’s work.

Since 1999, the project began to assist in the construction of household latrines (as well as several facilities at mosques).

In late 1997, the project set up a Planning and Management Advisory Unit (PMA) in the GAREWS headquarters. Initially, the PMA focused on building project management capacity at headquarters. Later, broader organisational transformation

and development was pursued (see below), and decentralisation, community involvement and sustainability were promoted. A considerable number of GAREWS branch offices were established during this period, so that by 2001 there was one in every Governorate.

One major component of SURWAS V support to GAREWS was the strengthening of the Branch Office in Hodeidah and the construction of a building for this office (completed in 2001). In addition to physical construction work, the project carried out operational support activities at the BO, built competence and capacity and transferred SURWAS methodology to the Hodeidah team.

3.5 Outputs

3.5.1 SURWAS IV

No terminal report for SURWAS IV has been traced. This makes it difficult to provide accurate information about its outputs. The final quarterly report for 1995 shows that 30 schemes had been completed. A further 11 schemes were under survey; another two had been well tested; and eight schemes were under construction. Five schemes had been abandoned (KN and RY, 1996: 23-24).



Pump house, Dir Al Maqboli, Hodeidah Governorate

It is unknown how many of these SURWAS IV schemes were previously functioning systems that were rehabilitated during this phase of the project. The final quarterly report for 1995 does show expenditures of EUR 0.3m on “Phase III projects”. This could either refer to the completion of operations started in Phase III or to the rehabilitation of Phase III schemes.

The same report states that by the end of 1995, sanitation projects had been completed in 21 villages, with one scheme still under construction. As noted above, most of these projects installed public toilets, though latrines were also built for individual households in a small number of villages.

Phase IV targets appear to have been stated only in terms of numbers of people served (see section 3.6.1 below). Consequently, physical outputs cannot be compared against objectives.

3.5.2 SURWAS V

Between 1996 and 1998, SURWAS V completed water supply schemes in nine villages in Dhamar Governorate and 16 villages in Hodeidah Governorate. Between 1999 and 2001, another 15 village schemes were completed in Hodeidah Governorate and the scheme at Al Moneira village was rehabilitated.

Not including Al Moneira, this means that a total of 40 village water supply schemes were completed during SURWAS V. Many of these schemes involved reticulation to a group of settlements rather than a single village.

The above data are drawn from the project’s final report (KN and RY, 2002). A 2001 evaluation report (Klaassen *et al.*, 2001) presents slightly different figures.

As has been noted, it is likely that these schemes involved development of existing boreholes. Apart from Al Moneira, it is unknown how many of these involved rehabilitation of existing water supply systems, possibly including schemes initially developed during earlier phases of SURWAS.

Phase V outputs include work on three IFAD-supported schemes in the Rayma area and a scheme for the town of Hais (population 12,000) in consultation with ADRA, an NGO.

Household sanitation schemes were implemented in six villages: a total of 844 cesspits and 822 latrines were built, serving a total of approximately 15,000 people.

Seven villages also received support in building a total of ten cesspits and 22 latrines at mosques.

The expansion of GAREWS Branch Offices to every Governorate in the country can be considered an output of the SURWAS planning and management component.

The most important result of the PMA activities over the last year is the awareness among the staff in GAREW, both in headquarters and in the Branch Offices, about the need of decentralisation.

KN and RY, 2002: 33.

The new building for the GAREWS Branch Office in Hodeidah is another important output of Phase V.

Once again, no physical construction targets appear to have been set during the design of Phase V, and only a very approximate reference was made to the intended population coverage of new schemes (section 3.6.2). Outputs can therefore not be compared against targets.

3.6 Beneficiaries and coverage

3.6.1 SURWAS IV

The latest available statement of water supply schemes completed during SURWAS IV, issued at the end of 1995, shows that these 30 projects served a total population of 42,379 – an average of 1,413 people per scheme. This far exceeded the original target of providing 29,000 people with reliable drinking water (KN and RY, 1991: 16; no new targets were specified in the 1993 project document for the Tihama extension). The beneficiaries of these projects were inhabitants of rural communities. Baseline data are not available, but it can be assumed that all SURWAS IV water supplies were incremental to those existing at the start of the phase – although a number of schemes rehabilitated earlier systems that were no longer operational.

No analysis of beneficiary characteristics is available from the implementation period, but this study's analysis (chapters 4 and 5) indicates that almost all villagers, rich and poor, had access to the improved water supplies. The 1993 evaluation of Phase IV lists the benefits for male and female community members. Men in several villages noted cost savings compared with earlier water supplies. More generally, men said that easier access to water enhanced households' income generating potential due to time savings and that water projects



Household tap, Dir Al Maqboli, Hodeidah Governorate

occasionally created employment. Women referred to the reduced burden of water collection and improved income generation, notably from gardening and handicrafts (KN and RY, 1993b: 12).

3.6.2 SURWAS V

Altogether the 40 village schemes constructed by SURWAS V served approximately 88,500 people (an average of 2,213 people per scheme). They were designed to meet the needs of population growth up to 2010, when the population of the villages served was expected to total 130,000 (KN and RY, 2002: 11). An additional 10,000 people were served by the rehabilitation of the scheme at Al Moneira in Hodeidah Governorate. However, these achievements must be seen in the local and national context, as observed by a 2001 evaluation:

Coverage in the villages where SURWAS has worked is high. However, coverage among the communities within the Hudaydah Governorate is low. It is very worrying that, as GAREW reports, population coverage with functioning, safe water supplies has decreased by about one-half from 55% coverage nationwide. The current speed of implementation may at most only marginally increase the proportion of the population served.

Klaassen et al., 2001: v.

As shown above, SURWAS only implemented sanitation schemes in a limited number of villages. However, coverage in these villages exceeded 80% of the households, whereas before the intervention it was less than 10% (Klaassen *et al.*, 2001: 9).

A very general coverage target was set for Phase V: “implementation of integrated water supply and sanitation scheme sin Dhamar and Hudaydah regions for approximate[ly] 75 to 100,000 people” (KN and RY, 2002: 3). With 88,500 people served and capacity to serve 130,000, the SURWAS Phase V water supply target was met. Nevertheless, achievements with regard to sanitation were much less successful. As in Phase IV, it can be assumed that the 88,500 people served with safe water as a result of Phase V operations constitute an increment to the number of people with access to this service at the start of the phase.

3.7 Costs

3.7.1 SURWAS IV

The initial Netherlands contribution to SURWAS budgeted for the 1991-1993 period was EUR 3.6m, matched by a Yemeni contribution of EUR 1.3m. 1993 data show that the 1991-1995 budget was EUR 5.9m, comprising EUR 3.6m for Dhamar and EUR 2.3m for the Tihama area (i.e. Hodeidah Governorate) (KN and RY, 1993b: 1). Somewhat unreliable data presented in a 1995 progress report suggest that a budget of EUR 2.2m was allocated to the Tihama extension (KN and RY, 1996: 17).

The same progress report stated that up to the end of 1995 EUR 5.6m of Dutch funds had been spent during Phase IV of the project in Yemen, excluding expenditures in the Netherlands. With regard to the Yemeni contribution, it stated that:

[n]o accurate information can be given on the actual spending of any of the allocated funds. However, because of the quite large number of counterparts and the local participation in almost every project, the Yemeni expenditures seem to be even more than budgeted for.

KN and RY, 1996: 14.

By contrast, Ministry of Foreign Affairs documents show that total Netherlands expenditures on SURWAS IV amounted to EUR 4m (KN, 2007a). This discrepancy makes it difficult to calculate total donor costs per beneficiary, which, based on these two figures would range between EUR 94 and EUR 132. The 1993 evaluation of SURWAS IV quotes per capita costs averaging EUR 70 (Netherlands costs only)

and EUR 150 (Netherlands, GAREWS and community costs) (KN and RY, 1993b: 9). These estimates are based on the official exchange rate; at the parallel exchange rate in use at the time, they convert to EUR 34 and EUR 72, respectively.

The above calculations refer to total donor expenditures. Alternative calculations, from the field perspective, were included in cost estimates prepared in 1993. A typical scheme was estimated to cost EUR 90 or EUR 43 per capita, depending on the exchange rate applied. The project would contribute an average of 70% of this amount and the community and local authorities 30% (KN, 1993). Like all SURWAS costs, these excluded the cost of drilling a well, since the project always worked with wells that were already in place.

3.7.2 SURWAS V

The budget for Phase V of SURWAS was EUR 6.8m. This amount covered the original period of 1996-2000, with an additional EUR 0.48m allocated for the extension to April 2001. Had the entire budget been spent, this would have worked out at approximately EUR 82 per beneficiary of the 40 water supply schemes installed during this phase of the project. However, Ministry of Foreign Affairs records suggest that total Dutch expenditures on the project amounted to EUR 4.2m. This amount implies a per capita cost of EUR 47 for the donor. A project evaluation suggests that the first figure is more accurate. It states that the per capita cost of SURWAS water schemes (including community and GAREWS contributions) was EUR 80, against EUR 84 per capita spent on GAREWS schemes (Klaassen *et al.*, 2001: 15).

Overall, the value of the community contribution was estimated at 20-25% of total construction costs for water supplies (KN and RY, 2002: 19) and 45% of the cost of a latrine (Klaassen *et al.*, 2001: 12). The same evaluation quotes the average total cost of a SURWAS V latrine as EUR 257, comprising a SURWAS subsidy of EUR 129 and a community contribution in materials and labour of EUR 128 (*ibid.*: 15).

It is difficult to assess the cost-effectiveness of SURWAS water supply schemes for lack of consistent financial data. SURWAS central procurement and probable foreign exchange advantages are likely to have made per capita costs lower than they would otherwise have been and the project's direct involvement in construction ensured higher cost-effectiveness than GAREWS was achieving at the time.

3.8 Summary

The overall objectives of SURWAS IV and V were to continue the provision of safe, sustainable domestic water supplies and the improvement of sanitation facilities to the rural populations of Dhamar and Hodeidah governorates. Complementary support was provided to promote institutional development at the levels of community water management and GAREWS. During Phase V the latter support was expanded to the General Authority's head office in Sana'a. Promoting women's participation in community water management was another important objective during both phases.

Technically, the SURWAS approach concentrated on pumping water from wells that had already been drilled, mostly by GAREWS, and reticulating it to individual household connections. Users were expected to contribute to the construction of water schemes, to manage their operation and to pay fees to community water management agencies in charge of operation and maintenance. These fees were typically based on meter readings at each household connection point. The project also promoted hygiene and sanitation awareness and action through extension programmes that gave prominent attention to women's roles. However, sanitation activities only received focused attention during the last two years of SURWAS V. Progressive enhancement of SURWAS social, community and institutional methods was meant to develop a country-wide approach. Community roles and responsibilities were reinforced and the technical and social dimensions of the approach were integrated more effectively.

Both SURWAS IV and SURWAS V combined inputs funded by the Netherlands and inputs from GAREWS' domestic budget. SURWAS IV began with a project staff of 25-30, including three Dutch staff members. The project funded construction contracts and infrastructure such as equipment and vehicles. GAREWS provided counterpart staff and office space. Throughout both phases, communities made important contributions of labour and materials. By the end of Phase V there were no longer any full-time Netherlands staff members; one adviser made periodic visits.

During Phases IV and V, SURWAS continued its principal activity of supporting the Rural Water Supply Department and subsequently GAREWS in constructing village water supply schemes and building institutional capacity enabling communities to operate these schemes based on user responsibility for their operation and maintenance. Phase IV saw the expansion of the project to include

Hodeidah governorate. Operations in Dhamar were phased out during Phase V. During both phases, hygiene and sanitation awareness programmes were carried out along with the construction of a number of public latrines at schools and mosques. The construction of domestic latrines in six villages was also supported between 1999 and 2001. During Phase V, SURWAS supported a Planning and Management Advisory Unit at GAREWS headquarters and built a Branch Office for the Authority in Hodeidah.

The final outputs of Phase IV are unclear, but the target of providing 29,000 people with reliable drinking water was far exceeded. (No construction target was set for Phase IV.) The total coverage of Phase IV is uncertain, but the first 30 schemes completed (with probably ten more built later) were reported to serve 42,379 people. Evidence of a physical construction target for SURWAS V was not found either, but it is reported that 40 village schemes were built during this phase and that household latrines were constructed in six villages (plus public sanitation facilities in seven additional villages). Other important outputs were institutional capacity in GAREWS and the new Branch Office building in Hodeidah. With 88,500 people served and capacity to serve 130,000, the rather broad SURWAS Phase V water supply coverage target of 75,000 - 100,000 people was met, although much less was achieved with regard to sanitation. The total number of beneficiaries equals approximately 6.5% of the current rural population of the two governorates. No data are available from the project implementation period regarding beneficiary characteristics, but this study confirms that almost all members of the communities served by SURWAS benefited from improved water supplies.

Data on the costs of these two SURWAS phases are ambiguous. It is therefore difficult to calculate the costs per person served by water supply and sanitation activities. Per capita costs were distinctly lower in Hodeidah than in Dhamar, due to the shallower water table. Costs do not include the drilling of wells, since SURWAS always worked in villages where GAREWS or other agencies had already drilled a well. The most accurate estimates of Phase IV costs of water supply per capita available are in the order of EUR 34 (donor costs) and EUR 72 (total costs, including GAREWS and community contributions). With regard to Phase V, the best estimate of total costs, including all contributions, is EUR 80 per capita. SURWAS Phase V latrines cost a total of EUR 257 each, half of which was made up of community contributions of materials and labour.

4 Survey results and impact analysis

4.1 Introduction

This chapter presents the quantitative analysis of the impact of support to rural water supply and sanitation in Dhamar and Hodeidah Governorates during the period from 1991 up to 2008. The chapter broadly addresses the evaluation questions on outcomes and impact (evaluation questions 9 through 18 of section 1.2).

The main purpose of this chapter is to determine whether a causal link exists between presence of a water scheme, hygiene and sanitation practices and improvement in health, education and households' living conditions. The basic method is to compare outcomes between villages or households within villages with ('treatment' villages) and without ('control' villages) water schemes.⁵ Villages differ in many respects apart from the presence of a water scheme. Therefore, outcome differences cannot simply be attributed to the presence of a scheme. To the extent that variables affecting outcomes are actually observed, they can be accounted for by using regression techniques and including them in the explanatory variables of a regression. Unobserved factors may also drive outcome differences. Such factors can confound the analysis if they are correlated with interventions: the notorious problem of selectivity of treatment. For instance, one might find that health outcomes are better in villages with safe water sources. However, both better health and presence of safe water might be caused by the relative welfare of these villages: better-off households are often also healthier

5 Three types of villages are distinguished: villages without a scheme, villages with a SURWAS scheme and villages with a scheme that is not supported by SURWAS. When it is clear that no major differences exist between SURWAS and other scheme villages, a simpler scheme/no-scheme classification is used. More accurate estimates can be obtained by pooling data from both scheme types.

and richer villages may be more successful in lobbying for facilities such as safe water provision. In this example, differences in health might have been caused by differences in welfare rather than differences in safe water availability. It is not possible to establish this without including the level of welfare in the analysis. Inevitably, there are variables that could affect the outcomes and for which no data are available. This could complicate any simple comparison of outcomes between villages with and without safe water sources. The method of fixed-effect regression, comparing *changes* in outcomes between treatment and control groups, can reduce the danger of wrong conclusions on the effects of interventions ('false positives'). However, the method has the disadvantage in that it requires data on outcomes for the same subjects for at least points in time and that it tends to increase the uncertainty brought by measurement errors, thereby increasing the likelihood of 'false negatives'. As far as appropriate data were available, fixed-effect regression was used in the impact analysis below.

Data from several sources have been included in the analysis.

- 1) *Household survey.* A survey was conducted among a total of 1651 households in Dhamar and Hodeidah governorates to obtain information on household access to and use of water and sanitation facilities and hygiene practices, in addition to general information on household circumstances. The household survey was designed to match rural villages endowed with a SURWAS water scheme to a village with a non-SURWAS water scheme and a nearby village with no scheme at all. Thus triplets of villages were surveyed in Hodeidah and in Dhamar. The following two tables show the number of survey villages and the number of survey households for each type of village and governorate. The names of all survey villages are listed in annex 2.

Table 2 List of survey villages				
	SURWAS	Non-SURWAS	No Scheme	Total
Dhamar	28	25	28	81
Hodeidah	28	28	28	84
Total	56	53	56	165

Table 3 List of survey households

	SURWAS	Non-SURWAS	No Scheme	Total
Dhamar	280	250	279	809
Hodeidah	280	280	280	840
Total	560	530	559	1,649

The sample covers almost 90% of the villages with SURWAS schemes in Hodeidah and Dhamar. In most cases, matching villages were selected within a radius of 5km; in cases when several villages qualified this criterion, the matching village was randomly chosen. Within villages, households were selected at random. The resulting triplets are well-balanced in terms of basic household demographic characteristics and household assets (see annex 3). This means that villages within a triplet are comparable, at least in terms of observed characteristics. One estimation strategy for assessing impact is therefore to compute the average outcome difference between scheme villages and no-scheme villages, since this is also the average of outcome differences between matching villages.

- 2) *Water sources: quality, quantity and location.* Households were asked about their primary and secondary water sources. Samples from the water source and point of use were collected for water quality testing. Quantity data were obtained from water meter readings in SURWAS scheme villages. No reliable water usage data could be obtained from other scheme and no-scheme villages. GPS position of primary and secondary water sources has been used to assess the distance to water sources for scheme and no-scheme villages.
- 3) *Focus Group Discussions.* In order to obtain data about women's perceptions a total of 23 FGDs were conducted in Hodeidah and Dhamar. Between 10 and 13 women – gathered in a local house – participated in each meeting. FGDs were primarily held to explore the direct and indirect impact of water and sanitation schemes on household livelihood and family's and women's welfare. This qualitative information has been useful for the interpretation and further understanding of results obtained from other sources (e.g., household survey, GPS information).

In order to obtain a balanced and realistic understanding of the water and sanitation schemes in the respective governorates, villages were divided into four categories encompassing all levels of functionality of the schemes (see annex 4). These categories include villages with: (1) Functional Schemes

(“normal”)⁶, (2) Distinct-functional Schemes⁷, (3) Seasonal-functional schemes/schemes with low water levels⁸, (4) Broken Schemes⁹. The number of FGDs conducted per each type of scheme was set based on previous information regarding the status of the schemes in each governorate, as well as the situation found in the field. The “functional schemes” category includes six schemes of villages in Hodeidah that were financed by the Netherlands government after 2001 and that are not included in the survey information.

Discussions were conducted following a semi-structured questionnaire with target topics that helped to guide the discussion. The proposed subjects included the impact of the schemes on livelihood, time saving, income and expenditure and health situation of the household. In addition, topics such as women’s role in water and sanitation and scarcity and drought were also discussed.

- 4) *Education data.* Data on school enrolment of girls and boys at village schools were collected as well as exam pass rates for the period between 1990 and 2006. These data can be linked to household data at the village level.
- 5) *Health data.* Records of health care centers were used to compile village-level data on disease incidence. In the end, these could not be used because of large differences in data quality and coverage (over the years and across health care centers). Consequently, the main source for health data is the self-assessment by households included in the household survey.

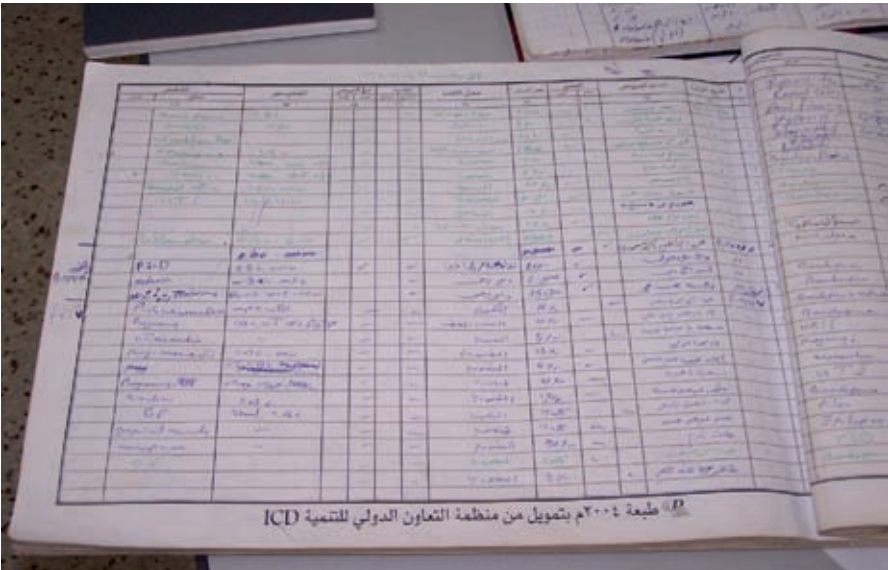
The rest of this chapter is organized as follows. Section 4.2 discusses households’ access to improved water sources. Section 4.3 reports the outcomes of water quality tests and estimated quantities of water used in villages with water schemes. Sanitation and hygiene practices are discussed in section 4.4, while the impact of schemes on health indicators is analysed in section 4.5. Section 4.6 reports on the time saved as a result of the availability of nearby safe water sources. One of the expected consequences of these time savings is higher school enrolment for girls,

6 “Functional Schemes (“normal”)” are those schemes that are currently operational and do not cause any specific problems.

7 “Distinct-functional Schemes” are schemes with specific characteristics, such as good models, operational but villagers are not satisfied and recurrent breakdown and subsequent repair.

8 “Seasonal-functional Schemes/Low water level (occasional & continuous low water levels)” refers to schemes developed to utilize spring sources, which suffer from recurrent diminishing annual seasonal water levels. This is the case for a number of schemes in Dhamar, whereas in Hodeidah continuously diminishing water levels are the main problem.

9 “Broken Schemes” are schemes that have not been operational (non-functional) and have not been repaired for a period of 4 years or less.



Clinic records

which is discussed in section 4.7. Finally, section 4.8 sums up the main conclusions.

4.2 Access to improved water sources

Coverage and exclusion

As indicated in chapter 3, the total number of beneficiaries of SURWAS water supply projects in both Governorates since 1991 is approximately 170,000. The water schemes have allowed most of these people to switch from unsafe to improved sources of drinking water: surveyed households from villages without schemes predominantly draw their water from uncovered wells. An important question is whether any households are denied access to scheme water and, if so, whether poor households are more likely to be excluded. Survey data suggest that households are only very rarely excluded from schemes. Too few observations were made to draw any conclusions on the socio-economic status of households without access to scheme water. Also, the survey does not provide any direct indication that households are excluded from water schemes because they cannot pay water charges. The following table summarizes the data on access to scheme water.

Table 4 Sampled households and water schemes

Group	Number of households
Operational connection, used by household	721
Other access to scheme water	114
Scheme operational but not used	60
Scheme broken	174
No scheme	571

In order to be able to recognize cases of excluded households, the number of connected and unconnected households were estimated based on administrative data and committee interviews while the survey was being prepared. Based on this information, the average (unweighted) percentage of unconnected households in scheme villages is 13%. Hence, one can expect to find one or two no-access households per scheme-village in the sample. The actual number is 1.8 households per village sample of 10 households. This is slightly more than expected, due to oversampling of non-access households.¹⁰

Only a very small fraction of households in scheme villages is fully excluded from water schemes. This category covers a total of 56 households, 33 of which are included due to the oversampling mentioned above. Taking the difference (56-33=23) as a crude indication of the incidence of exclusion in the random (representative) part of the sample, full exclusion would be as low as 2.2% of households in scheme villages.

4.3 Water quality and quantity

Water quality

The data sources mentioned earlier provide details on the quality and the quantity of the different improved water sources used in Yemen. For those without access to a (SURWAS or other) water scheme, the main source of water is a well (borehole). Most households, both from scheme and no-scheme villages consider their water clean (tables 5 and 6). However, the reported incidence of 'kidney stones' (related to high calcium levels as well as low water consumption) is worrying¹¹ (Table 7).

¹⁰ Enumerators planned to sample one or two of the excluded households in a village if there appeared to be any such households. As a result, the sample contains 67 'excluded' households.

¹¹ These self-diagnosed kidney stones should be interpreted as indicative of more general abdominal pain, especially among men.

Table 5 The taste of the water

Taste of the water	Frequency	Percent
Neutral	1,354	84
Salty	168	10
Bitter	60	4
Other	26	2
Total	1,608	100

Table 6 The appearance of the water

Colour of the water	Frequency	Percent
No response	25	1
Clear	1,338	83
Green	24	1
Brown rusty	25	2
Brown muddy	92	6
White milky	112	7
Other	3	-
Total	1,619	100

Table 7 Households reporting kidney stones

Kidney stones	Freq.	Percent
Not applicable	31	2
Unknown	155	9
Yes	1,188	72
No	274	17
Total	1,648	100

A less favourable image also emerges from some of the Focus Group Discussions. Although this information is anecdotal and does not imply a disqualification of the above findings, it provides additional insights in the quality problems certain villages may be facing.

Participants reported problems with water from primary as a well as secondary sources. In some villages with an operational scheme, the water is perceived to be salty.

“We have enough water, but it is salty (...) we are blessed with water, but it is salty”
(Hodeidah, Deer Akaad, Working scheme)

It seems that the use of tanks is common in interviewed villages. The water is stored in tanks and, afterwards, released to the households through taps. In other cases, containers are used to store water that comes from a primary or secondary source, when a household is not connected to a tap and problems of scarcity, low water pressure and scheme breakdown are anticipated.

“Water stays a long time in tanks for about 3 or 4 months, because we save it up, and when we open it, we find it full of worms” (Dhamar, village Bani Duheam. Seasonal functional schemes).

In addition, women identify problems caused by the water they use from creeks or other natural sources, including the incidence of diarrhoea, itching spots and kidney stones.

“Daughter, we are exhausted, we have allergy and headache because of the water that we wash our bodies with, it is not clean” (Dhamar, Wathan, Distinct-functional Schemes).

If connections are operational consumption of water is high.

“Children can take a bath every day because of the pump” (Hodeidah, village Al Domin, Working scheme)

“Before we were not taking bath and there were no clean clothes (...) today water is available any time (...) you can clean and wash (...) yeah, we take bath any time”
(Hodeidah, village Al Mahadiah, Working scheme).

But also:

“Sometimes we don’t have water for 4 or 5 days; we save it only for drinking and do not wash anything” (Hodeidah, village Al-Haz, Functional scheme)

In order to assess water quality more objectively, four water samples were taken from each village. One sample from two randomly selected households each, the “primary water source” mentioned most often and the “secondary water source” mentioned most often. Tank water and bottled water have not been tested. Water

was tested on TDS (total dissolved solids), electric conductivity (ec), pH value and presence of E.coli for all samples. In addition, hardness, calcium, chloride, nitrate, sulphate, iron, fluoride levels were measured for the primary and secondary sources selected. Tables below indicate whether samples are ‘clean’ (i.e., within WHO limits) or ‘polluted’ (exceeding WHO limits). The laboratory analysts also gave an overall assessment of each water source (potable/non-potable) which virtually coincides with the presence of E.coli.

Test Results

At the time of the sample, 91% of the sampled SURWAS and non-SURWAS schemes were functioning in Hodeidah, against 79% in Dhamar. Tables 8 (for Hodeidah) and 9a and 9b (primary and secondary water sources for Dhamar) present the differences in quality of water from ‘primary’ sources in SURWAS-scheme villages, other-scheme villages and no-scheme villages. For Hodeidah test results are unavailable for more than half of the secondary sources. They have therefore been omitted from the analysis. The tables show that there are no major differences between SURWAS and other schemes, but both score slightly less than no-scheme villages, especially in Hodeidah. This result is unexpected, as it suggests that households in no-scheme villages also have access to relatively safe water or that water quality is not a major issue in Hodeidah and Dhamar. Unfortunately, the data collected do not allow further analysis: the vast majority of primary water sources in no-scheme villages are classified as “well”, without indicating whether this well can be considered an improved water source.¹² If households in no-scheme villages have access to protected wells, this could explain why scheme water does not appear to be of better quality. Given the similarity of water quality in both scheme and no-scheme villages, any impact of water schemes is more likely to be related to water quantities used or the convenience of piped schemes leading to better hygienic practices. Water quality is markedly better in Dhamar than in Hodeidah. This could reflect the fact that groundwater levels in Dhamar are deeper than in Hodeidah. Note the higher E.coli pollution in secondary sources in Dhamar (table 9b).

For an accurate assessment of changes in water quality the results for scheme villages would have had to be compared to the water quality of primary sources before a scheme was established. Comparing current scheme to current no-scheme villages is an imperfect substitute. Nevertheless there is no indication that scheme villages have been specifically selected because their water quality was below-average.

¹² The well would qualify as improved water source if it is protected from runoff water and covered.

Table 8 Water test results Hodeidah, fall 2007

Primary Water Sources (percent safe)			
test	SURWAS	Non-SURWAS	No-scheme
ec	28	42	38
ph	100	100	100
tds	96	100	100
hardness	92	84	92
calcium	8	4	12
Chloride	68	77	84
nitrate	28	23	35
Sulphate	100	96	100
Iron	64	62	65
Fluoride	92	88	85
E.coli	48	46	58

The table presents the percentage of samples that are safe according to WHO guidelines for drinking-water quality.
Source: analysis of water samples from 25 SURWAS-scheme villages, 26 other-scheme villages and 26 no-scheme villages.

Table 9a Water test results for primary water sources in Dhamar, fall 2007

Test	SURWAS	Non-SURWAS	No-scheme
Ec	91	96	92
Ph	87	87	96
Tds	100	100	100
Hardness	100	100	100
calcium	100	100	100
Chloride	96	100	100
Nitrate	87	100	92
Sulphate	100	100	100
Iron	100	96	100
Fluoride	83	83	92
E.coli	83	83	92

Source: analysis of water samples from 28 SURWAS-scheme villages, 25 other-scheme villages and 28 no-scheme villages. Numbers refer to the percentage of samples that are safe according to WHO guidelines for drinking-water quality.

Table 9b Water test results for secondary water sources in Dhamar, fall 2007

test	SURWAS	Non-SURWAS	No-scheme
Ec	100	94	95
Ph	80	94	82
Tds	100	100	100
Hardness	100	100	100
Calcium	100	100	100
Chloride	100	100	100
Nitrate	75	94	91
Sulphate	100	100	100
Iron	100	100	95
Fluoride	75	100	86
E.coli	45	53	77

Source: analysis of water samples from 28 SURWAS-scheme villages, 25 other-scheme villages and 28 no-scheme villages. Numbers refer to the percentage of samples that are safe according to WHO guidelines for drinking-water quality.

As one of the quotes from the Focus Groups Discussions above already suggested, people store water to cope with scarcity or broken schemes. This practice has a further negative impact on the quality of water used by households (tables 10a and 10b). The tables compare the quality of water used by households to water in the primary source (the most likely source of the water used at home). In both scheme villages and no-scheme villages E.coli pollution is much higher in water stored at home which is a worrying finding on water quality. It suggests that training and awareness campaigns should focus more on safe storage of water.

Table 10a Primary water sources and home-kept water (Hodeidah)

test	Scheme Villages		No-Scheme Villages	
	Household Water	Primary Source	Household Water	Primary Source
Ec	100	100	100	100
Tds	98	98	100	100
pH	98	100	100	100
E.coli	23	47	36	58

The table presents the percentage of samples that are safe according to WHO guidelines for drinking-water quality.



Filling a yerrycan

Table 10b Primary water sources and home-kept water (Dhamar)

test	Scheme Villages		No-Scheme Villages	
	Household Water	Primary Source	Household Water	Primary Source
Ec	94	93	91	92
Tds	100	100	100	100
pH	91	87	91	96
E.coli	40	83	39	67

The table presents the percentage of samples that are safe according to WHO guidelines for drinking-water quality.

Water Quantity

Unfortunately, it proved too difficult to collect reliable information on water quantities used in non-scheme villages. A comparison of water quantities used in scheme villages (SURWAS or other) and non-scheme villages can therefore not be made. In principle, quantity information is available for scheme villages based on meter readings and usage charges. Table 11 reports annual per capita use of scheme water in sampled households from SURWAS and non-SURWAS villages. The numbers indicate higher quantities of water use in SURWAS villages. Greater quantities of water are a likely explanation of the fact that scheme villages

perform better on health indicators (section 4.5). However, the enormous differences in water quantities are rather suspect: they could be due to errors in meter readings or other forms of misreporting. For instance, it is hard to conceive that a person can survive on quantities as low as indicated, particularly for non-SURWAS villages. The findings presented in table 11 therefore warrant further investigation.

Table 11 Daily use of scheme water (average number of litres per capita per day)

Year	Hodeidah		Dhamar	
	SURWAS	non-SURWAS	SURWAS	non-SURWAS
1997			10.7	1.1
1998			13.2	1.6
1999			12.1	1.9
2000	10.1	1.6	19.7	1.1
2001	14.5		13.4	2.2
2002	21.9		15.3	3.6
2003	28.2		13.4	6.3
2004	26.8		14.8	7.4
2005	31.8	6.3	14.5	8.5
2006	32.1	6.0	14.0	11.5

Source: Water committees' usage records of sampled households in scheme villages.

4.4 Access to improved sanitation and hygiene practices

As described in chapter 3 the SURWAS approach included sanitation and hygiene education campaigns. Sound sanitation and hygiene practices are an essential link between health outcomes and the 'hardware' of water provision schemes and sanitary facilities. Do households in SURWAS schemes have more toilets/latrines than villages without a scheme or a non-SURWAS scheme? And what is the project's effect on sanitary conditions? The current section addresses these questions.

More than half of the households with a scheme also have a toilet, whereas more than half of the households without a scheme have no toilet, either (see table 12). Scheme households are significantly more likely to have a toilet ($p=0.000$). Differences between SURWAS and non-SURWAS schemes are insignificant. In

addition, households in a village connected to a scheme are more likely to have a private toilet than households in villages without a scheme. However, as table suggests, there are major differences between Dhamar and Hodeidah. Toilets are much more common in Dhamar households. In fact, in the case of Dhamar there are no significant differences in toilet prevalence between villages with SURWAS schemes, other schemes, or no schemes.

Table 12 Toilets in scheme and no-scheme villages

	Hodeidah				Dhamar			
	No response	Toilet	No Toilet	Total Responding		Toilet	No Toilet	Total Responding
no scheme	2	35%	65%	278	4	63%	37%	275
SURWAS scheme	1	56%	44%	279	4	69%	31%	275
Non-SURWAS scheme	3	54%	46%	277	3	68%	32%	246
Total	6	404	430	834	11	530	266	796

Table 13 shows that most toilets do not smell badly (according to the interviewer). This is not related to scheme presence or governorate. Other indicators of cleanness (stains of excreta in pans and on floors, walls and doors) confirm this observation.

Ownership of a flush toilet is very rare. 1-2% of households own a flush toilet (table 14). In this respect there are no differences between Dhamar and Hodeidah or between villages with or without schemes.

Table 13 Malodorous toilets

	No response	Bad smell (%)	No bad smell (%)	Total
Scheme village	419	36%	64%	1,076
No-scheme village	299	35%	65%	571
Total	718	332	597	1,647

Table 14 Flush toilets

	No response	Flush toilet (%)	No flush toilet (%)	Total
Scheme village	426	1%	99%	1,076
No-scheme village	303	2%	98%	571
Total	729	14	904	1,647

Evidence on change in hygienic practices is limited. The household survey contains questions that shed some light on household awareness and practices (not separately reported in tables). Only a limited number of households report recalling hygiene awareness campaigns, but these households are from many different villages, especially from Hodeidah villages with SURWAS schemes. Households from water scheme villages have better awareness of sanitation and hygiene practices, particularly if they recall hygiene awareness campaigns. In addition, households in villages with water schemes have more modern water containers and cleaner toilets.

4.5 Impact on health

The SURWAS schemes are expected to provide health benefits. The main transmission channels of health effects are improved water quality, adequate water consumption, improved sanitary facilities and hygiene practices. The results in section 4.3 provide no evidence that water quality actually increased. However, one can see adequate water consumption in SURWAS villages, especially in Hodeidah, and improved sanitary conditions in terms of modern latrines. This section investigates whether any observed differences in health outcomes occurred that can be attributed to programme interventions. The analysis in this section draws on the health and morbidity module of the household survey. This module inquires whether any household members have suffered from specific diseases over a defined period of time.¹³

Self-reported disease prevalence is useful as it allows insight into how water schemes have affected different diseases. A drawback of this type of information is that answers are prone to measurement and reporting error. However, it is not expected that measurement error will bias the impact evaluation, since such measurement errors are likely to affect villages with and without schemes in a similar way. Table 15 compares disease prevalence among households connected

¹³ Respondents were read out a list of diseases and asked whether their household members have suffered from any of these diseases since the last Ramadan, which amounts to a recall period of approximately one year.

to a scheme, households from connected villages without a functioning connection and households from villages without a scheme. Non-connected households from scheme villages are considered separately in order to obtain a more precise assessment of the impact of a water scheme: if their outcomes are similar to those of no-scheme villages, this would be further evidence that the connection makes the difference; if their outcomes are rather similar to those of connected households in scheme villages, this would suggest that it is the village, not the connection that makes the difference. Finally, in order to increase the statistical power of the analysis, data from SURWAS and non-SURWAS schemes and from Dhamar and Hodeidah governorates have been pooled.

For all types of self-reported illness it appears that disease prevalence is lower in connected households, compared to the households from villages without a scheme. However, the differences between these households are only statistically significant for diarrhoea, abdominal pains, bilharzia, malaria and typhoid.

Among control households 66% reported that at least one household member suffered from malaria, whereas this is 4 percentage points lower for connected households. Diarrhoea and abdominal pain affected 71% and 77% of connected households, respectively, compared to 75% and 82% of households in no-scheme villages. Both bilharzia and typhoid are 5 percentage points lower in connected households than in control households.¹⁴

For non-connected households from scheme villages no clear pattern can be distinguished. For certain diseases prevalence is higher, whereas for others it is lower than the control households. The only statistically significant effect is for diarrhoea. Although this does not constitute a formal test, the results for non-connected households do strengthen the case that the impact observed for the connected household is actually due to the water schemes and not to other health-related village characteristics and selection effects.

In addition to the recent history of disease prevalence, the survey also collected information on changes in disease prevalence within the last 10 years. Households reported whether prevalence of a specific disease among household members has increased, decreased, remained unchanged or did not occur during the last 10 years. Table 16 compares the answers of the different household types. The categories

¹⁴ Although self-reported disease incidence is lower in scheme villages, this does not establish a direct causal link between disease and water provision. For instance, if such a link is clearly demonstrated for diarrhoea this does not mean there is reason to expect an impact of safe water provision on malaria incidence. The correct interpretation is that there are numerous factors affecting disease incidence and that the constellation of these factors is more favourable in scheme villages. Given the way villages have been sampled and matched, one could argue that this constellation is more favourable *because of* the water schemes. However, the survey data do not allow conclusions as to why this would be the case.

“unchanged” and “doesn’t exist” have been combined as they both indicate that the level of disease prevalence has remained unchanged.

Information on changes in household health status is useful as it reflects changes over the period in which the SURWAS scheme expanded, providing a time dimension to the analysis. However, caution is required when interpreting such self-reported changes in morbidity, as reporting error is even more likely to occur when retrospective questions cover long periods of time. Moreover, in the long run self-reported disease prevalence is partly determined by affordability of health care, leading to underreporting by the poor. While there is no direct reason to assume that reporting bias is different for connected and non-connected villages, the weakness of this data should be acknowledged.

Findings are relatively consistent with the results for short-term disease prevalence in that connection to a water scheme is associated to a lower probability of disease prevalence. But the 10-year retrospective questions add a number of interesting nuances to the impact of water schemes. In all villages a large number of households reported increased disease incidence, but for abdominal pain, bilharzia, typhoid and yellow eyes the presence of a water scheme reduced the overall increase in prevalence. That is, prevalence has increased more rapidly in no-scheme villages compared to connected households in villages with a scheme. For example, 17% of connected households report an increase in typhoid prevalence, compared to 24% of households from villages without scheme. This suggests that for a number of diseases water schemes did not so much improve the health status, but rather prevented further deterioration.^{15 16}

15 To test the robustness of these results several alternative analyses were considered, such as separate tables for provinces and inclusion of control variables such as indicators for hygiene training and awareness and scheme functionality (for Dhamar). These variations do not change the patterns of impact as presented in tables 13 and 14, though they do lead to variations in significance.

16 Although households' answers on health trends show a perceived overall increase in disease incidence, this result could well be due to 'recall bias' causing households to underestimate past disease incidence. In fact, the scant data that are available on health trends in Yemen suggest an improvement in health conditions. The World Development Indicators (World Bank, 2006c) suggest a decline in child and infant mortality over time. More important for this report is that recall bias is likely to be less important when comparing relative trends between households from scheme and no-scheme villages. It can thus be concluded from table 16 that health trends are more favourable in scheme villages.

Table 15 Self-reported disease prevalence compared (between Ramadan 2006 and fall 2007)

	Prevalence in no-scheme villages	Higher(+) or Lower(-) prevalence in scheme villages	
		Connected households	Non-connected households
Malaria	0.66	-0.04*	-0.07
Diarrhoea	0.75	-0.04*	0.09*
Abdominal pain	0.82	-0.04**	0.01
Bilharzia	0.28	-0.05**	0.02
Intestinal worms	0.61	-0.04	0.02
Scabies	0.48	-0.02	-0.07
Eye infection	0.47	-0.02	-0.05
Typhoid	0.37	-0.05**	-0.05
Cholera	0.04	-0.01	0.03
Fever	0.79	-0.02	0.00
Yellow eyes	0.08	-0.01	0.02
Number of households	554	933-934	95

The table lists differences in disease prevalence reported by connected and non-connected households in scheme villages, compared to those of households in no-scheme villages. Significance levels indicated by * (90%) and ** (95%).

Table 16 Reported changes in disease prevalence (within last 10 years) compared

			Higher(+) or Lower(-) reported changes scheme villages	
		Reported changes in no-scheme villages	Connected households	Non-connected households
Malaria	Decreased	0.28	-0.01	0.06
	Unchanged	0.23	0.02	-0.04
	Increased	0.49	-0.00	-0.02
Diarrhoea	Decreased	0.32	0.00	-0.03
	Unchanged	0.19	0.03	-0.03
	Increased	0.49	-0.03	0.06
Abdominal pain	Decreased	0.32	0.03	0.03
	Unchanged	0.17	0.04**	0.00

Bilharzia	Increased	0.51	-0.07***	-0.03
	Decreased	0.16	-0.03	-0.04
	Unchanged	0.66	0.07***	0.02
Intestinal worms	Increased	0.18	-0.05**	0.02
	Decreased	0.29	-0.00	0.07
	Unchanged	0.36	0.01	-0.12**
Scabies	Increased	0.35	-0.00	0.05
	Decreased	0.34	-0.01	-0.07
	Unchanged	0.42	0.05*	0.09*
Eye infection	Increased	0.24	-0.04	-0.02
	Decreased	0.36	-0.02	-0.08
	Unchanged	0.45	0.04	0.07
Typhoid	Increased	0.20	-0.02	0.01
	Decreased	0.18	0.02	0.07
	Unchanged	0.58	0.06**	0.02
Cholera	Increased	0.24	-0.08***	-0.09**
	Decreased	0.03	0.00	0.00
	Unchanged	0.93	0.01	-0.06*
Fever	Increased	0.04	-0.01	0.06**
	Decreased	0.27	0.03	0.09*
	Unchanged	0.27	-0.03	-0.06
Yellow eyes	Increased	0.46	-0.00	-0.04
	Decreased	0.08	-0.01	-0.04
	Unchanged	0.87	0.03*	0.01
Number of households	Increased	0.05	-0.02*	0.03
		318-548	597-937	62-97
The table lists perceived changes in disease prevalence reported by connected and non-connected households in scheme villages, compared to those of households in no-scheme villages. Significance levels indicated by * (90%), ** (95%) and *** (99%).				

4.6 Time use for fetching water and use of time savings

SURWAS water schemes reduce the time households need to collect water, as the SURWAS water source is, on average, closer to the village than most other primary and secondary water sources available. Households were not asked directly how

much time they spent fetching water, but an indication of time saved can be inferred from the locations of primary and secondary water sources. For the purpose of taking water samples households were asked about their primary and secondary water sources. For households with a house connection to a scheme the primary water source is the scheme itself, in particular the location of the pump house (and the corresponding well or standpipe). The distance connected households gained is therefore the distance to the primary source. The distance between a central location (the local mosque) and the primary source can then be used as an estimate of the average distance gain for connected households.¹⁷ Table 17 below summarizes the distances between mosque, primary and secondary locations in Dhamar and Hodeidah. The distances are ‘as the bird flies’ so they are imperfect indicators of actual distance or time.

Table 17 Distances (straight line) in km from mosque to primary and secondary water sources

	Hodeidah			Dhamar		
	SURWAS	non-SUR-WAS	No scheme	SURWAS	non-SURWAS	No scheme
Primary source	0.385 (25)	0.470 (20)	0.360 (20)	0.325 (27)	0.636 (23)	0.535 (17)
Secondary source	0.562 (22)	0.640 (6)	0.974 (10)	0.520 (22)	0.486 (19)	0.471 (12)

Source: data collected on water sources.
Number of reporting locations between parentheses.

The table shows that the estimated distance gained for connected households is approximately 350m for SURWAS schemes and 550m for non-SURWAS schemes. As expected, the distances to secondary sources are generally much longer.

Time spent on collecting water reduces the time that could be spent on other activities such as agricultural field work, domestic work or schooling. Time saved by reducing the distance to the primary water source can thus be used for other livelihoods-related activities and to increase households’ earning potential.

¹⁷ Distances based on GPS measurement of locations. For various reasons it has not been possible to geo-reference all sources.

This section investigates the impact of SURWAS and non-SURWAS schemes on time used for water collection and attempts to identify how households allocated the time they saved. The first subsection looks at how water collection tasks are shared between household members and the amount of time gained due to the presence of water schemes.

The analysis is based on three sources of information. First, GPS information is used to measure travel distance as reported in table 17 above. Second, the household survey provides information on water collection by individuals in villages with a water scheme. The survey asks (i) whether household members fetch water and how frequently (sometimes, regularly or exceptionally frequent), (ii) whether household members have more time available since the introduction of the water scheme, and (iii) how this available time has been used. These questions are asked separately for boys, girls, men and women. Note that the usual caveats for self-reported changes apply: recall data can be unreliable. The results from Focus Group Discussions were used for partial verification of the survey results. They can also be used to facilitate the interpretation of the quantitative findings and to provide a deeper understanding of the survey results.

The household data show that most household members (women, men, boys and girls) occasionally collected water. Among these members, women and girls fetch water on a regular basis, whereas a higher percentage of boys and men only went in exceptional cases (see tables 18 and 19). For instance, a similar proportion of boys and girls fetched water before the scheme was constructed. However, merely 58% of the boys did so on a regular basis, against 84% of the girls. Given that “exceptional cases” include a more distant source, it can be concluded that men and boys also play an important role in this activity.

Table 18 <i>Family members who occasionally fetch water (percentages of households)</i>						
	SURWAS (%)	Non-SURWAS (%)	No scheme (%)	Total (%)	Observations	
Women	81	70	52	74	807	
Girls	48	48	30	47	724	
Boys	41	41	58	42	637	
Men	43	36	55	40	799	

Table 19 Family members who regularly fetch water (percentages of households)

	SURWAS (%)	Non-SURWAS (%)	No scheme (%)	Total (%)	Observations
Women	87	79	75	83	597
Girls	82	87	78	84	339
Boys	57	55	87	58	260
Men	38	38	65	39	317

In the majority of the cases, fetching water was not an exclusive activity for women. In 63% of the households with children, women were not the only persons in charge of collecting water. Furthermore, in households without children, women did not receive any help with this activity in only 23% of the cases. Nevertheless, it appears that in general it is women or girls who fetch water regularly (in 73% of the interviewed households), whereas other members did not or only rarely participate in this activity (table 20). In a minority of cases, women and girls were the only ones who went regularly (23%). Furthermore, the probability that it was a woman who fetched water regularly decreased to 52% if there was a girl in the households, whereas it increased to 73% if there was a boy in the household¹⁸. Finally, women who belong to a village with a SURWAS scheme are slightly more likely (but not significantly so) to fetch water regularly than women who live in non-SURWAS scheme villages.

Table 20 Women or girls who go regularly

	SURWAS (%)	Non-SURWAS (%)	No scheme (%)	Total
Not regularly	25	27	54	27
Regularly	75	73	46	73

Note: Other members do not go, or only in exceptional cases.

In cases where time is thus saved, this leads to a reallocation of time within the household, which is determined by the total amount of time saved, existing patterns of time allocation between members of the household, preferences and

¹⁸ These results are obtained by a logit regression (not reported) having as a dependent variable a dummy that takes the value of one if women went to fetch water regularly and zero otherwise. Explanatory variables were: household size, presence of boys and girls in the household, number of boys and girls between 5 and 16 years old and the type of scheme.

power relations of household members. The effect of time saving on the type of activities will therefore largely depend on gender and age of household members.

Table 21 shows that almost all household members have more time available since a water scheme was established in their village. But there are also small gender differences. In terms of time saving, boys and men have, on average, benefited somewhat more from the water schemes than women and girls.

Table 21 *More time available due to water schemes*

	Percent	Observations
Boys	93	266
Girls	89	339
Men	93	317
Women	90	607

Table 22 shows how the extra time was spent. For boys, 55% of households report that the extra time was allocated to school activities. In a smaller number of households more time was also allocated for field work (32% of households) and leisure (21%). Only in a few cases, boys spent their newly available time on collecting firewood and other household work (less than 3% in both cases). A very different pattern emerges for girls. In most households, girls spend their extra time on domestic activities, including housework (77% of households) and collecting firewood (19%). Just over a quarter of the households report that the extra time girls have is used for schooling, which is approximately half that of boys. Girls' leisure time increased only in two percent of households. This is consistent with the results obtained from the focus group discussions. Women report that when the scheme functions, some girls are allowed to go to the school. Nonetheless, they have to miss classes or to drop out if the scheme no longer functions. Differences also exist between adult men and women. Men mainly use their extra time for agricultural activities. The amount of time thus spent also increased for women, but only for one third of the households. Women mostly used the extra time available for domestic work (93% of households report extra time spent on house work and 29% on collecting firewood). It is worth noticing that the increase in time to collect firewood can lead to a decrease in household expenditures, given that they can cut back their kerosene consumption.¹⁹

¹⁹ Reported in the Focus Group Discussions.

Table 22 *Main activities for which available time was used (percent of households reporting)*

	Boys	Girls	Men	Women
Other house work	3	77	3	93
Field work	32	21	56	33
Collect firewood	2	19	3	29
Play	21	2		
Go to school	55	26		

These results are in accordance with the village-level impact estimates on schooling (see section 4.7 below). These impact estimates suggest that SURWAS schemes have been successful in increasing school enrolment for girls as the presence of a scheme is associated with a relative increase in the female student population.

Finally, the results support findings from the FGDs. According to the women participating in these FGDs, they and their daughters were – or currently are – the ones primarily in charge of fetching water for the household. They complain about the fact that they do not receive any help from their husbands, even if it is a long distance to the nearest water source. In villages with operational schemes women acknowledge the importance of the time saved. The FGDs provide some impressive anecdotal evidence on how difficult it used to be to collect water. Women explained that they would go very early in the morning and return after lunch. In some cases, women must take turns getting water. A number of women used to fetch water during the night, which evidently involved risks. These women feel more secure by the presence of the scheme.

Most of the FGD participants mention that the time gains resulting from the presence of a scheme are now spent on other housework, including taking care of the children, which confirms the results from the household survey. Women also report that they use their free time to collect firewood, feed the cattle and work with hay. This is to be expected, given that most villages are subsistence economies and most activities do not generate monetary income. FGD participants complained about the lack of employment, also for men.

4.7 School attendance, graduation and female participation

The presence of water schemes is expected to affect school attendance and achievements of children. The results reported above (such as those presented in table 22) indicate that the water schemes have led to time savings among boys and

girls, and that part of the extra time available has been used for schooling, particularly for boys. Another reason why the presence of water schemes affects school attendance is that parents may be reluctant to send their children to school if there are no safe water and sanitation facilities. Nevertheless, it is unclear how this extra time for schooling has been used and, hence, how this has affected the accumulation of human capital. For example, was the extra time used to increase enrolment or to reduce absenteeism? Also, the effects will differ by gender. The analysis of time savings shows that the burden of collecting water is disproportionately higher for girls and that the time saved is primarily invested in schooling for boys and to a lesser extent for girls. In addition, initial enrolment levels are higher for boys. This section investigates the effects on schooling outcomes, in particular school graduation rates and relative female participation rates (proportion of female students). The analysis draws on historical school records, containing information on enrolment and graduation of primary school students by gender. For Dhamar, data include annual records from 1991 to 2006; for Hodeidah these records cover the period from 1995 to 2006. These data have been combined with village information on presence of a water scheme (SURWAS or non-SURWAS) and the year of inception of the scheme for each village. Table 23 summarizes the data.

Table 23 Graduation and enrolment statistics

	Dhamar		Hodeidah	
	Mean	Std. Dev.	Mean	Std. Dev.
Graduation rate (%)	90	9	90	9
Female graduation rate (% of student population)	26	12	32	15
Female graduation rate (% of female students)	89	12	88	14
Proportion of female student population (%)	27	15	17	21
SURWAS scheme (presence, %)	30	46	25	43
SURWAS scheme (age in 2006)	13 year	6 year	7 year	4 year
Non-SURWAS scheme (presence, %)	19	39	13	34
Non-SURWAS scheme (age in 2006)	11 year	11 year	8 year	14 year
Time period	1991-2006		1995-2006	
Number of observations	977		583	

The schooling outcomes of Dhamar and Hodeidah show different trends. Table 24 shows schooling outcome averages. The graduation rate in Dhamar steadily increased from 89% in 1991 to 91% in 2006, in contrast to Hodeidah where graduation rates strongly decreased from 93% in 1996 to 86% in 2006. In Dhamar, graduation rates improved after 1996. By contrast, in Hodeidah both female and male students had much lower graduation rates in 2006 than in 1996. Further statistical analysis of the data suggests that the changes in graduation rates are not associated with the presence of water schemes.

More results can be obtained on female enrolment. The trends of female school enrolment in Dhamar and Hodeidah are shown in table 24 and figures 2 and 3. The figures show a general increase in the proportion of girls in schools for all villages. The survey results presented above suggest that the time saved in fetching water has partly led to more schooling for girls in scheme villages. Thus, one would assume that the increase of the proportion of girls is more pronounced in scheme villages. This assumption is examined below.

Table 24 Graduation and female share of student population, percentages

	Dhamar			Hodeidah	
	1991	1996	2006	1996	2006
Graduation rate	89	89	91	93	86
Female graduation rate*	90	87	90	92	87
Male graduation rate*	89	89	91	93	86
Proportion of female students	21	26	33	10	25
Observations	51	53	67	40	58

*Measured as the percentage of females (and males) who pass the final exam over the total female (male) student population.

Figure 2 Dhamar, proportion of female students over total attendance population (1991-2006)

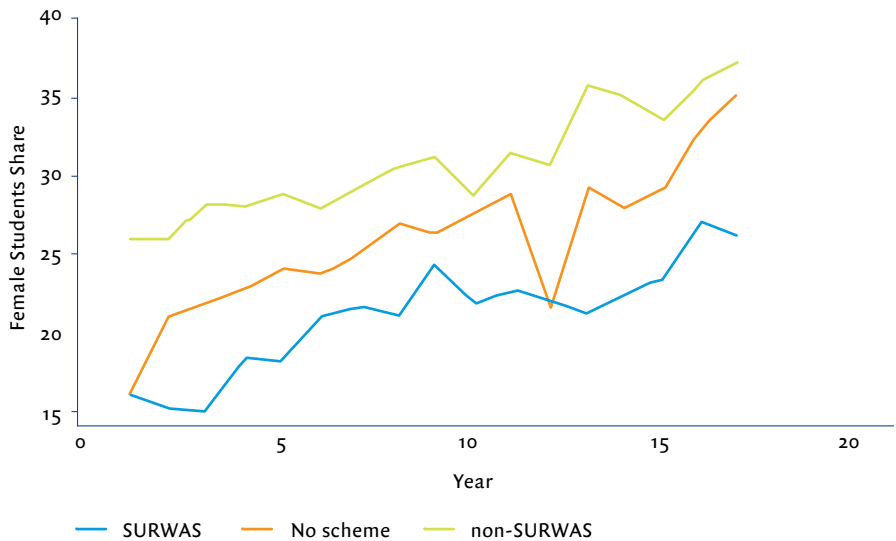
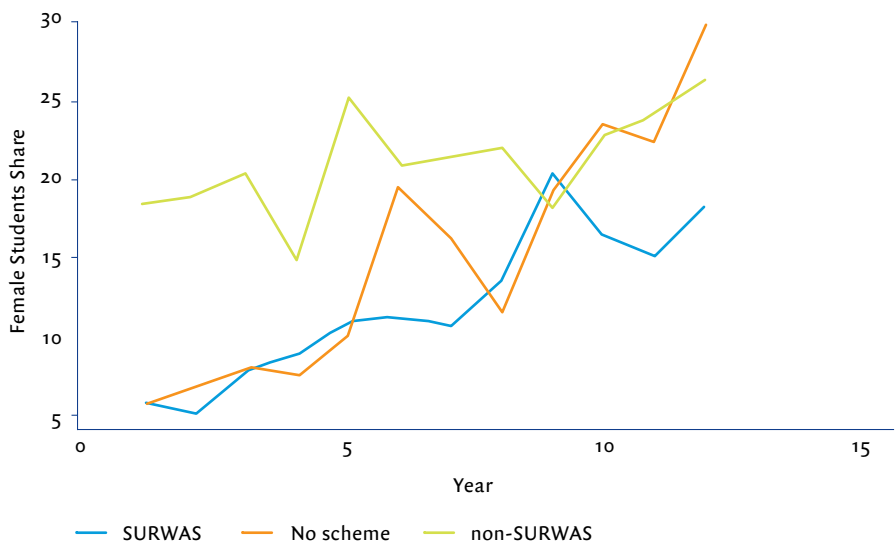


Figure 3 Hodeidah, proportion of female students over total attendance population (1996-2006)



Differences in schooling outcomes over time between SURWAS, non-SURWAS and no-scheme villages can be explained both by the presence of a water scheme and by the time it has been in operation. ‘Fixed effects’ regression (see section 4.1)

controls for structural pre-intervention differences between villages with and without a scheme. This minimizes the danger of confounding variables driving the results. Year fixed effects capture changes due to general time trends, such as macro-economic events. The village fixed effects captures village characteristics that do not change over time, including eligibility criteria for participation in a water scheme and other selection effects, such as political ties and geographic characteristics.

Table 25 reports the results of three different regressions relating the female share in enrolment to water schemes. The first, in columns (1) for Dhamar and (4) for Hodeidah, is a simple indicator of whether a water scheme was present in a particular year or not, taking values zero (no scheme present) or one (scheme present). The results suggest that in Dhamar water schemes added more than 4 percentage points to the female share in enrolment in non-SURWAS villages; likewise, in Hodeidah SURWAS schemes added almost 8 percentage points. The second pair of regressions, in columns (2) and (5), relates the female population share to the time a water scheme has been in operation in each village. Outcomes for Dhamar are slightly different: SURWAS schemes seem to have a small but increasing impact on relative female school attendance while there is no discernable effect for non-SURWAS schemes. In Hodeidah, there is a strong effect over time for SURWAS schemes, confirming the simpler regression in column (4). Finally, combining the years of operation variable with its square allows us to determine whether the effect of a water scheme diminishes or increases over time. This is reported in the third pair of regressions (columns (3) and (6) in table 25). The small and negative coefficients of the squared number of years a scheme is in operation (for non-SURWAS schemes in Dhamar and both types of schemes in Hodeidah) do indeed suggest that the impact of a scheme on relative female enrolment slightly decreases over time. Note that the results in regression (6) are very similar for Dhamar and Hodeidah: growing impact over time with similar but declining growth rates. The overall conclusion is that schemes have contributed positively over and above the general trend in female enrolment shares that can also be found in no-scheme villages. Unfortunately, data do not allow further explanation of why non-SURWAS schemes appear to have a bigger impact on enrolment in Dhamar, while SURWAS schemes have such a strong effect in Hodeidah.

Table 25 Effect of water schemes on proportion of female students (fixed effects, unbalanced panel)

	Dhamar			Hodeidah		
	(1)	(2)	(3)	(4)	(5)	(6)
SURWAS scheme	0.0021 [0.0164]			0.0693* [0.0338]		
Non-SURWAS scheme	0.0332* [0.0156]			0.0177 [0.0363]		
SURWAS scheme (years)		-0.0018 [0.0021]	-0.0036 [0.0033]		0.0125* [0.0062]	0.0251* [0.0113]
SURWAS scheme (years sq)			0.0002 [0.0001]			-0.0011 [0.0010]
Non-SURWAS scheme (years)		-0.0068** [0.0024]	-0.0010 [0.0037]		-0.0079 [0.0083]	0.0077 [0.0106]
Non-SURWAS scheme (years sq)			-0.0002* [0.0001]			-0.0006* [0.0003]
Constant	0.2062** [0.0145]	0.2256** [0.0146]	0.2202** [0.0150]	0.0862** [0.0289]	0.1108** [0.0320]	0.1264** [0.0325]
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Village fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	612	612	612	330	330	330
Number of villages	41	41	41	34	34	34
Number of years	17	17	17	12	12	12
R-squared	0.31	0.31	0.32	0.18	0.20	0.22

Standard errors in brackets; + significant at 10%; * significant at 5%; ** significant at 1%P

Positive and /or negative unintended effects?

Survey data and Focus Group Discussions do not point to substantial effects other than those described above. However, in the FGDs reference was made to a number of additional health effects of the schemes due to the fact that women no longer need to walk long distances to collect water. Participants in the FGDs mention that they feel relief because of the presence of scheme. For instance, in cases in which the scheme is not functioning properly, the women still have health problems associated with carrying water. They report having backaches, headaches and even hair loss problems.

“I have headache. I have no hair in this part of my head, and my knees hurt so much, I cannot sleep at night I ask my children to sleep on my legs so I feel better”(Dhamar, Al-Shamani, Broken scheme)

4.8 Conclusions

This chapter drew on a number of data sources to give quantitative estimates of the impact of the introduction of water schemes in Dhamar and Hodeidah. The main conclusions are summarized below.

- If a scheme exists in a village it is accessible for the vast majority of households. Exclusion of households is rare.
- Water quality is fair, especially in Dhamar. However levels of E.coli are worrying, especially in water that is stored by households. Water quality in scheme villages is slightly worse than water quality in villages without a scheme. This is puzzling in view of the generally favourable impact of water schemes.
- Households in SURWAS scheme villages use considerable quantities of (scheme) water. This might account for a number of the favourable effects of schemes.
- Households in scheme villages tend to have more and better sanitary facilities and higher awareness of sound hygiene practices. However, most respondents do not recall receiving training or participating in hygiene awareness campaigns.
- (Self-reported) recent disease incidence is lower in scheme villages compared to no-scheme villages (controlling for location effects). Significant effects are observed for malaria, diarrhoea, abdominal pain, bilharzia and typhoid. Households report increased incidence of a number of diseases over the last ten years, but this increase is less prominent in scheme villages.
- Both male and female household members are involved in water collection for domestic use. Usually it is women and girls who fetch water regularly. A house connection leads to considerable time saving. Men and boys benefit slightly more than women and girls. Both sexes use this time gain differently. It is used for going to school (boys and, to a less extent, girls), play (boys), firewood collection (girls, women), field work (boy, girls, men, women) and other house work (women, girls).
- Time savings and water facilities at schools have led to increased school attendance of girls. The proportion of female students in village schools has increased more in scheme villages. In Hodeidah the proportion of girls in the school population of village primary schools is 8 percentage points higher for locations with a SURWAS water scheme (controlling for time and village

differences). A similar effect is visible in Dhamar for non-SURWAS schemes (4 percentage points). The data suggest that the impact takes time to materialize. The proportion of girls increases at a slow rate. Higher enrolment of girls could be the effect of a reduction in time spent on fetching water, but also of other factors, such as availability of water and sanitation facilities in schools.

5 Institutional strategy, current arrangements and sustainability

5.1 Introduction

Like other studies in this series of impact evaluations of rural water and sanitation projects and programmes supported by the Netherlands, this evaluation identifies four key sets of explanatory factors for sustainability. First, environmental factors play various fundamental roles in determining sustainability (for example influencing the availability of water in aquifers). Secondly, a series of technical factors affect the sustainability of these programmes, such as the durability of pumps. The third set of factors are economic: what resources is society able and willing to invest in the installation, operation and maintenance of water supply and sanitation arrangements and how are the costs and benefits of those investments distributed across society and over time. Finally, and linked in various ways to the other three sets of explanatory factors, the structure, quality and performance of institutions are major determinants of the sustainability of rural water and sanitation programmes. These institutional factors, linked as they are to the fundamental quality of a society's governance and politics, are often the most influential and complex determinants of water and sanitation standards. This evaluation therefore gives them special attention.

5.2 Approach to the assessment

The study's special attention to institutional issues is reflected in its terms of reference (annex 1). The core evaluation questions about outcomes and impact are naturally focused on the effects of the implementation of SURWAS IV and V on individual, household and community variables at the local level. The institutional questions have a broader scope. First, they address the full range of the

institutional framework, from the community to the national level. Institutional performance at local level can only be adequately explained in the context of national institutional factors. Secondly, these questions require an understanding of recent developments and contemporary conditions. This part of the evaluation therefore spans the period up to 2007.

This chapter first describes the institutional strategy pursued during Phases IV and V. It then outlines current institutional arrangements for rural water supply and sanitation. Finally, it discusses the influence the strategy and current arrangements have had on the achievements and sustainability of community-managed services.

5.3 SURWAS institutional strategy at community and local levels

When **Phase IV** of SURWAS began, the project had already recognised the importance of user and community participation in the design, construction and management of water supply schemes. The Phase II model of minimum user involvement and construction by contractors had been abandoned in Phase III, which, inspired by the working procedures developed by the New TransCentury Foundation, was marked by an emphasis on village participation and the importance of health and sanitation training. Describing this as a new “integrated approach to water supply, sanitation and health”, a 1990 evaluation reported that

Community participation is well developed, not only in terms of providing money, materials and labour, but also in decision making with respect to the technical design and implementation of the water supply scheme... Dependency on contractors greatly decreased as schemes are largely constructed by the community itself with project guidance and supervision only. Recently the project also started to promote the use of water meters...

The communities appear to have sufficient experience to deal with government agencies and also have their own system of internal communication and decision making. In all cases the principle of village contribution to the project is well understood and accepted, and often elaborate records are maintained to show contributions made in cash and kind during system construction by each family in the community. Also procedures, for system operation are devised, a cost recovery system is designed, and rules and regulations are set for system users.

KN and RY, 1990: 6-7, 10.

By the start of Phase IV, the role of local government was also recognised. The 1990 evaluation found that SURWAS staff and beneficiary villages had established “good and realistic working relations” with the then Local Councils for Co-operative Development, which were involved in the negotiation of new schemes and co-signed the relevant official documentation (ibid.: 10). LCCDs were also called in to help resolve problems that arose at community level in connection with the installation or operation of water supplies.

Phase IV of SURWAS appears to have maintained the institutional approach developed in Phase III. The 1990 evaluation of Phase III, the 1991 design document for Phase IV and the 1993 evaluation of Phase IV all describe the set of steps outlined in section 3.2 above and emphasise the importance of user participation and responsibility at all stages in the preparation, design, construction and operation of water schemes. The 1993 evaluation found that

The participation of communities and LCCDs in the preparation and implementation is good. Only in two cases was the project abandoned for lack of co-operation, one time during the feasibility phase and one time during construction.

The role of the LCCD is to provide the necessary assistance and approvals during project preparation. In one case the LCCD obtained a substantial amount of additional financial support for the project from the government.

The community is involved in the project from the planning stage onward, and must indicate its willingness to participate during the feasibility stage... At the end of the design period, when the detailed cost estimate is known, the project enters into an agreement with the community, that specifies the community contribution in cash and/or kind. The start of the project, that is conditional to the availability of the village contribution, is only very seldom delayed for non-compliance with this requirement.

KN and RY, 1993b: 15.

As outlined in section 3.2, **Phase V** of SURWAS intensified efforts to integrate technical and social aspects of the project’s approach, with further emphasis on participatory planning and management of rural water schemes. These efforts were intended to develop a field methodology that could be applied throughout Yemen. There was greater emphasis, too, on the integration of water supply and sanitation and enhanced community participation and hygiene education.

The SURWAS institutional approach also evolved during Phase V. The creation of village water committees was supported during earlier phases, but these committees often failed to function effectively. During Phase V more intensive

facilitation aimed to create more sustainable Water and Sanitation Committees (WSCs), comprising a General Committee of 20-30 members and a Supervision (or Management) Committee of five to seven members. In a sense, this nomenclature was the wrong way round, because one of the roles of the former, larger body was to monitor the latter, executive body. The 2001 evaluation of Phase V quotes two instances in which “general committees had replaced a member of the management committee, in both cases for financial negligence” (Klaassen et al., 2001: 11).

Ultimately the WSC was meant to be registered officially as a Water and Sanitation Society by the Ministry of Social Affairs, although this was a time-consuming procedure. The WSC would in turn appoint executive and technical staff to manage and operate the scheme. SURWAS provided training for all these bodies and cadres. New efforts were made to involve women in at least some aspects of the management of rural water supply and sanitation, but these had only limited success (see box).

The SPU has developed a unique and innovative programme to involve women in rural communities, particularly in hygiene promotion... However, with the exception of one scheme... there are no women on the committees and women are not allowed to vote for the committee members. It is understood that in the conservative rural community, if men refuse to let women vote for the general committee, then it is very difficult to force the issue. However, some projects in other countries have experimented with different types of committee organisation, for example, having sub-committees composed of women who have a special mandate for hygiene and/or sanitation.

Klaassen et al., 2001: iv

Enhanced and better-integrated approaches at local level could not resolve the continuing difficulty of facilitating rural water supplies in communities riven with strife. SURWAS continued to pick those communities where it was able to accomplish things and to avoid those where local politics were too difficult. Whether a community received a SURWAS scheme also continued to depend partly on the ability of local leaders to lobby for this support through GARWSP – a factor that has become more important since the end of SURWAS. Other practical factors affecting rural people’s likelihood of benefiting from SURWAS or post-SURWAS schemes include settlement size (SURWAS required a minimum of 300 people) and accessibility. Some communities remain without water schemes because they have no vehicular access. In Yemen as elsewhere, some of the poor

remain poor due to where they are, or due to the quality of local politics and leadership.

A 2001 evaluation mission expressed its concern that the revised participatory methodology and institutional approach of SURWAS, though much better than what had gone before, might not be sustainable by GAREWS, which could not afford to spend the 150 person days SURWAS had devoted to community contact in each village. It suggested that 40 person days would be realistic for GAREWS and sufficient to achieve sustainable village schemes (Klaassen *et al.*, 2001: iii-iv).

Apparently responding to the evaluation mission's concerns, the project completion report acknowledged

that the SURWAS methodology can not be copied one to one by a Government organisation can be true. There are however many elements in the SURWAS methodology that can be adopted by a Government organisation.

Community participation and contribution in the execution of the works is indispensable to create a sufficient base in terms of sense of ownership. The tendency of contracting works and community participation is shaped to fit herein is maybe a manner to build faster but it is no guarantee for effectiveness. The easy way is always to have a community contribution in money... In the SURWAS project it has been experienced that the required amount of money is not the biggest problem. Many villages have inhabitants who are willing to donate important sums to complete the required contribution what in a later stage can cause problems to establish an appropriate scheme management structure. The community contribution should be from as much as possible members of the community and in that respect it should be acceptable that this contribution is in money, in labour or in materials.

KN and RY, 2002: 42-43.

5.4 SURWAS institutional strategy at national level

At the start of **Phase IV** of SURWAS, it was reported that the project received valuable support from the then Rural Water Supply Department of the Ministry of Electricity and Water. This support had greatly facilitated the shift to the new integrated approach to water supply, sanitation and health (KN and RY, 1990, 10). Collaboration was then focused on the RWSD branch office at Dhamar, which the project had helped to develop. At this stage, little reference was made to the development of RWSD as a national institution. SURWAS was described as “functioning as a RWSD unit in Dhamar” (KN and RY, 1991: 10). But one of its

aims was to “promote the SRWS approach of implementing projects within the RWSD” (KN and RY, 1991: 6).

By the time a revised Phase IV project document was produced in 1993 to cover the extension of the project to Hodeidah and western Dhamar, more attention was given to the development of a national rural water supply institution. One of the project’s ten ‘immediate objectives’ was “to support the institutional building of the RWSD headquarters in Sana’a” (KN and RY, 1993a:7). Meanwhile, however, a 1992 presidential decree had transferred all rural water supply responsibilities to a new General Authority for Rural Electrification and Water Supply. The 1993 evaluation concluded that SURWAS had better relations with the new GAREWS than with the former RWSD and that GAREWS was “increasingly cognisant of the high degree of success of the approach developed by the project” (KN and RY, 1993b: vi). It recommended that the Netherlands consider providing technical assistance to support the GAREWS headquarters in policy development, planning and institutional development.

This recommendation was taken up in **Phase V** of the project. Special attention was given to strengthening the planning and management capabilities of GAREWS. This support was channelled through a Planning and Management Advisory Unit (PMA) within the organisation. During Phase V, both SURWAS and the General Authority underwent important changes. For its first three years SURWAS V was executed in the same way as the previous phase, under the direct authority of DGIS. From July 1999, however, project management was contracted out to a Dutch company, IWACO. During the first part of Phase V, the project’s support to GAREWS focused on capacity building at headquarters with regard to project management. After the SURWAS implementation arrangements had been changed, support was co-ordinated by a Yemeni manager of the PMA, focusing on the decentralisation of the General Authority and the consequent strengthening of its Branch Offices. He was supported by a part-time external adviser. Particular attention was devoted to six pilot BOs, including Dhamar and Hodeidah. Five working groups made up of headquarters and pilot BO staff were formed to address planning and management, technical issues, database development, community participation and decentralisation. However, due to major policy changes in the Netherlands, SURWAS was then terminated approximately 18 months after the new approach had been launched. While it grappled with the complexities of the institutional landscape of Sana’a, the project’s contributions were ultimately and unexpectedly halted by upheavals in the very different institutional environment of The Hague.

The final report of SURWAS concluded, not surprisingly, by regretting that there was so little time in which to implement this approach before the project was terminated. It summed up the key institutional issues as follows:

The main issues in the process of institutional development are:

- decentralisation
- community involvement
- sustainability

For effective decentralisation, the management culture has to develop from the command based, hierarchical style to delegation of responsibilities and authorities... taking decisions at the lowest technically feasible level increases the organisational efficiency.

...GAREWS has always worked through and in cooperation with the communities. However, it was never sufficiently understood and appreciated that community involvement requires a complete re-thinking of the project cycle.

...The sustainability of rural water supply and sanitation depends on the capability of the community organisation to run the facilities technically and administratively. If community involvement concentrates on the willingness of the community to participate, sustainability requires the community's capability to do so.

...An organisational restructuring process of GAREWS is an ambitious undertaking... In a process like this, it is more important to take sufficient time to allow the changes to gain acceptance... than to deploy massive technical assistance that may develop too many new concepts too fast for the organisation to digest.

KN and RY, 2002: 25-26.

From the beginning, it was agreed that the approach for PMA needed a long period to produce sustainable results. In the present situation, this long period has not been made available to the project... The consequence... is that most of the PMA activities are now aborted while still under development.

Ibid.: 33.

Meanwhile, GAREWS had come under increasing criticism for alleged inefficiency, mismanagement and corruption. It was dissolved in April 2001. The many managerial difficulties experienced by the organisation in the period prior to its closure hampered the efforts of SURWAS to provide support through the PMA. Following

protracted uncertainty about how to restructure institutional responsibilities following the closure of GAREWS, it was decided to separate the water and electricity functions. The former was assigned to a new General Authority for Rural Water Supply Projects (GARWSP) established in 2002. There was continuing, dysfunctional uncertainty about a ministerial home for the new Authority, which was first placed under the Minister of Agriculture and Irrigation. In 2003, a Ministry of Water and Environment was created and GARWSP was reassigned Ministry. This was about two years after SURWAS itself had ended. At national level, the institutional impacts of SURWAS have thus been filtered through a lengthy period of fragmentation, confusion and low morale in the water sector. Nevertheless, as will be shown, a number of these impacts can be identified in the current policies and approaches of GARWSP. Meanwhile, the Ministry of Water and Environment has made important progress in developing more integrated and effective policy and approaches to the sector, as was shown in section 2.6.

5.5 Current national institutions and programmes

The Netherlands has always aligned its support to rural water and sanitation in Yemen with the functioning of the government's central agency for this sector. As was described in chapter 2, during the successive phases of SURWAS collaboration with the predecessors of GARWSP – RWS and GAREWS – was close although Dutch project managers tended to maintain operational independence on a day-to-day basis and were not significantly hampered by the bureaucratic and political inefficiencies for which those agencies were notorious. Decades of Dutch and other support did enable the central agency to develop substantial technical competence. GARWSP has managed to inherit and retain much of this competence, despite the institutional turmoil of recent years. It has tended not to be so strong on the social side. Social facilitation and corresponding expertise were built up by SURWAS but tended not to be sustained after project support ended.

The main challenge for GARWSP since its establishment has been to develop a more focused, structured, efficient and cost-effective mode of operation. This is a common challenge for many public institutions in Yemen. In the past, the agency and its predecessors resembled a political market place where rural communities' competing bids for service were promoted, negotiated, compromised and satisfied on the basis of complex considerations of patronage and influence. Far too often the result was that those who were most successful in exerting political persuasion through their governor, Member of Parliament, sheikh or relative at the branch or central levels of GARWSP would receive just enough of a positive response to satisfy

those who needed to be satisfied. These intricate political judgements by the agency's management might mean, for example, that a borehole would be drilled but not equipped and pipelines delivered but not installed. The number of communities with complete and functioning water supplies rose considerably more slowly than the number whose demands had been met by the delivery of at least some of the required infrastructure. Rural Yemen has many half-built water projects. Informants at Alm Glaf, for example, stated that their district had 27 incomplete projects and four that were functioning. This is one reason why SURWAS did not drill boreholes. It could concentrate on places where boreholes had already been drilled but pumps and pipes had not been installed.

Against the background of the alleged corruption and mismanagement that led to the closure of GAREWS in 2001, the Chairman of GARWSP is striving to build a transparent organisation that operates according to professional criteria, can account satisfactorily for the funds used and delivers complete and functioning rural water projects within an appropriate time frame. He enjoys strong Dutch support in this endeavour. Most development agencies and several senior Yemeni leaders remain sceptical about the performance of GARWSP and are not yet willing to focus all their resources on its programmes. They prefer to spread risks and resources across GARWSP and various other programmes and parastatals. The Netherlands Embassy, on the other hand, argues strongly for focused support to GARWSP as the only way to build a strong rural water sector. In the early years after SURWAS, Dutch support was restricted to the Public Works Project and technical assistance to GARWSP and the World Bank-funded Rural Water Supply and Sanitation Project (RWSSP). Since 2005, Dutch funds are again flowing through GARWSP to accommodate the building of the Authority's capacity at central and Branch Office levels and for the implementation of rural water schemes. This Dutch on-budget support is allocated in the context of the National Water Sector Strategy Investment Programme (NWSSIP) in terms of a Memorandum of

Understanding for Programme Aid to the Water Sector (PAWS) drawn up by the Netherlands Embassy and a range of Yemeni authorities in 2005 (IHE, 2007: 27).

Through its Branch Offices, GARWSP remains responsible for the direct implementation of rural water supply schemes – alongside various other agencies and programmes. Opinions continue to differ about GARWSP's future role. Many analysts foresee that field implementation functions will be transferred to local government agencies, while GARWSP retains its central functions of policy and planning. But this will not happen in the near future. In the short to medium term,

there is much to be done in meeting rural water demand through strengthened GARWSP Branch Offices, building the overall institutional capacity of GARWSP (notably in the fields of social facilitation and sanitation) and strengthening local government so that it can play a bigger role. The Chairman has introduced a package of structural and procedural reforms to GARWSP and although these were still under review by Cabinet in mid-2007, a number of elements were already being implemented. Prominent among the reforms is the process of decentralisation to strengthened Branch Offices (see section 5.6), which is planned to be completed by 2010. Thereafter, the Chairman envisages a five-year period of operation according to the reformed structure and strategies, after which an evaluation should decide on future approaches – with a potentially reduced role for GARWSP. Meanwhile, with all these institutional reforms taking place in the background, the organisation has been making good progress in increasing the coverage of safe water supplies in rural areas, accounting for much of the reported increase from 26% to 45.7% rural water supply coverage between 2002 and 2007.

Rural sanitation received little attention from GARWSP until recently. As its name implies, it has focused mainly on water supply. Intermittent work on sanitation during several SURWAS phases was not carried forward by the General Authority, although the two main parallel agencies do carry out sanitation sub-programmes. The NWSSIP notes that “too often sanitation is neglected. In future projects, sanitation will be obligatory on the beneficiaries and hygiene education that targets women will be an integral part of each project/scheme” (RY, 2005: 30). This goal has not yet been realised, although discussion between GARWSP and other agencies about low-cost sanitation approaches has continued with the intention of achieving “integrated water and sanitation service delivery in 2008” (RY, 2007: 4). GARWSP began implementing and promoting low-cost sanitation this year.

Three other public agencies or projects – the Social Fund for Development (SFD), the Public Works Project (PWP), and the World Bank-financed Rural Water Supply and Sanitation Project (RWSSP) have thrived on their autonomy and freedom from the constraints of the Yemeni administration, and on their own planning and implementation approaches. Approaches hitherto have been polarized, with SFD offering a limited menu of very low tech options, and RWSSP offering complex mechanized schemes with high investment costs and expensive sanitation options. SFD, PWP and RWSSP may oppose the reform attempt to harmonise approaches, technology and financial packages, and so may undermine... reform by their behaviour without necessarily opposing it.

World Bank, 2007: 55.

The **Rural Water Supply and Sanitation Project (RWSSP)** was launched shortly before the closure of GAREWS in 2001. The current phase was due to end in December 2007, but will be succeeded by an interim phase pending a new Water Sector Support Programme that is expected to start in 2009 (with support to rural water supply and sanitation following the modality currently adopted by the Netherlands). Funded largely by the World Bank, the RWSSP claims to have inherited much of the SURWAS approach and to be maintaining it now. Like GARWSP, it refers to its approach as ‘demand responsive’. It currently operates in six governorates (not including Dhamar and Hodeidah), but it is proposed that the new programme would cover all Yemen’s governorates. This obviously raises questions about the respective roles of GARWSP and such national projects. Although working relations are said to be generally good and RWSSP management expresses commitment to the strengthening of GARWSP, RWSSP’s maintenance of separate Project Implementation Units (PIU) in the governorates in which it operates is a clear duplication of GARWSP Branch Office structures. The World Bank believes that, in principle, the RWSSP PIUs should be merged with GARWSP Branch Offices – but it points out that this cannot be achieved overnight. In the meantime, the project has contributed to the delivery of rural water schemes in Yemen: it is reported that more than 100 were handed over by March 2007, with a further 50 under construction. Unlike GARWSP, RWSSP does field social mobilisation teams in each governorate in which it operates and includes hygiene education programmes in its field work. Sanitation construction focuses on mosques and schools.

The **Social Fund for Development (SFD)** was established in 1997 and is funded by the World Bank, the Arab Fund for Social and Economic Development, the Netherlands and several other partners. Operating nationwide and independently of GARWSP from its own eight branch offices, it is active in various sectors – including water and sanitation. The social and institutional approaches of its water and sanitation component are similar to those developed by SURWAS and now endorsed by GARWSP, though its technical focus is significantly different. It emphasises user participation and community responsibility even more strongly than SURWAS did, arguing that – given the number of rural communities in Yemen – this is the only practical way to achieve sustained rural water and sanitation services. It always works through community contracting, training village committees to manage construction work. These committees comprise one representative per village served. Although SFD does not work closely with Local Councils, local water committee elections have to be approved by these authorities.

SFD takes a systematic approach to monitoring and evaluation, including baseline surveys and impact evaluation reports.

On the technical side, SFD is notable for its focus on water harvesting (although it also supports small dams and irrigation systems). It emphasises the long tradition of water harvesting in Yemen, especially in mountainous areas where drilling for groundwater and pumping it to users is impractical and very expensive. It argues also that pumped schemes may be captured by elites within user communities whereas this is less likely with water harvesting. It also points out the maintenance and sustainability problems arising from mechanised schemes. The non-mechanised schemes supported by SFD do not require user fees and are maintained through traditional arrangements for the operation of water harvesting systems. However, communities do make substantial contributions to construction costs, ranging from 25 to 50%. SFD's emphasis on water harvesting is criticised by other agencies and several donors, including the Netherlands, largely because of concerns about water purity, year-round reliability of supply and adequacy of quantities delivered. (Technical debates have arisen in Yemen about whether communities supplied by water harvesting can be included in the statistics for safe water coverage.) SFD counters that not all water supplied by community schemes needs to be potable. It has explored and promoted a number of home filtration systems and is also promoting rooftop water harvesting. Until recently, SFD was not concerned with rural sanitation. With expertise from India, it is now piloting the 'community-led total sanitation' approach, which is expected to involve strong participation by women.

The Netherlands has been a major supporter of the **Public Works Project (PWP)**. Between 2001 and 2004, it contributed US\$12.2 million to PWP I, of which EUR 2.6m was spent on water and sanitation and US\$9.2 million to PWP II, of which EUR 0.6m was spent on water. The World Bank was the principal funder of this project, which was established "alongside SFD as part of the initiative by government and donors to establish a social safety net... unlike SFD, PWP is a 'project', not a permanent institution" (World Bank, 2006a: 15). PWP focuses on labour-intensive public works with a strong pro-poor focus (IHE, 2007: 17). It operates through a Project Management Unit in Sana'a and six regional offices. PWP's public works approach is solely based on local contractors and community labour – unlike SURWAS, which used its own contractors to implement construction projects. PWP uses local consultants to build the capacity of communities and their local contractors. Like SURWAS, PWP emphasises community ownership of water schemes. Construction contracts are signed by the community, which must develop by-laws

for the operation of the scheme. PWP reports growing collaboration with local government authorities. It is starting to co-finance water schemes with the governorate of Hodeidah, which is reported to allocate about half of its development budget to this sector. PWP's local consultants are responsible for preliminary design studies and pre-appraisals, as well as environmental impact assessments, detailed design and construction supervision. The project monitors schemes' operation for two years after completion. It expects Local Councils to fulfil their legal responsibility to monitor performance after this period, in collaboration with user representatives.

...schemes managed and financed outside the public sector have long existed and are often viable and sustainable, for instance those set up by communities themselves, by private businesses or benefactors, or NGOs. However, these schemes are not linked to public sector entities and tend to be little known or understood. As a result, their technical and institutional achievements and issues remain unknown, and lessons are not exploited.

World Bank, 2007: 41.

It is a principle of the NWSSIP that NGOs should be encouraged to participate in the rural water supply and sanitation sector (World Bank, 2007: 11). NGOs, private companies and rich individuals all support certain water schemes, but they tend to be poorly known (see box) and there is little evidence of either NGOs or the private sector having played a prominent role in developing rural water supplies in Dhamar and Hodeidah. The World Bank argues that, despite the good work that some NGOs do in the sector, there has been “no indication that NGOs are being encouraged to expand their work, nor is there any channelling of public funds to NGO water projects” (ibid.: 44). GARWSP reportedly agreed to set up a framework partnership with NGOs, enabling them to mobilise and train communities, a challenge that has received inadequate attention since the end of SURWAS (ibid.: 57).

In addition to running a number of rural water schemes with apparent success, the private sector plays a major role in the supply of materials and services for the construction, operation and maintenance of water systems. However, GARWSP continues its central procurement of key construction materials such as piping, arguing – probably correctly – that this is more cost-effective than procurement by BOs from local suppliers.

As indicated at the beginning of this section, the two key drivers of policy, legal and institutional reform in Yemen's water sector since the mid-1990s have been concerns about water resource availability and management and commitment to enhanced delivery of basic services to the poor. A third area of concern has been prominent among several donors, notably the Netherlands. It concerns co-ordinated delivery and institutional development. There are two conflicting imperatives in this regard. The first, strongly supported by the Netherlands, is to build a strong central Yemeni institution for the sector – GARWSP – that can in due course share its responsibilities with emerging local government structures. The second, plainly evident in World Bank strategies of recent years, is to ensure delivery on the ground through parallel, more efficient agencies such as the SFD and PWP, while also contributing to the development of GARWSP and other national structures. World Bank staff suggest that GARWSP's emphasis on pumps and pipes can be complementary to PWP's focus on labour-intensive civil works and that SFD, with its focus on water harvesting, does not duplicate the kind of intervention that GARWSP delivers. They agree in principle that parallel agencies should be phased out and merged with a stronger GARWSP, but argue that this cannot be achieved overnight. However, the Water Sector Support Programme that is expected to start in 2009 will increasingly focus its support (from the World Bank, the Netherlands and the United Kingdom) on GARWSP.

It remains to be seen how soon and how effectively these differing perceptions and imperatives will converge. In the meantime, the Netherlands' annual governance ratings for the water sector in Yemen showed slight improvements from 2002 to 2005 (IHE, 2007: 58; comparable ratings are not available for 2006). As noted above, Dutch support to the sector (EUR 14.3m, 2006-2009) is now based on a Memorandum of Understanding for Programme Aid to the Water Sector. This support comprises capacity building for GARWSP and a GARWSP programme for rural water scheme construction. It will be delivered in the twin contexts of devolution and decentralisation.

5.6 Devolution and decentralisation

Devolution and decentralisation are different processes. Devolution is the transfer of authority and power from central agencies to more local ones. Usually, part of this transfer concerns the strengthening of local agencies' budgets through direct subventions from the central fiscus. As a result, local agencies have substantial authority in planning the use of these funds. Devolution may also involve the strengthening of their right to raise revenue through local taxation. Devolution

thus constitutes a fundamental local government reform with profound political implications. Decentralisation, on the other hand, is simply a restructuring of centrally controlled agencies so that more of their operational decision making and resource allocation take place through strengthened local offices. Many governments have concluded that this is a more efficient way to deliver services. Staff in district or field offices are closer to local realities. If they are given the authority to plan and manage their work and resources through a loosening of central administrative control, they can operate in closer and more effective collaboration with their local target groups and take decisions more quickly. However, they are still the local offices of central authorities. Decentralisation does not involve a fundamental transfer of power in the way that devolution does.

Both these processes are pertinent to rural water supply and sanitation in Yemen. The Local Government Law of 2000 constituted a fundamental devolution to strengthened local authorities. Under this law, a Local Council is elected for each of Yemen's 333 districts. Local Councils are in turn represented on a higher council at the level of the 20 governorates in the country (excluding Sana'a municipality). This local government reform allows a growing proportion of the national capital budget to be allocated to governorates and Local Councils for use on locally determined development priorities. The closer relationship between Local Councils and their constituents is thus meant to strengthen community involvement in the planning and management of the development process. Over time, Local Councils are expected to establish their own technical departments in sectors such as education, health, public works, water and sanitation. Partial devolution of funding to the Local Councils has already occurred in education, health and public works (although some sector projects are still managed centrally and decentralised offices of central ministries continue to operate at regional level). For rural water supplies, on the other hand, it has not: GARWSP, a central agency, continues to control the capital budget. However, it is presently discussing with the Ministry of Finance the direct transfer of investment budgets to its Branch Offices, starting with 15 Category A BOs in 2009. It is envisaged by some, however, that ultimately GARWSP may also come to serve as a technical service agency responding to the requirements of local authorities, largely funded by those authorities' local budgets.

The process of devolution was reinforced by the revision of local government legislation in 2004 and by policies of the government that took office in 2007, following the 2006 national elections. Under the national strategy for local government reform up to 2025, Local Councils are responsible for the improvement and delivery of services, along with the related capital budgets. Central government

ministries serve policy, strategic and supporting technical roles only, servicing the requirements of local authorities.

The Local Council and rural water supplies in Thuran district

The Local Council acts as an intermediary between villages and GARWSP. Before the Council was established in 2002, villagers used to go directly to GARWSP, which sometimes led to duplication and clashes between water schemes. Now, the Local Council co-ordinates plan through the councillors for the respective villages. Since 2004, it has been following proper tendering procedures. The chairman of the Council is always the District Manager, who is appointed by the Ministry of Local Administration. In the future, however, the chairman of the Local Council and the Governor will both be elected, while the General Secretary will continue to be an appointed post.

People are now legally required to approach central government agencies through their Local Councils. Previously, projects used to go to those with power and influence. This year, the Thuran Local Council has YR 4m for capital projects, but it keeps these funds for emergency purposes such as road repairs after floods.

District Manager and Chair, Thuran Local Council, Dhamar governorate

Emphasising its legal and policy mandate, the Ministry of Local Administration is actively promoting devolution as a more efficient development strategy, pointing out that after some 18 years of centralised government in the current Republic of Yemen, the poor are still poor. The current reality is that local authorities at district and government level are still weak. Not surprisingly, levels of local institutional development are uneven across the country. Hodeidah happens to be a governorate where more progress has been made. Dhamar is significantly weaker. In a recent analysis, the World Bank expressed scepticism, arguing that although the devolution of “power and responsibility to intervene in water resources management should in principle increase the responsiveness and transparency of the system... two parallel risks may undermine these outcomes, at least in the short term: (1) the [Local] Councils will remain extremely weak in implementation capacity in the water sector... (2) in the Yemeni context, a process of elite capture is almost inevitable, with the domination of councils by the local sheikhs...” (World Bank, 2007: 28).

An unpopular Local Council: controversy at Madman Althanee

Local leaders and water users allege that their water committee is ineffective and corrupt, and that it is supported in its fraud by elements in the Local Council. The Local Council instructed the committee to transfer funds to it shortly before elections, and for a short time thereafter the water system (which had been dry for months) functioned again. Since then it has operated erratically, and only for a couple of days a week. People are paying user fees but receive very little service. Requests to the Local Council for investigation of the community water committee's performance have gone unanswered, they claim. Instead, a member of the Council, supported by a colleague, is alleged to have hijacked the committee, making himself chairman and his son treasurer. The sheikh and the agul have written to the Governor requesting action, but he has responded that the Local Council is a public, elected body whose affairs and accounts should be transparent. The Council has ignored this, they allege. Their Member of Parliament is a brother of the sheikh and helped arrange the installation of the water system. He has told the committee to reform, but they are ignoring him. Meanwhile, people use donkeys to collect water (free of charge) from local agricultural wells. They would prefer paying fees for a properly functioning community water system.

GARWSP, meanwhile, retains central control of government service to the rural water supply sector. While authority over this sector is not devolved, GARWSP is actively engaged in the decentralisation of its own structures and systems. This involves the establishment of GARWSP Branch Offices (BOs) in every governorate and their progressive strengthening through the organisation's three capacity categories ranging from 'C' to 'A'. Dhamar and Hodeidah BOs are two of the 11 that have reached 'A' status. All BOs are planned to achieve 'A' status by 2010, after which the Authority's Chairman expects a five-year period of full operation of the decentralised structure. Thereafter, he envisages, the situation will be reviewed and further change is possible. The implication is that this might entail devolution of GARWSP's functions to local authorities. Another scenario is that BOs become "autonomous governorate-based Rural Water Authorities", as envisaged by the Rural Water Supply and Sanitation Reform Policy Agenda (IHE, 2007: 15). Meanwhile, however, GARWSP BOs are already collaborating more closely with Local Councils in a number of governorates, including Dhamar and Hodeidah. There is a general directive from GARWSP headquarters that BOs should undertake all their activities in consultation with these local authorities, which are meant to provide liaison with local user groups. The director of the Hodeidah BO emphasises that

implementation in association with the Local Council as single counterpart can be much more efficient than the earlier practice of negotiating and operating with multiple partners. At present, his office still manages a number of projects that involve the PWP and the Ministry of Agriculture and Irrigation, which supplies a number of village water tanks.

Despite the process of decentralisation to BOs, GARWSP remains centralised in a number of fundamental ways. Given the organisation's contentious political history and still fragile status, GARWSP's survival, in one way or another, will depend on strong central direction – as provided by its current Chairman – for some time to come. Operationally, central budgeting and procurement still seem the most efficient option. It is more cost-effective, for example, for pumps, pipes and other materials to be procured centrally than for each individual BO to make such arrangements.

5.7 Current governorate and district institutions

As has been shown above, governorate and district institutions play a growing role in the actual planning and implementation of rural water supply and sanitation schemes. Revisions to the Local Government Law of 2000 will further strengthen these institutions. At present, Local Councils comprise between 18 and 30 members, depending on the population of the districts they represent. Each Local Council has a Management Committee of five members, comprising a District Manager (an employee of the Ministry of Local Administration), a General Secretary (elected by the members of the Local Council) and representatives of the three standing committees: Planning and Budgeting, Services and Social Affairs. At governorate level, each district has one representative on a similar Council, which also has a Management Committee of five: the Governor (a central appointee to date, but to be elected in terms of Law no. 18 of 2008), the General Secretary (elected as above) and representatives of the three Standing Committees.

A key feature of the revised local government system is that the Governor is to be elected by the Local Councils, rather than appointed by central government. The Local Councils in a governorate then appoint the General Director, a technocrat supervising the administration and finances of the governorate as well as all technical departments. A similar administrator is to be appointed for each Local Council.

The Local Council and rural water supplies in Al Hada district

This Local Council started work seven years ago and has now taken complete responsibility for development activities. Community requests for projects are channelled through the Local Council. The Council also collaborates with GARWSP in facilitating planning and institutional arrangements with communities for new water schemes. GARWSP does not accept direct approaches from communities any more: requests must always be made through the Local Council. In the past, however, GARWSP's approach has been too fragmented: a well drilled this year, pipes next year, pumps the year after... People lose trust and faith. The Local Council does have a capital budget, provided from central government and from local taxes. It has been able to spend some money on local roads, schools and health units.

General Secretary, Al Hada district.

Local Councils potentially have three sources of funding: local taxes, subventions from the central Ministry of Finance and support from donor agencies. At present, the funds available to Local Councils are extremely limited. Districts currently receive approximately 1% of the national budget. A District Level Development Support Programme is set up to strengthen Local Council operations, focusing on 48 pilot districts. Having facilitated the establishment of a Local Authority Development Fund with the Central Bank, it advocates increased capital support for Local Councils through this Fund, potentially including a proportion of the budget support that external donors may provide to Yemen.

All these developments are strengthening the role of Local Councils and governorates in the planning and management of rural water supply schemes, a trend that GARWSP encourages. In Hodeidah, the BO works with a number of schemes that have been funded completely by Local Councils; its role is limited to providing technical support. The Governor of Hodeidah reportedly promotes increased funding for Local Councils and the Director of the BO states that the Councils are “in charge” of the project developments that GARWSP supports. According to his data, Local Councils provided more funding for water projects in the governorate than any other source between 2002 and 2007.

In other parts of the country, however, the degree and effectiveness of local authority involvement is generally still weak. There is substantial variation and Local Councils are a new arena for often complex local politics (see box). Several villages, and their

respective schemes, may be represented by a single member of a Local Council. At community level, the village sheikh remains highly influential in the water sector as in other local matters and intricate webs of political relationships affect the functioning of water supply systems. Despite a small number of communities that report that the Local Council has little or no influence on the village water sector, the general trend is undeniable. Local Councils have the mandate to monitor the performance of community institutions and programmes, including those for water and sanitation. GARWSP respects the facilitation and mediation roles that Local Councils are expected to play and generally appreciates that the new dispensation makes its own work simpler.

5.8 Current community institutions

The community institutional structure promoted by SURWAS is now widely established in Yemen and persists in most Dhamar and Hodeidah villages surveyed for this evaluation. This study's 2007 survey covered 108 communities (56 in Dhamar and 52 in Hodeidah) with water schemes. Fifty-five of these were SURWAS schemes and the remainder were installed by GARWSP, its predecessors or other agencies. Of the 108 schemes, 88 (81%) had a community water committee; the percentage of SURWAS schemes and non-SURWAS schemes with a committee was virtually identical. Of the 108 schemes, 92 (85%) were operational at the time of the survey. The proportion of operational schemes was exactly the same for both SURWAS schemes and non-SURWAS schemes. However, in Dhamar significantly higher proportions of both SURWAS and non-SURWAS schemes had no committee compared to Hodeidah. Only one of the 28 SURWAS schemes surveyed in Hodeidah did not have a committee, whereas one third of the SURWAS schemes surveyed in Dhamar lacked such a body. Among the non-SURWAS schemes surveyed, three of 28 in Hodeidah had no committee, compared with seven out of 25 in Dhamar. Culture and history are likely explanations of this difference. Society is more fractious and institutions are harder to sustain in Dhamar. A certain level of erosion over time is also understandable, especially considering the particular conditions of this governorate, in which SURWAS operations had started earlier than in Hodeidah.

Table 26 SURWAS and other schemes operational and inoperative, Hodeidah and Dhamar

	Hodeidah						Dhamar						Total					
	SURWAS %		Other %		Total %		SURWAS %		Other %		Total %		SURWAS %		Other %		Total %	
Operational	24	86	27	96	51	91	23	85	18	72	41	79	47	85	45	85	92	85
Inoperative	4	14	1	4	5	9	4	15	7	28	11	21	8	15	8	15	16	15
Total	28	100	28	100	56	100	27	100	25	100	52	100	55	100	53	100	108	100

Table 27 SURWAS and other schemes with and without committees, Hodeidah and Dhamar

	Hodeidah						Dhamar						Total					
	SURWAS %		Other %		Total %		SURWAS %		Other %		Total %		SURWAS %		Other %		Total %	
Committee	27	96	25	89	52	93	18	67	18	72	36	69	45	82	43	81	88	81
No committee	1	4	3	11	4	7	9	33	7	28	16	31	10	18	10	19	20	19
Total	28	100	28	100	56	100	27	100	25	100	52	100	55	100	53	100	108	100

The continued existence of a committee is significantly related to whether the scheme is still functioning: among all 108 communities, the scheme was inoperative in 11% of those with a committee, whereas it was inoperative in 30% of those without a committee. Among SURWAS schemes, the same proportion (one in seven) was inoperative in both Dhamar and Hodeidah. But among the non-SURWAS schemes, significantly more (28%) were out of action in Dhamar, compared with only one out of 28 in Hodeidah.

Support us directly, not through the government!

At Markiz Utmah, the same individuals are now in their third term of office on the Water Committee, having been re-elected twice. The next election is scheduled for 2009. Their water tariff has risen from YR 25/m³ in 1991 to YR 130/m³ in 2007. They also charge local government offices for their water. Some pay, some do not. The judge is one of those who do. Fifteen very poor families are allowed free water by the Committee. About 25% of the Committee's monthly revenue goes to the bank and is kept for maintenance and investment purposes. The system ran without maintenance from 1992 to 1995. Then funds were used to lift the pump from the borehole and replace various parts. There was another round of expenditure on maintenance in 1996. In 2001, the main and booster engines both underwent major overhauls, and a year later a shaft of the pump broke and had to be replaced. More recently, valves in the main engine had to be replaced and a new pump installed at the well head. At present, the Committee would not have enough money to replace the engine. This Committee says that it has a good relationship with the Local Council, which has a monitoring function and has sometimes helped them to communicate with central government. The Committee's basic plea is that development assistance should be given directly to such community structures, and not channelled through the highly bureaucratic processes of government.



A village water committee office, (AL-Monirah water supply project), Hodeidah Governorate

The SURWAS approach was to encourage the establishment of a larger General Committee and a small Supervision or Management Committee with day-to-day operational responsibility. The interviews conducted in the context of this study were primarily concerned with what the questionnaire termed the ‘executive committee’, i.e. the authority managing the scheme. This is the body often referred to as the Supervision or Management Committee in SURWAS documents. Of the 88 communities with such a committee, half (45) said that there was also a General Committee and half (43) said that there was not. The larger body was slightly more common in SURWAS schemes (57%) than in the others (45%).

Table 28 SURWAS and other schemes with and without General Committees, Hodeidah and Dhamar

	Hodeidah						Dhamar						Total					
	SURWAS %		Other %		Total %		SURWAS %		Other %		Total %		SURWAS %		Other %		Total %	
General Committee	17	61	11	46	28	54	9	50	8	44	17	47	26	57	19	45	45	51
No General Committee	11	39	13	54	24	46	9	50	10	56	19	53	20	43	23	55	43	49
Total	28	100	24	100	52	100	18	100	18	100	36	100	46	100	42	100	88	100

Eighty-two percent of the 259 enumerated members of the executive committees surveyed were reported to be able to read and write. All 259 were male. None of the 88 committees had any female members. Answers as to whether women were allowed to vote for members of the General Committee (from which the executive committee is supposedly drawn) were only obtained in ten communities. In all of these cases the response was negative. Of the 88 executive committees, half (45) said that they occasionally organise general meetings for all households participating in the scheme. The proportion was the same for SURWAS and non-SURWAS schemes. However, only five indicated to hold such meetings regularly – and four of these concerned SURWAS schemes. No more than one of the 45 committees (at a SURWAS scheme in Hodeidah) occasionally meeting with all participating households reported that women take part in these meetings. SURWAS clearly made little progress on the basic gender dimensions of local water governance.

Eighty-three of the 88 committees surveyed answered the question relating to the training their members received. Of these, only 25 (30%) reported receiving any training. All were SURWAS schemes. Twelve reported that they were given some financial training; six accountants had received this support. Eleven pump operators were said to have received technical training on pump operations, one had been trained on repairs and one on water tank cleaning. The survey suggests that committee members, although they may have received general support in institution building, are largely self trained or use skills they acquired elsewhere. Evidence suggests that SURWAS, GARWSP and other agencies have largely relied on existing community capacity.

Community water committees are expected to facilitate user participation in the design and installation of water schemes. Yet, their relationship with established local leadership in this regard is variable. Once a scheme has been constructed, the role of these committees is to manage their day-to-day technical and financial operation. That is what most of those surveyed appear to attempt: 77 of the 88 committees said that they meet 'regularly'. Committees include one or more pump operators and technical personnel capable of maintaining and repairing the infrastructure. They also include accountants and meter readers who collect user fees, maintain financial records and procure fuel and other supplies for



Pump operator

scheme operation. Recently, SURWAS also focused on sanitation and hygiene issues and, in theory, community committees should also be active in this sector. But only two of the committees surveyed reported a hygiene promoter among their membership and there is little sign that committees are active in this regard.

Many community water committees are reported to respect the principle of periodic elections by water users. Of 86 that answered the question, 58 surveyed committees (67%) said that their membership had at least changed to some extent since the establishment of the scheme. There was virtually no difference between SURWAS and non-SURWAS schemes in this regard.

Cross subsidy at Beit al Hajiri

The Beit al Hajiri Water Committee serves 150 metered consumers in five sub villages. It is the only committee in the area. There is no fixed schedule of elections to the Committee, but at times of dissatisfaction with one or more of its members community meetings have replaced them with new people. Such changes require the approval of the District Manager, they report. This Committee emphasises its independence and says that this is a key to success for such community structures; they should not be controlled by the sheikh or anyone else. The Committee does recognise the authority of the Local Council, although it operates the water system itself and the Local Council's role is restricted to helping with letters to GARWSP or other higher authorities. Although the Committee's revenues cover its costs, there is very little capital in the bank at present because the money that had been accumulated was used to provide the community's 8% contribution to construction of a school by the Social Fund for Development. As a result of this investment, the Committee also lacks the funds to extend its water network to some 50 newer households that are currently not connected.

As reported in section 5.7, Local Councils are increasingly important in the governance of rural water supply. However, only 26 of the 108 schemes surveyed answered the question whether their Local Council had provided any assistance. In two non-SURWAS cases, the Council had financed the full construction cost of the scheme. In two others (one SURWAS and one not), the Council had funded repairs. More commonly (in 11 cases), Local Councils helped to initiate or facilitate scheme construction. Three non-SURWAS schemes were initiated with Local Council help; this kind of Local Council involvement was not reported for any SURWAS scheme. Facilitation support was provided to both SURWAS and non-

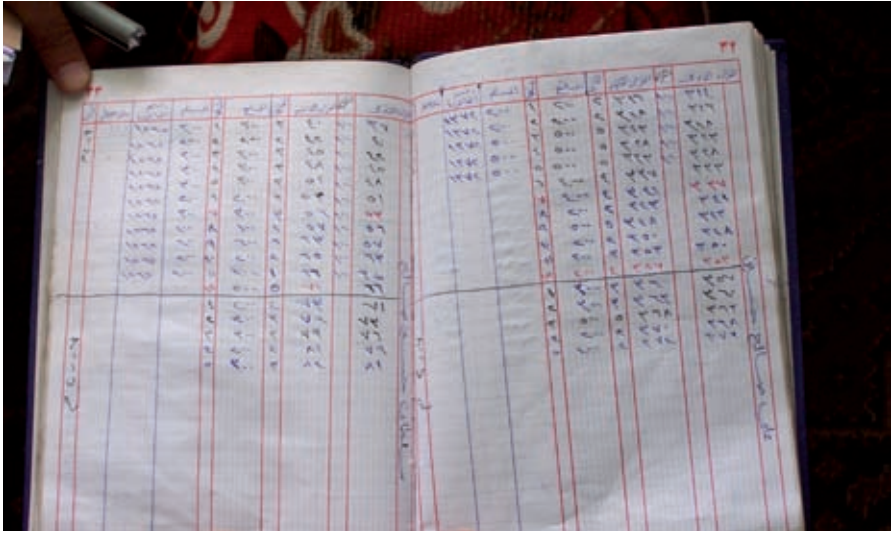
SURWAS projects. Another important related role, reported by four SURWAS and four non-SURWAS schemes, is conflict resolution. Several water committees, however, continue to resist Local Council involvement, or question these bodies' efficacy.

Table 29 Local Council support for water schemes

Local Council helped with:	Hodeidah (21 schemes answered)						Dhamar (5 schemes answered)						Total (26 schemes)					
	SURWAS (10) %		Other (11) %		Total %		SURWAS (3) %		Other (2) %		Total %		SURWAS %		Other %		Total %	
Finance entire construction			2	18	2	9									2	15	2	8
Finance extension of scheme																		
Finance repairs	1	10	1	9	2	9							1	8	1	8	2	8
Initiate construction			3	27	3	14									3	23	3	12
Facilitate construction	4	40	4	36	8	38							4	31	4	31	8	31
Conflict resolution	3	30	4	36	7	33	1	33			1	20	4	31	4	31	8	31
Capacity building			1	9	1	5									1	8	1	4
Official registration	1	10			1	5			1	50	1	20	1	8	1	8	2	8
Other	4	40	5	45	9	43	2	67	1	50	3	60	6	46	6	46	12	46

In many but not all cases, committees pay salaries to at least some of their members. Twenty-four out of 64 enumerated committee chairmen were paid. Not surprisingly, 73 of 78 reported pump operators belonging to committees – arguably the most important position – were also paid, as were 48 of the 59 meter readers and fee collectors reported to be committee members. There was no significant difference between SURWAS and non-SURWAS schemes regarding payment for any of these positions.

Financial policy and strategy are essential to the installation and sustainability of community water schemes. Eighty-six (80%) out of 107 schemes responding said that the village had had to contribute money to the construction of the scheme. Slightly fewer of these were SURWAS schemes (78% against 83% of non-SURWAS schemes). Of all respondents, 62 (72%) said that each household had had to



Village water records, Markiz Utmah, Dhamar Governorate

contribute (ten respondent committees did not know what the situation had been). This was reportedly required in a larger proportion of the responding SURWAS schemes (87%) than of non-SURWAS schemes (74%). Normally, the amount paid per household varies: this variation was reported by 48 (83%) of 58 committees that could answer the question. Sometimes, households contributing less money are required to contribute more in kind, through labour or provision of materials. This had been the case in 30 (51%) of 59 communities able to answer the question. It was reportedly more often the case in SURWAS projects (63% of respondents) than in non-SURWAS ones (42%).

Table 30 Community contributions to water scheme construction

	Hodeidah						Dhamar						Total					
	SURWAS %		Other %		Total %		SURWAS %		Other %		Total %		SURWAS %		Other %		Total %	
Contribution required	27	96	26	93	53	95	15	58	18	72	33	65	42	78	44	83	86	80
Contribution not required	1	4	2	7	3	5	11	42	7	28	18	35	12	22	9	17	21	20
Total	28	100	28	100	56	100	26	100	25	100	51	100	54	100	53	100	107	100

As SURWAS intended, general community involvement in scheme construction is very common: 91 (84%) of 108 surveyed schemes were built in this way. However, it was significantly more common in SURWAS projects (95%) than in non-SURWAS cases (74%). Apart from providing board and lodging to non-local workers (79% of the total 91 schemes), the commonest types of contribution were digging ditches (55%), building pump houses (44%), providing watchmen during construction (44%) and providing cement and stones (37%). Digging ditches was a much more commonly reported community contribution in SURWAS schemes (73% of those responding) than in non-SURWAS schemes (44%). This was also true of contributions to pump house construction (50% compared to 36%), provision of watchmen (48% versus 36%) and provision of cement and stones (48% compared to 23%).

Table 31 Community contributions to scheme construction

	SURWAS schemes %		Other schemes %		Total %	
Building pump house	26	50	14	36	40	44
Digging ditches	38	73	17	44	55	60
Connecting pipes	14	27	15	38	29	32
Building pipe supports	10	19	5	13	15	16
Connecting water meters	11	21	7	18	18	20
Building demonstration latrine	6	12	0	0	6	7
Providing pipes or pipe connections	12	23	7	18	19	21
Providing cement and blocks	25	48	9	23	34	37
Providing stone	9	17	7	18	16	18
Providing lodging and food for workers	44	85	28	72	72	79
Providing transportation for materials	12	23	9	23	21	23
Providing watchman for site	25	48	15	38	40	44
Other	10	19	11	28	21	23



Receipt book Ka'awan village, Dhamar

Al Dira'a: we'll ask the Dutch

At Al Dira'a, the Water Committee, which is in office since 1999, has seven members. There is no larger General Committee. The chairman, who is the local sheikh, also serves as pump operator and accountant for the scheme. The cashier keeps the Committee's funds in the village. The scheme, which has operated for 12 years, serves three villages and seven sub-villages: a total of 80 water meters. There is no pressure for Committee elections here, says the chairman: those currently serving are trusted. This Committee has no real links with the Local Council. It sent a letter to the previous Local Council seven years ago, and never got a reply. Over the years, the chairman estimates, the Committee has spent some YR 3m on maintenance. It has funds for further maintenance, but not for a replacement engine or pump – they would ask the Dutch for that. They do not believe that the Local Council has the funds to help them much. If they have serious water problems at Al Dira'a, they will go straight to GARWSP or the Dutch for help.

It is standard practice for users to pay for water consumed from village schemes. In only 14 (13%) of 108 surveyed schemes was water reported to be provided free of charge. There was no significant difference between SURWAS and non-SURWAS schemes in this regard. The commonest billing period is monthly (in 64% of

responding cases, with no significant difference between SURWAS and other schemes). A small number of schemes issue bills every two or three months, or less regularly. People in Dhamar must pay much more for their water, as water must be drilled from deeper wells and often pumped substantial distances uphill from the well to the village tank. In the surveyed communities, the mean payment for the first cubic metre consumed by a household in one billing period was YR 48 in Hodeidah and YR 130 in Dhamar, with a maximum of YR 60 in the former and YR 300 in the latter. In both governorates, evidence suggests that SURWAS schemes typically charge more than non-SURWAS schemes. In Hodeidah, for instance, four out of 19 respondent schemes charge YR 60 per cubic metre (the highest rate in that governorate), whereas only one out of seven non-SURWAS schemes that answered this question charge at that rate. In Dhamar, nine out of 13 respondent schemes charge over YR 120 per cubic metre, compared to five out of 13 non-SURWAS cases.

Although the concept of sliding tariffs for larger volumes of water use is often discussed, it appears not to be applied in the surveyed communities – at least not in the 54 committees that use water meters (59% of those responding to this question). They all said that the rate per cubic metre did not increase with increased consumption. Water meters for connected households are significantly more common among SURWAS schemes (70% of responding communities) than among non-SURWAS schemes (47%). Of 38 committees that do not use water meters, 13 reported that they charge each household the same fixed fee, six said that the fee depended on household size and 19 reported a range of other, sometimes variable, charging practices.

Table 32 Use of water meters						
	SURWAS schemes %		Other schemes %		Total %	
Use of water meters	33	70	21	47	54	59
No use of water meters	14	30	24	53	38	41

Table 33 Ways of charging for unmetered water		
	Total %	
Same fee for all households	13	34
Fee depending on household size	6	16
Other system	19	50

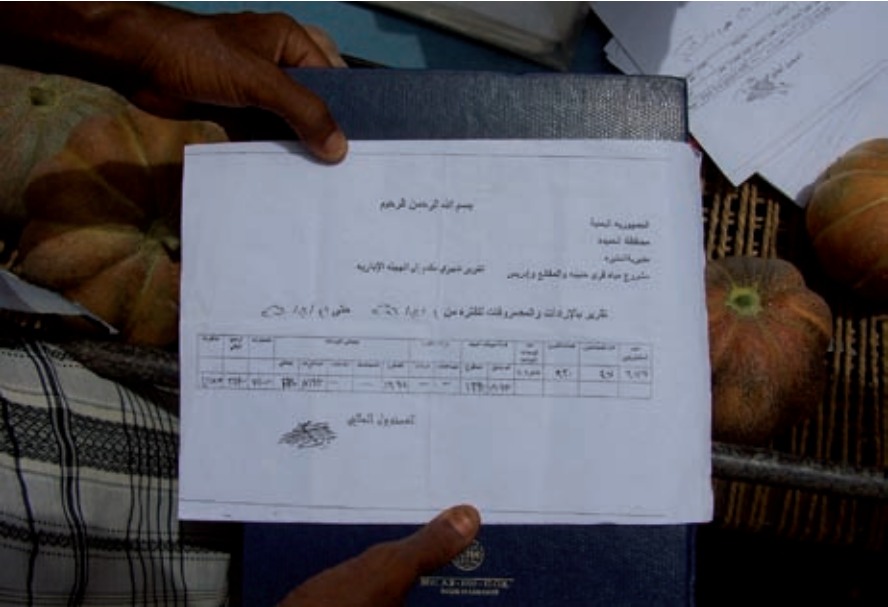


Household water meter, Dir Al Maqboli, Hodeidah Governorate

Jarf Isbeel: the water system is more important than our eyes

Jarf Isbeel in Dhamar governorate had its water system rehabilitated by SURWAS around 1990 and has operated it successfully ever since. The system currently serves approximately 512 households, but the village population has risen fast and people feel they need a second well and pump. Fees have risen from YR 20/m³ to YR 100/m³, reflecting significant increases in the price of diesel. There have been two sets of elections for the Water Committee. Members of the current Committee believe that they are doing their job well, which is why the Local Council has not conducted any monitoring or supervision mission, as it has in other places. The law does not give the Local Council the right to interfere in the Water Committee's affairs, they argue. Local leaders estimate that 75% of the population are 'poor', and that the better-off 25% carry much of the responsibility for helping the rest to survive – notably through their income from qat. "If there was no qat cultivation, we would be killing each other through poverty." The Committee has used its savings to buy two new engines for its pumps, and to undertake major rehabilitation of the borehole itself. "The water system is more important than our eyes. We would do anything to keep it going."

Although the difficulty and cost of extracting groundwater vary through the seasons, only three committees surveyed said that their water rates vary with the time of



Water committee monthly report

year. Water fees have certainly increased over time, however. This is largely due to the increasing cost of fuel for pumps and the increasing depths from which water must be pumped as the resource becomes scarcer. Seventy-nine (82%) of 96 committees responded that they had increased their rates, with 76 citing higher fuel costs as a reason. There was no significant difference between SURWAS and non-SURWAS schemes with regard to the increase of rates.

Most community water committees keep detailed and competent accounts, although 14 (15%) of 91 responding committees said that they did not keep records of all collected fees. Not keeping records was somewhat more common among the non-SURWAS schemes that responded, but the difference with SURWAS schemes is not statistically significant. Only 19 (20%) of 96 committees, however, reported having bank accounts. In most cases the money is kept locally, in the treasurer’s house, for example. The proportion of respondent SURWAS schemes with bank accounts (23%) is higher than that of non-SURWAS schemes (17%), but the difference is not statistically significant.

A small number of committees – 8 out of 96 that answered the question – reported that they occasionally use their water funds to make loans to community members. (At Beit al Hajiri in Dhamar (see box above), the committee used most of its spare cash to finance the community counterpart contribution needed for construction

of a new primary school.) It is not surprising that loans are rare, since many committees periodically run short of the money they need to operate their schemes adequately. Fifty-three (60%) of 89 committees said that they sometimes had problems paying salaries, buying fuel or meeting other costs. The commonest strategy in such a situation – in 38 (72%) of these cases – is to borrow money. (Eighty-four percent of the non-SURWAS schemes that responded to the question reported that they borrowed money, compared against 59% of the SURWAS schemes.) Often, better-off individuals in Yemeni communities are prepared to make substantial contributions to either scheme construction or to meeting shortfalls in recurrent funding. Despite their periodic problems, however, many community water committees try to set money aside for future maintenance expenses. Fifty-one (59%) out of 87 committees that answered the question said that they do this, with no significant difference between SURWAS and non-SURWAS schemes. On the other hand, very few committees have, or can ever expect to have, enough money for major rehabilitation of their schemes. In 2007, 71 (76%) of 93 responding committees answered that they still used their original pumps – with no significant difference between SURWAS and non-SURWAS installations. But as water schemes get older, the need to install new pumps and carry out other major renovations increases. In general, this scale of capital funding is beyond communities' reach.

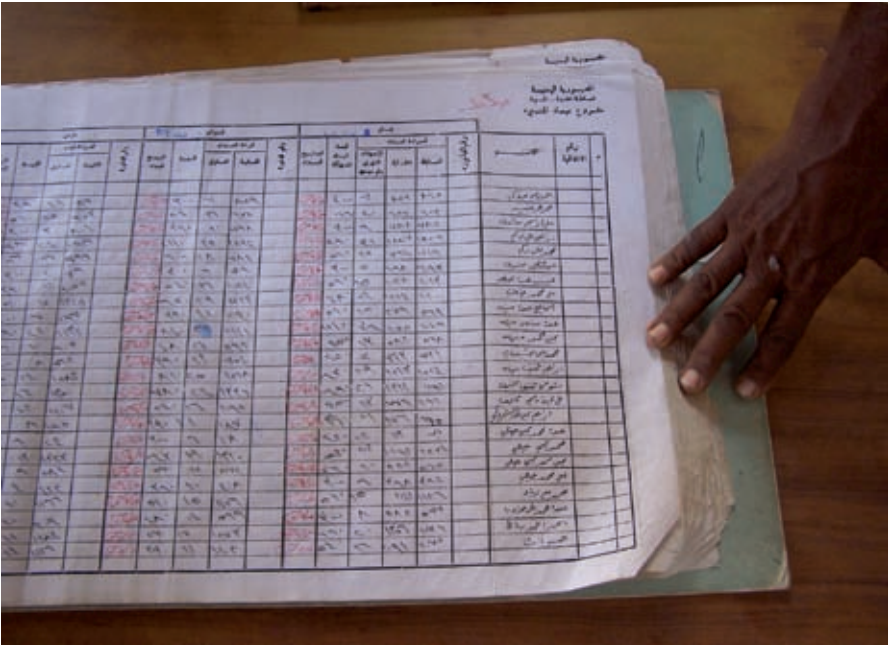
Usm: how things get done

Presently, the village of Usm does not have a functioning water system. A TransCentury project installed one after the 1982 earthquake and it worked for a number of years before it broke down. Nine years ago, says the former operator, GARWSP provided a new pump, which only worked for one year. GARWSP then deepened the well, but no pump suitable for the new depth was provided. There has never been a Water Committee, says the old operator, and although their Member of Parliament is a deputy to the President of Parliament and a good friend of the chairman of GARWSP, nobody here has the influence to go to the MP and get him to act. The General Secretary of Dhamar Governorate comes from this district and said he would deal with the problem, but there have been no results.

Elsewhere in the village, the community's new representative on the Local Council, a former member of the President's special guard, says that action is now imminent. GARWSP has been contacted and will be including a new pump for Usm in its next round of tendering. Shortly before he was elected, he arranged for the Local Council to send a letter about the problem to GARWSP. That was in July 2006, so GARWSP's tendering

for the pump a year later is considered to be prompt action. A Water Committee of five members is now to be formed, with the Local Council representative as its chairman. The Local Council will help the community to buy and install water meters, which GARWSP will not provide.

The question whether to charge (very) poor households less or nothing, for their water is a major policy issue for many village water committees. The general Yemeni principle is that nobody should be excluded from a community water supply by their poverty, though a number of committees claim that nobody is too poor to pay and some argue that the increasing availability of social welfare payments from the government means that the very poor can use this money to pay for their basic needs. Of 104 committees that answered the question, 37 (36%) indicated that very poor households pay less for their water. There was no significant difference between SURWAS and non-SURWAS schemes in this regard. Forty-nine committees reported that some such households were not charged for their water. The apparent contradiction between these figures may represent the difference between standard policy towards the poor and occasional charity. Again, no significant difference between SURWAS and non-SURWAS schemes was established, although the proportion allowing the provision of free water was somewhat higher in the latter



Village water consumption and payment records

cases (71% of responding committees) than in the former (61%). Overall, survey data suggest that 2.2% of households in villages with SURWAS or non-SURWAS schemes lack access to scheme water. However, the socio-economic status of these households was not recorded (Chapter 4).

Another important policy issue faced by those dealing with this basic human need is what to do in case households default on their water payments. Action is normally taken: half (44) of 89 responding committees said that information about defaulters was brought to the committee and 55 (62%) indicated that a meeting would be held with the defaulting household. However, only a quarter (22 committees) reported to go as far as shutting off such a household’s supply. The responses of both SURWAS and non-SURWAS schemes were very similar with regard to each of these options.

Table 34 Charging policy for poor households and (occasional) provision of free water

	SURWAS schemes %		Other schemes %		Total %	
Poor pay less	20	37	17	34	37	36
Free water for some poor households	31	61	32	71	63	66

(Percentages refer to committees answering the respective questions)

Table 35 Action taken when water fees are not paid on time

	SURWAS schemes %		Other schemes %		Total %	
Nothing	1	2	4	9	5	6
Inform committee	24	51	20	48	44	49
Talk to household	29	62	26	63	55	63
Close the household’s tap	12	26	10	24	22	25
Other	15	32	16	38	31	35

The principle of user responsibility through community institutions has taken root in the governance of rural water supplies in Dhamar and Hodeidah. This can be attributed to the convergence of SURWAS approaches and support with the self-reliance and robust local structures found in many Yemeni communities. On the other hand, there were, and still are, many places where levels of local social or

political conflict have made the participatory development of community water supplies impossible. SURWAS selected communities in which there was a reasonable chance of success and bypassed those where levels of conflict were too high. A number of schemes collapsed due to local political differences.

In general, however, institutional systems and structures for the governance of water supplies are clearer and better established at the community level than they are at the national level. Acceptance of the principle of user responsibility and understanding of committee structures and procedures promoted by SURWAS are widespread. Roles and responsibilities are clearly defined and institutional capacity, though far from perfect, is adequate for most day-to-day management purposes – except in communities where local political conflicts are too severe. The comparatively small number of significant differences between SURWAS and non-SURWAS schemes indicates a general convergence between the approaches of SURWAS and other agencies. This supports the view of many informants at policy level that SURWAS approaches have been largely adopted across the country.

5.9 Institutions for water resource management

As has been shown, the development of community institutions for the management of domestic water supplies poses a complex set of governance challenges. The government and international agencies have also addressed another set of governance challenges in the water sector, which, from several perspectives, are more urgent. These challenges concern water resource management, as Yemen is a country where at least 93% of the water is used for irrigation, where the lowering of water tables that provide most of these resources is causing widespread concern and where the state is weak and does not have the capacity to control resource extraction. Sustainable water use in accordance with the principles of integrated water resource management and broader environmental considerations is clearly an urgent priority. The National Water Resources Authority has made a slow start. Parallel to GARWSP, it has its own Branch Offices. So far, these have been set up in seven of the 14 basins into which the country is divided. Meanwhile, implementation of the Water Law is far from adequate (section 5.5) – although, at the time of SURWAS, there was no such legislation in place. Under this law, NWRA is authorised to control drilling. So far, it has had little impact in most parts of the country and unauthorised drilling is still widespread. GARWSP is also required to obtain licences from NWRA to drill new village wells. However, the new NWRA office in Hodeidah reported that the General Authority's local BO was not co-operating.

NWSSIP reform policies for water resource management

Decentralised management and stakeholder partnership approach

- i) *decentralising to basin water committees within basin plans*
- ii) *implementing basin plans on an integrated water resource management basis*
- iii) *promoting water user associations and self management at the local catchment level*

Recognising existing rights and controlling expansion

- i) *recognition of farmer use rights*
- ii) *implementation of the licensing, regulation and other provisions of the Water Law*
- iii) *national water well census and water resources assessment*

Revision of the economic incentive structure for groundwater use

- i) *raising the diesel price and freeing up agricultural trade, including for qat*
- ii) *possible recognition of tradable water rights (pilot project in Ta'iz)*
- iii) *improving water productivity through research, extension and subsidies to investment*

World Bank, 2007: 11.

In this context, the National Water Sector Strategy and Investment Programme proposes three sets of reforms (see box). From the perspective of this study, the first set of actions is the most important. A limited number of basin committees have been set up to serve “as a joint government/water user forum to advise on water resources management and basin water plans” (World Bank, 2007: 13). Three such basin plans have been prepared so far. At local level, NWRA (supported by a Community Water Management Project in Dhamar) is promoting the formation of Water User Groups (WUGs), comprising 15-20 well owners and other users. These groups are expected to raise awareness about water conservation and to address water resource management and related technical issues. Working in Dhamar, Hadramawt and Tai'iz, the Community Water Management Project has so far launched 44 WUGs, of which ten are specifically set up for women – recognising women's important roles as water users. At a higher level, WUGs are to send representatives to Water User Associations (WUAs), which in turn are to be represented on Basin Committees. However, few of these higher linkages and structures have actually been created yet. The Sana'a basin is an exception. Rapidly growing urban demand for this basin's diminishing groundwater resources has

driven the establishment of approximately 700 WUGs and 48 WUAs.

This institution building initiative for water resource management is driven by conservation imperatives. So far, few links have been created with the parallel and much better established process of institution building for domestic water management, which is driven by the imperative of meeting basic human needs equitably and efficiently. Even on the most optimistic assessment, converting Yemen's groundwater governance from its current state of open access to one of common property resource management will be a slow and contentious process. From the perspective of institutional efficiency, the creation of parallel institutions for water resource management and community water supply management is inappropriate. Ways must be found to link these structures. Village water committees, which in many areas are themselves users of groundwater, should be represented on Water User Associations. Local Councils provide another opportunity to create stronger linkages. As has been shown above, these bodies have a growing role in the supervision and support of village water committees. In several governorates, including Dhamar, they are also reported to be supporting the development of WUGs.

5.10 The influence of institutional strategies on SURWAS achievements

SURWAS' institutional strategy was central to its longer-term impact. Promoting user responsibility through community-based institutions proved a viable and effective strategy in Yemen. This effectiveness was primarily due to the robust and durable nature of existing concepts of local organisation and leadership as well as the capacity for leadership, data management and technical operations that typically exists at village level. The committee structures and management procedures promoted by the project proved well within communities' competence, due to this society's long tradition of structured local governance and record keeping.

This is not to pretend that the SURWAS institutional strategy could be universally applied, nor that it was unanimously welcomed. As has been pointed out, there were, and are, places where the required degree of community harmony and consensus could not be achieved. Elsewhere, the institutional achievements of SURWAS have since collapsed, for a host of local political reasons. When such problems arise – as they are bound to – external agencies should be ready to help resolve the disputes. GARWSP and other agencies in the water sector rarely are. Local Councils, governors and other authorities are sometimes able to help, though

this study quotes a case that illustrates that their efforts are not always effective. The inadequacy of external support structures to strengthen local water governance institutions significantly impairs the sustainability of SURWAS' institutional achievements. This study has shown the institutional erosion now taking place, seven years after the project was discontinued. One third of the SURWAS schemes in Dhamar, where the project was launched earlier, no longer have committees; a number of committees in Hodeidah have perished as well. Institutions are proving more durable than infrastructure, but they, too, require maintenance, and that maintenance is not adequately available. Institutional sustainability cannot be taken for granted.

It should not be supposed that the basic model of participatory, democratic community governance promoted by SURWAS has been transposed unchanged into Yemeni society. More often than not, existing authorities and power structures are prominent or dominant in community water committees. While this arguably weakens consumers' voice in management of their water systems, it does usually reinforce the effectiveness of that management. At the same time, more participatory concepts such as periodic elections to committee membership and consultations with the general public are at least partially taken root in Dhamar and Hodeidah.

One aspect of institutional development where SURWAS values have definitely not been transposed concerns women's participation. Not surprisingly, the institutional landscape for community water governance reflects Yemeni cultural values, which continue to exclude women from any role in such matters. This detracts from the potential performance of water supply systems and is a fundamental reason why local institutions continue to give little or no attention to hygiene and sanitation issues. SURWAS has had no sustained results with regard to gender in institutional development.

Involvement of women in community self-management still has a long way to go. With few exceptions, gender appears more neglected than mainstreamed... The GARWSP chairman [stated in 2007] that despite his personal conviction that women are better water managers than men, "women only participated in three new [Water User Associations] in 2006 (out of 200 that were established)." A combination of community reluctance and GARWSP lack of social mobilisation capacity appears to be the cause.

World Bank, 2007: 48

SURWAS' outputs at the community level could have been greater if a less participatory approach had been adopted. More schemes could have been built if less time had been invested in involving users in their design and construction and developing the institutional capacity to operate them. If that had been the case, however, the project's outcomes would have been far less convincing. The continued operation of the water supply systems that SURWAS helped install is largely attributable to the durability of the community institutions that manage them. The achievements of these institutions are the successful result of a combination of the principles instilled by the project and the values and structures inherent in Yemeni society.

Rural communities are aware that the institutional landscape is changing at district and governorate levels. The decentralisation of GARWSP and the strengthening of its Branch Offices are of little direct concern to them, although the General Authority's strategy is clear and appropriate from the perspective of Sana'a and should make it less of a political marketplace than it has been in the past. The growing role and responsibilities of Local Councils are much more relevant to the rural population. The authority, resources and effectiveness of these bodies remain uneven. This study has shown the differing views communities across Dhamar and Hodeidah have about Local Councils' involvement in rural water supplies. But the trend is evident and promising, linked as it is to governorate institutional reforms towards democratisation and efficiency. Again, accomplishments are only partial so far: with regard to their water sector, citizens of Hodeidah can rely on more coherent and professional support from their governorate agencies than the people of Dhamar. The relationship between the technical service role of GARWSP and the planning, facilitation and monitoring roles of Local Councils is also becoming clearer to all parties (communities, Councils and General Authority BOs). However, the performance of this triangular relationship remains variable in practice.

The institutional strategy developed by SURWAS is reflected in the current policy of GARWSP and in implementation by GARWSP through all its branches in 20 governorates of Yemen. Now clearly defined institutions, roles and responsibilities are adequately understood and fulfilled by beneficiaries and other stakeholders.

A demand responsive approach has been adopted throughout. There is full community participation in preparing a water supply plan and in selecting technology

alternatives; in sharing the cost of construction; in construction of facilities; in formation of a water committee; in building the capacity of the water committee; in community-based operation and maintenance; and in monitoring. Sustainability is promoted through closer work with community institutions and commitment between GARWSP and the beneficiaries.

The coverage of rural water supply services is increasing at an accelerating rate, at a decreasing cost per capita. Finance is targeted to the greatest need. The capacities of partners are built and promoted. A common approach has been developed, to be followed by all entities operating in the sub sector. There is strengthened co-ordination between all these entities, and a strong and diversified base of partners. The RWSS Strategy is endorsed and put into effect by GARWSP and other RWSS stakeholders. Transparency is promoted in all the operations of GARWSP.

From a statement by the Chairman of GARWSP to the research team, September 2008.

This study has shown that the institutional strategy developed by SURWAS is widely reflected in current policy and institutional arrangements (see box). Like countless other development projects around the world, however, it took SURWAS a long time before the strategies now endorsed as appropriate were finally developed, soon after which it was discontinued. Appropriate institutional approaches were only consolidated during Phase V. It is reasonable to assume that had they been developed more quickly, during earlier phases of the project, the overall sustainability of SURWAS' achievements would have been substantially greater. Had they been continued longer – in other words, had SURWAS not been terminated so abruptly during Phase V – the sustainability of the project's outcomes would have been reinforced.

Section 5.3.2 showed that, at the end of Phase V, both SURWAS and its evaluators recognised the impossibility of the General Authority sustaining the levels of facilitation and institutional support that the project had provided. This has indeed turned out to be the case: post-SURWAS schemes are provided with significantly less training and facilitation input than those supported by the project. It is difficult to establish whether this has materially reduced the achievements of these schemes, since – partly because of SURWAS – the general principles and systems of user responsibility in managing water supplies are now widely known and applied. The post-SURWAS reduction of inputs most directly affected the linked aspects of gender, hygiene and sanitation.

SURWAS' institutional strategy gradually focused more on the central, national level. Whereas the project's earlier management focused on getting things done at community level, there was growing recognition in later phases that Yemen needed support in building an effective central authority for rural water supply. Although the General Authority SURWAS Phase V worked with was closed at roughly the same time as the project itself, many of the principles and approaches that SURWAS promoted in Sana'a can still be recognised in the continuing development and ongoing practice of GARWSP.

5.11 Sustainability of services

Whether community-level institutions have the capacity to perform the required functions in the long term depends mainly on two kinds of capacity.

First, do community water committees have the financial capacity to maintain their infrastructure? Evidence from this study suggests that many of them are able to fund routine maintenance, but that few, in the current situation, are able to pay for the major renovations that become necessary after a decade or more. Most SURWAS schemes have now reached that age. In certain cases committees were able to afford new pumps, but it is likely that this was made possible by richer community members who supplemented the funds collected through user fees.

Secondly, do community water committees display institutional sustainability? The answer is similar. As this study has shown, these village institutions have achieved impressive levels of competence and self-reliance. They certainly seem more sustainable than their national counterparts. Many of them are able to run their local water supplies year after year with little or no support from GARWSP, the Local Council or the governorate. But, as can be expected anywhere and especially in Yemen, frictions and disputes do arise and occasional outside support, quite reasonably, remains necessary. Such support is not adequately available, though GARWSP has extended its social mobilisation support by an additional six-month period following the completion of physical works in rural water schemes.

A third kind of institutional capacity is essential as well. Community committees must be able to employ people with the technical skills to operate and maintain the schemes. This does not seem to pose a problem. Rather few schemes are managed by operators who were trained (all by SURWAS), but it is evidently possible to find people with adequate technical background. Still, pumps and

reticulation would arguably last longer if all operators and maintenance staff had received comprehensive technical training.

Our findings raise basic questions about what institutional ‘sustainability’ really means. In the context of development co-operation, it normally refers to the ability to continue intended functions and activities without further external support. This support is generally assumed to come from donors outside the country in question. From a domestic perspective, however, the concept of sustainability is more complex and, perhaps, less relevant. Elements and structures within a society are bound to be at least partially interdependent and almost all political systems – certainly that of Yemen – maintain that there must be a certain level of transfer of resources to support poorer and weaker institutions and citizens.

It is certainly difficult to define what ‘sustainability’ means with regard to the national Yemeni institutions involved in rural water supply. The answer to the specific evaluation question – whether GARWSP and other agencies have the capacity to perform the required functions in the long term – remains as yet difficult to answer. Such has been the institutional turmoil and uncertainty in this sector over the last ten years that it is impressive that GARWSP maintained its current level of capacity – due in no small part to the consistent support provided by the Netherlands. Thanks partly to the efforts of SURWAS, there are encouraging signs of ‘sustainability’ in community water supply institutions. Despite the efforts of SURWAS and many others, and although real progress is being made, there are fewer signs yet of that elusive quality at national level.

At the national level roles and responsibilities are least clear. Clarity is emerging, at least in theory, as the institutional confusion of the early part of the decade is dispelled. In practice, however, as section 5.5 showed, there is continuing dissent about the appropriate balance between institutional development and delivery on the ground. The Netherlands remains clear about its strategy and emphasis, supporting the core role and development of GARWSP in the same manner as SURWAS supported its predecessor. Other agencies confirm the central role of GARWSP but prefer parallel delivery mechanisms in the short to medium term. There is thus a tension between the desire for institutional clarity and the need for performance in the field. The challenges to sustainability persist. There is little clarity about future support for community schemes and institutions set up through these parallel implementation channels. But if GARWSP’s own capacity for local institutional support is not more convincingly developed, the supposed core agency for the sector will not be able to guarantee the sustainability of community

schemes, either. Meanwhile, much of the institution building efforts are currently devoted to water resource management through NWRA (section 5.9) and a planned hierarchy of user representative structures. However vitally important water resource management may be in Yemen, more clarity is needed about how GARWSP and NWRA, and respective user/consumer institutions, are to interact. Also, more commitment is needed to ensure that they collaborate in practice. It is anticipated that current efforts to update and revise the NWSSIP will facilitate such closer collaboration, for example in the context of joint preparations for water master plans.

At all levels, effective monitoring is a key element of sustainable operations. Current institutional arrangements do not make adequate provision for results-based monitoring. (Earlier Netherlands-funded efforts to provide technical assistance to the RWSSP and GARWSP in order to develop a monitoring system were unsuccessful.) In fact, very few monitoring activities are presently carried out. No arrangements have been made for systematic monitoring of the quality of the water supplied by village schemes, either by local committees or higher authorities. Ongoing groundwater depletion points to the need for monitoring of water levels, particularly of sources used for safe domestic water supply, and for sound systems for timely follow-up action when needed. GARWSP ascribes the monitoring issues largely to the fact that neither it nor the Ministry of Water and Environment has offices or representation at the level of Local Councils, as some other agencies do. It has not been possible to trace any of the foundations of the monitoring system laid by SURWAS to organise baseline data collection in each new scheme area. None of these baseline data, which would have been highly valuable for this study, could be found. New efforts are presently being made by the Ministry of Water and Environment to establish a monitoring system for the water sector as a whole, with specific reference to the implementation of the NWSSIP. A national inventory of the rural water and sanitation status is being prepared and is intended to serve as the foundation for further monitoring activities.

When issues arise at local level, it is usually up to users and their local leadership (sometimes including the water committee) to lobby for attention at higher levels, ideally through their Local Council to the GARWSP Branch Office. Despite limited progress in database development, GARWSP not even has a complete overview of all the rural water schemes it is supposed to monitor and support, let alone the baseline data supposedly assembled by SURWAS. However, the developing role of Local Councils in monitoring and follow-up support is likely to promote the sustainability of infrastructure and institutions. In some cases, Local Councils

assess community committees' performance and mediate disputes. However, developing the strong local government that sustainable rural water supply requires will take a long period of commitment and effort.

5.12 Summary and conclusions

At community level, the institutional structure promoted by SURWAS is now widely established in Yemen and is the norm in Dhamar and Hodeidah governorates. The policy principle of user responsibility through community institutions has taken root in the governance of rural water supplies in Dhamar and Hodeidah. Institutional roles and responsibilities are clearly defined, understood and fulfilled in most communities. This can be attributed to the convergence between SURWAS approaches and support and the self-reliance and robust local structures found in many Yemeni communities.

Nevertheless, SURWAS and its institutional approaches have not been able to provide access to safe water to all. Whether a community could benefit from a SURWAS scheme depended on factors such as location, settlement size, local politics and leadership. There was, and is, a significant political dimension to beneficiary selection. Consequently, certain communities benefit from their leaders' connections and capacities, whereas others suffer because of local strife or lack of leadership.

Most of the community committees facilitated by SURWAS still function and there is a significant correlation between the continued operation of the water scheme and the continued functioning of the committee. Very few women hold office on these committees or participate in any way in community water management. SURWAS clearly made little progress on the basic gender dimensions of local water governance. In fact, SURWAS achieved sustainable institutional performance in those aspects of its community water management model that most conformed to existing Yemeni attitudes, capacity and culture. Sanitation, hygiene and gender were never accorded the same priority, either by the project or by its hosts. Nevertheless, GARWSP's current approach and policy recognise the importance of appointing women to responsible positions in its headquarters and Branch Offices in such fields as engineering, management and social mobilisation and the Chairman reports progress in this regard (A. Soraimy, pers. comm.).

Community water committees continue to manage scheme operations and collect user fees. They arrange and pay for a variety of maintenance tasks, though few can afford the major renovations, such as the installation of new pumps, that are

increasingly necessary as SURWAS schemes age. In keeping with Yemeni culture, their attitude to those who find paying their water fees difficult or impossible is benign. Very poor people are often allowed free water. Few defaulters find their supplies shut off.

However, two factors constrain this apparent institutional success. The first is local conflict, which is not uncommon in Yemen. It prevented SURWAS from working in several villages and continues to preclude development of water supplies in a number of cases. The second factor is the general institutional erosion that is increasingly apparent. Institutional sustainability cannot be taken for granted. Village institutions have acquired most of the skills to perform their functions in the long term, but, like pumps and pipes, these need some ongoing maintenance. This maintenance is rarely provided, although Local Councils are meant to take on at least part of the responsibility for providing institutional support.

This study has shown that the institutional strategy developed by SURWAS is widely reflected in current policy and institutional arrangements. Like countless other development projects around the world, however, it took SURWAS a long time to develop the strategies that are now endorsed as appropriate, and soon after ended soon after that stage had been reached. Appropriate institutional approaches were only consolidated during Phase V.

Definition, understanding and fulfilment of institutional roles and responsibilities become less clear as one moves up the governance spectrum through district and governorate institutions to the national level. In the context of local government reform and a stronger role for Yemen's 333 Local Councils, both devolution and decentralisation are taking place. While authority and resources are devolved to these Councils in several sectors, this is not taking place with regard to rural water supplies. GARWSP is actively decentralising to its Branch Offices, but devolution to Local Councils is not yet on the agenda. The strengthened BOs, including those in Dhamar and Hodeidah, are collaborating more closely with Local Councils, though the capacity of the latter is still weak and uneven.

At national level, dissent about appropriate institutional strategies in the short to medium term continues, despite the achievements of the new Ministry of Water and Environment and agreement about the central role of GARWSP. Although good progress has been made increasing rural water supply coverage and strengthening Branch Offices, the General Authority does not yet have the capacity to perform its functions in the long term. A number of observers and donors have argued that

heavy emphasis on building GARWSP capacity may detract from delivery in the field, which should therefore also be supported through other agencies. Others – notably the Netherlands – argue that GARWSP is building its capacity and delivering at the same time and that it is the other programmes and agencies that cause distraction.

Since SURWAS ended, the Netherlands has continued to support the institutional development of the central agency for the rural water sector. GARWSP's main challenge, as for many public institutions in Yemen, has always been to develop a more focused, structured, efficient and cost-effective mode of operation. The organisation has managed to retain much of the technical competence developed in earlier years, but has been significantly weaker on the social side. It has accomplished very little with regard to rural sanitation. In his attempts to transform the General Authority from a marketplace of political intrigue, bargaining and compromise into a transparent and efficient organisation, the Chairman has enjoyed strong Dutch support. Presently, that support once more includes the funding of rural water supply schemes in selected areas, as part of the Netherlands' on-budget support for the National Water Sector Strategy Investment Plan.

While other funding agencies recognise and support GARWSP's key role, they are not as convinced as the Dutch that the urgent need for enhanced rural water supplies should be met by implementing new schemes through the General Authority. Instead, three major programmes are currently implemented separately through the Rural Water Supply and Sanitation Project, the Public Works Project and the Social Fund for Development. These programmes, with their separate management and delivery structures, have "thrived on their autonomy and freedom from the constraints of the Yemeni administration" (World Bank, 2007: 55), but have complicated the institutional landscape and are arguably slowing the development of GARWSP.

A new, parallel hierarchy of institutions, from Water User Groups to Basin Committees, is now promoted for water resource management purposes. Still at a pilot stage, these structures are developed to address the dominant institutional issues in the Yemen water sector, which concern management of the 93% of water resource use devoted to agriculture. Thus far, local water resource management institutions have little or no connection with those managing domestic water supplies.

In general, the institutional strategy of SURWAS had a major impact on its achievements and sustainability. It slowed the project's performance. On the other hand, 85% of the surveyed schemes built by SURWAS still functioned in 2007. This is a significant level of sustainability, although obviously not perfect. The continued operation of the water supply systems that SURWAS helped install is largely attributable to the durability of the community institutions that manage them. The achievements of these institutions are the successful result of a combination of the principles instilled by the project and the values and structures inherent in Yemeni society.

The main issues that put pressure on sustainability are lack of funds for the replacement of pumps and other major components of the infrastructure and conflicts that cannot be solved by the community water committee itself. When issues arise at local level, it is usually up to users and their local leadership (sometimes including the water committee) to lobby for attention at higher levels. The developing role Local Councils have in monitoring and providing follow-up support should help to promote the sustainability of infrastructure and institutions. However, developing the strong local government that sustainable rural water supply requires will take a long period of commitment and effort.

Annex 1 Terms of reference

1 Rationale, purpose and scope of the evaluation

Netherlands development co-operation has been active in water supply for over 30 years. The Policy and Operations Evaluation Department (IOB) of the Netherlands Ministry of Foreign Affairs has initiated a series of impact evaluations of support to water supply and sanitation activities. This impact evaluation concerns the Netherlands-supported schemes in Yemen, Dhamar and Hodeidah Governorates, where the Netherlands' involvement started as long ago as 1982. In addition to impact the evaluation will study the contribution of the water user organizations and governmental and other support organizations involved at Governorate and local level to sustainable results.

The evaluation will cover the period 1991-2006. In this period the 'Support for Rural Water Supply Project' phase IV (SURWAS project 1991-1996) and phase V (SURWAS project 1996-2001) were implemented. During phase IV water supply schemes were supported in Dhamar Governorate. In phase V support was extended to water supply schemes in Hodeidah Governorate, which continued up to 2001. During phase V support to Dhamar Governorate was phased out.

Since 2005, the Netherlands has provided programme aid to the National Water Sector Strategy and Investment Program through the General Authority for Rural Water Supply Projects (GARWSP). The 2005-2006 aid programme contributed to the delivery of safe drinking water to 125,000 inhabitants in five governorates through the completion of 32 water schemes. Support to GARWSP under the Program Aid Support Water Sector (PAWS) is expected to deliver rural water supply and sanitation to 900,000 rural people through 301 completed and rehabilitated water supply schemes in 10 Governorates, including Dhamar and Hodeidah. The concerned schemes in these two Governorates are included in the study of local institutions.

During the SURWAS projects a community-based, demand-responsive and gender-specific methodology for the implementation of the water supply schemes was developed and further improved. Important elements of this methodology are taken up in the ongoing National Water Sector Strategy and Investment Program (NWSSIP).

The purpose of the impact evaluation is to study the impact of past support to rural water supply and sanitation in the two Governorates as well as, based on its findings, draw lessons that will be useful for rural water supply and sanitation policy and implementation. This particular impact evaluation is also expected to contribute to methodological knowledge on impact evaluation of water supply and sanitation activities in general.

Yemen and the Netherlands are both signatories to the Millennium Development Goals that include targets for reducing the proportion of people without access to safe drinking water and without access to hygienic sanitation. The ultimate purpose of support to water supply and sanitary facilities goes beyond access: it is intended to improve health, reduce the time used for collecting water, by women and girls in particular, raise school enrolment and attendance and enable increased productivity. There is consensus on the importance of such ultimate impacts on human welfare but conventional evaluation studies do not usually quantify them. Quantification is a key characteristic of the proposed impact study.

The study will consist of four parts. The first part describes the major problems and the context for water and sanitation activities in Yemen since 1991. The second part describes the key interventions and direct results, such as the number of functional schemes and beneficiaries of the projects since 1991. The third part presents the analysis of the impact, such as on health improvements and to attribute these to the project activities. The fourth part presents an analysis of the extent to which Water User Associations, GARWSP Branch offices, Local Councils and other concerned agencies manage to ensure safe water schemes and hygiene and sanitation practices for a long period of time.

2 Background and context of the supported schemes

Yemen is a poor country and most of its people are poor or very poor. The 1998 Household Budget Survey indicated that approximately two thirds of the population were poor, with expenditures of less than US\$1.50 a day (70% of the rural population and 58% of the urban). Water problems are a major component

of poverty in Yemen. Current access to improved water sources in rural areas is estimated at 37% and to sanitation at 20%.

Yemen is divided into 20 Governorates in addition to the Sana'a Capital Secretariat. The Netherlands support to rural water supply needs in Dhamar region in the 1980s was a response to an emergency situation as a result of a severe earthquake in 1982. This support continued up to 1998. Hodeidah Governorate was selected for support as it is one of the poorer Governorates in Yemen.

Dhamar is located in the western part of the republic of Yemen, approximately 100 km from the capital Sana'a. The Governorate is divided into 12 districts that are ruled by Local Councils and has a total population of approximately 1,370,000 people. Agriculture is the main economic activity; the main products are cereals, fruits, vegetables, fodder and cash crops such as qat and coffee. Other activities include livestock production and bee honey production. Mountains, plains and plateaus characterize the terrain comprising mountain chains that extend from the north to the south.

Hodeidah is also located in the western part of the republic, bordering the Red Sea over a long stretch (approximately 300 km) and located about 225 km from the capital Sana'a. Hodeidah is divided into 26 districts and has a total population of approximately 2,220,000 people. In Hodeidah agriculture is the main economic activity as well, followed by livestock farming, fisheries, production of bee honey and industry (cement, salt, tobacco and cotton related industries as well as transformative industries such as juice and canned food production). Hodeidah largely covers a plain with a slight slope towards the sea, which is crossed by numerous wadis that flow to the sea.

A typical SURWAS-supported rural water scheme consists of a well, pump and pump house, overhead tank and distribution network with water connections within household compounds, although some schemes have neighbourhood water points. Schemes serve populations usually ranging between 700 and 4,000 people. The number of water supply schemes supported in the two regions since 1991 is 34 in Dhamar and 36 in Hodeidah. In Hodeidah, six additional schemes were supported through the Netherlands programme aid provided to NWSSIP. Dhamar plans to use the Netherlands programme aid to support another 19 schemes.

Over the years, the projects have increasingly been implemented in collaboration with the Government. Since 1992 the General Authority for Rural Electrification

and Water Supply (GAREWS) is the authority responsible for all rural water supply activities.

Since the 1970s developments in Yemen, particularly the growth of irrigated agriculture, have drastically increased the demand for water. Currently about 90% of the scarce water resources are used for irrigated agriculture. Unregulated access to drilling rigs and pumps led to a rapid increase in groundwater extraction in many regions. By the early 1990s problems arising from falling groundwater levels began to emerge and have become very serious in some of the basins. The need for regulation, water resource planning and management and improved sector performance became increasingly clear and in the course of time a new institutional landscape emerged to respond to this need.

In 1995, the National Water Resources Authority was created as the country's sole agency responsible for water resource planning and management. In 2002, the Water Law was approved providing a legal basis for groundwater extraction. That same year, the Ministry of Water and Environment was established to reorganize the water sector and create an integrated structure for water management. The new Ministry provides an umbrella structure for the different organizations and agencies involved in the water and environment sector, except for those dealing with irrigation. The General Authority for Rural Water Supply Projects (GARWSP) was also established in 2002 and placed under the authority of the Ministry of Water and Environment in 2003.

In response to the growing crisis in water resources and services the Government of Yemen and national and donor stakeholders agreed on the National Water Sector Strategy and Investment Programme 2005-2009 (NWSSIP) in 2004. The overall objective for its rural water supply component is the rapid expansion of water and sanitation services in rural areas, targeting to provide services to more than 5m people by 2015. Major policy issues include 1) adoption of decentralized implementation mechanisms, 2) enhancement of the beneficiary community's role 3) adoption of a demand-responsive approach to identify targeted communities, which is to become standard practice and 4) targeting and cost-effectiveness, by identifying means to meet the needs at lower costs. The approach includes integrating sanitation and hygiene in rural water schemes, ensuring and protecting water sources and their quality, improving targeting and sustainability by adopting bottom-up approaches and mainstreaming gender issues, broadening the range of partners and directing available funds to the greatest need.

3 Evaluation questions

Problem and context

- 1) What have been the key aspects of the problems addressed by, and the context of, the Netherlands-supported water supply and sanitation activities in Yemen since 1991?

Project description

- 2) What were the objectives of Phases IV and V of the SURWAS project?
- 3) What approach was adopted during Phases IV and V of SURWAS in order to meet these objectives?
- 4) What inputs were provided during these two phases of the project?
- 5) What activities/interventions were undertaken during Phases IV and V of SURWAS?
- 6) What were the outputs (water supply schemes, sanitary facilities and hygiene and sanitation promotion) of these two phases and were targets achieved?
- 7) Who were the beneficiaries of Phases IV and V of SURWAS?
- 8) What were the total costs, subsidies, user contributions, water charges and costs per beneficiary of Phases IV and V of SURWAS?

Outcomes and impact

- 9) What has been the change in the proportion of the population with access to an improved water source changed since 1991?
- 10) Are there households in the target community that lack access to the water supplied?
- 11) Has the quality and quantity of the water consumed changed?
- 12) What has been the change in the access of the population to an improved sanitary facility?
- 13) What has been the effect on hygiene awareness and improvement of practices?
- 14) What have been the effects on the health of the population?
- 15) What has been the effect in terms of time use for collection of water?
- 16) Has productive use been made of the time saved and/or improved water availability?
- 17) What have been the effects on school attendance, graduation and female participation?
- 18) What positive and/or negative unintended effects occurred?

Institutional analysis

- 19) How did the institutional strategy of SURWAS evolve during Phases IV and V?
- 20) How did the project's institutional strategy affect its outputs and outcomes during Phases IV and V?
- 21) Is the institutional strategy developed by SURWAS reflected in current policy and institutional arrangements?
- 22) Are institutions' roles and responsibilities now clearly defined?
- 23) Are institutions' roles and responsibilities adequately understood and fulfilled by beneficiaries and other stakeholders?
- 24) Do the relevant institutions have the capacity to perform the required functions in the long term?
- 25) Do institutional arrangements include adequate provisions for result-based monitoring?
- 26) Have monitoring and follow-up support arrangements promoted the sustainability of infrastructure and institutions?

4 Methodology

Problem and context

Question 1 will be answered on the basis of literature review and interviews with key informants. Policy developments will be a key aspect of the context described here.

Project description

Questions 2-8 will be answered largely on the basis of a review of project documentation, particularly project design documents, completion reports and evaluation reports. In the fieldwork described below, descriptions of activities, results and costs in the official documentation will be cross-checked with the descriptions given by residents of the sample villages where SURWAS operated during Phases IV and V. Interviews with key informants will provide supplementary information.

Outcomes and impact

In order to answer questions 9 to 18, a major component of the study consists of fieldwork (purpose-built survey) to collect data at the village level in a sample of villages. In addition, the study will make extensive use of existing data. These are usually kept at the local level (village, health unit or school) and their collection will therefore be combined with the fieldwork in the villages.

Provisionally a sample of approximately 100 villages is envisaged, stratified by governorate (Dhamar and Hodeidah) and by whether or not there is a SURWAS scheme (50 “with” and 50 “without”). We will cover the period between 1991 and 2001 (phases IV and V of SURWAS) and our interest is in SURWAS schemes introduced within that period. Sampling probabilities will be proportional to village size (in terms of population). A small number of additional villages where post-SURWAS schemes were implemented will also be included (with a customised questionnaire). Although the impact analysis is focused on SURWAS interventions, this extension will generate some information on later schemes allowing us to compare the two at least in a descriptive sense.

The impact analysis will rely both on comparisons between villages (those “with” and “without” SURWAS schemes) and on comparisons over time (“before” and “after”). To take an example, it is likely that interventions have resulted in a reduction in malaria incidence. A comparison of malaria incidence in 2007 between “with” and “without” villages might suggest a positive impact of the interventions. However, this would obviously not be fully convincing: since interventions have not been allocated randomly to villages it is possible that those who benefited from SURWAS schemes already had lower malaria incidence prior to the intervention. In that case the “with-without” comparison would be biased: it would overstate the health effect of the water schemes. Fortunately, considerable information on the villages is available and this will help to correct this bias by accounting for other differences between villages that may contribute to malaria: differences in observed village characteristics can be taken into account in the statistical analysis.²⁰

Ideally the “with-without” comparison is combined with comparisons over time. This would prevent an incorrect attribution in case, for example, malaria incidence had fallen everywhere for reasons unrelated to the water schemes. More generally, comparisons over time allow us to deal with the effects of village characteristics that are not observed. This is important because impact studies without a randomized design can always be faulted on the ground that not all potentially relevant variables have been included in the analysis. Where baseline data are available this problem can be reduced significantly. Accordingly, the question is not whether, say, malaria incidence in 2007 is lower in the programme villages than in the control villages but rather whether incidence has fallen more over a particular period in the former group than in the latter group of villages.

²⁰ Technically, this is done by including such characteristics as control variables in the regression. This means it is explicitly taken into account that the health outcome is not only determined by the policy intervention of interest but also by these village characteristics.

Three domains of impact will be considered:

- Health improvements: reduced incidence of water-related diseases;
- Gender impact: changes in time taken to collect water by women and girls and the impact of time savings on school enrolment and outcomes;
- Livelihood: productive use of time savings and beneficiaries.

It appears that baseline data for health exist. The health units (and health centres) record diagnoses for all people seeking treatment. They have been doing so for a long time and spot checks suggests that old records (e.g. for 1984) can be consulted. These records can be used to measure baseline incidence of diseases likely to be affected by the schemes: malaria, eye infections, diarrhoea, skin diseases, intestinal worms and bilharzia.²¹ This will require members of the survey team to visit the nearest health unit (or, where appropriate, health centre²²) for each village in the sample and count the number of recorded cases in which people from these village were diagnosed with one of the relevant diseases. Similarly, village schools keep records of enrolment and school attendance (reported to be measured three times per year during unannounced visits). These records can be used as “before” and “after” measures of enrolment. In addition, SURWAS collected extensive baseline information for the schemes, but no such information is available for the control villages. However, these data can be used to determine whether changes in the treatment villages differ from aggregate trends.

The scope for establishing impacts on livelihood appears limited. Based on the focus group discussion the extent to which time savings were used productively, e.g. for additional farm work, will be explored and, if so, who benefited. The implication is that we expect results on impact in terms of health and enrolment changes to be more conclusive than results for livelihood impacts. (Anecdotal evidence suggests that water interventions have had major effects but have not led to changes in livelihood sources.)

The data to be collected in the villages concern: the amount of water used, payments for water, water sources used in the past, changes in health, changes in time spent on water fetching, perceived effects of the scheme on women’s lives,

21 A particular complication is that in certain parts of the country villagers typically seek treatment in private clinics, bypassing health units. In these cases data must be collected at one or more of such clinics. It is not yet clear what records they keep and whether they will be willing to make these available.

22 Serious cases are referred from health units to health centres. These also serve as the first line institution (i.e. as de facto health units) for the surrounding area.

sanitation facilities, hygiene training or awareness raising activities carried out and the extent to which key messages are still remembered and observed (e.g. hand washing). In addition, information will be collected on water facility management, the functioning of Water User Associations, the election of committees, people's ability to maintain and repair equipment, the effects of recent increases in water charges (notably on the poor) and the financial resources of the group. These data can be used to assess institutional arrangements.

Some of these data will be collected from a sample of respondents in focus group discussions; other information will be collected for all households (e.g. water use and payments, from the water meter readings). Special arrangements will be made to conduct interviews with women. Where appropriate, we will use exactly the same form of questionnaire or focus group format as was used by SURWAS in the baseline survey.

During the field work water samples will be taken in all sample villages. Chemical and biological tests will be conducted to establish water quality (e.g. in terms of fluoride content or presence of *E.coli* bacteria).

The period covered by the impact analysis is 1991-2001 (phases IV and V of SURWAS): 1991-1998 in Dhamar and 1996-2001 in Hodeidah. Revisiting the SURWAS communities in 2007 (after a substantial interval) is important as it allows us to assess the sustainability of the approach.

The impact analysis will use statistical tools to assess whether the observed changes can be attributed to the intervention, how large the effects are (e.g. in terms of reduced incidence of diarrhoea) and whether these effects are statistically significant.²³ In evaluations, an intervention (e.g. the provision of a piped water scheme) is an activity creating impact via intermediate outputs. It is therefore appealing to follow this logical sequence in the evaluation. Instead, the approach directly relates impact variables to inputs, bypassing the output and outcome variables.²⁴ However, the qualitative information collected will provide valuable insights into these intermediate steps.

23 This methodology was tested in the earlier IOB study of water and sanitation interventions in the rural Shinyanga region of Tanzania. It relies on regression techniques to account for the various determinants (including the intervention itself) of the variable of interest. Where possible, it uses "double-differencing", i.e. combining comparisons between "treatment" and "control" villages (those with and without water schemes) with comparisons over time (differences between current and base-line results).

24 Statistically this amounts to estimating a reduced form rather than a structural model. Estimating a structural model would involve relating impact variables to outcome variables, outcome variables to output variables and so on, as in a logical framework. Unfortunately, this seemingly attractive approach is riddled with estimation problems since many of the regressors are bound to be "endogenous" and therefore lead to biased estimates.

Data collection not only provides input into this statistical analysis, but also into the descriptive part and the institutional analysis. At various points, links will be established between the different kinds of data collected. For example, the impact evaluation stops at establishing the impact of the interventions, a major task in itself. One can take the analysis a step further by combining the estimated impacts with the available cost data on SURWAS activities (reported in the descriptive part of the study). This study will not produce a cost-benefit analysis; it can, however, present both the main impacts of interventions and their costs.

Institutional analysis

Questions 19-26 will be answered on the basis of:

- review of documentation;
- interviews with key informants at national, governorate, district and community levels;
- questions included in the field surveys undertaken in villages that took part in SURWAS projects and in those that did not.

The relevant institutional issues span the whole spectrum of governance, from national to community levels. The study will focus on local institutions, as this is the level of governance most critical to the sustainability of rural water supply and sanitation arrangements. However, it will also address the changing structures and roles at national level and their influence on the implementation of rural water supply and sanitation programmes. Other topics to be covered will include:

- the influence of recent changes in local government legislation and institutions on the management and sustainability of rural water supplies;
- factors influencing variance in local water management institutions' performance and sustainability;
- the influence of multiple agencies' involvement on the implementation and sustainability of rural water and sanitation projects;
- the extent to which SURWAS institutional approaches are reflected in current national policy and practice.

These Terms of Reference include an evaluation matrix guiding the data collection and analysis.

5 Organisation and timing

The impact evaluation will be a joint effort of the Policy and Operations Evaluation Department of the Netherlands Ministry of Foreign Affairs (IOB), the Amsterdam Institute for International Development (AIID) and the Yemen organisation Soul (Society for the development of Women and Children). IOB will be responsible for overall supervision and funding of the study. AIID is the main consultant for the implementation of the study and established collaboration with the organisation SOUL for this purpose.

The major activity of the study will be village-level data collection. This requires sophisticated quantitative and qualitative data collection techniques. A substantial involvement of Yemeni researchers and students is envisaged, both in data collection and in the subsequent analysis.

The tentative planning of the study is as follows:

- March – April 2007: study of existing data and documentation, preparatory activities for the field survey;
- May - June: field survey and institutional assessment;
- July - November: data analysis and first draft report.

A reference group will be appointed for the impact evaluation. It will include three members who will also serve on reference groups for other impact evaluations of Netherlands support to the water supply and sanitation sector:

- a representative of the Netherlands Ministry of Foreign Affairs department for environment and water;
- a representative of the Netherlands Ministry of Foreign Affairs department of effectiveness and quality of development co-operation;
- an expert of the IRC International Water and Sanitation Centre.

The reference group will also include two members who can offer specific expertise for the impact evaluation in Yemen.

This reference group will comment and advise on the main draft documents for the impact evaluation.

The draft report for the study of the programmes will be shared with the General Authority for Rural Water Supply Projects and the Embassy of the Kingdom of the Netherlands for their comments. IOB has final responsibility for these documents.

Evaluation matrix:

Objective-means	Indicators/variables	Sources
Input Operationalisation of activities	<ul style="list-style-type: none"> • Policy, legal and institutional context • Project objectives • Institutional setting of the projects • Financial inputs • Technical, social, institutional and financial approaches: <ul style="list-style-type: none"> • Water supply, sanitation and hygiene interventions (type, number, standards); • Water user participation, legalities, gender issues, involvement of the poorest; • Institutional arrangements, support to Water User Associations (legal, financial, organisational development, training, hygiene awareness and promotion, etc.); • Design, planning, implementation, M&E; • Costs, funding, user contribution and water charges, share of household budget 	Policy and strategy documents Project design documents Progress and completion reports Evaluation reports Results of interviews with key informants
Output Water supply and sanitation facilities Sanitation and hygiene awareness Water User Associations Support institutions	<ul style="list-style-type: none"> • Direct results/achievements: <ul style="list-style-type: none"> • Number and percentage of (functioning) water supply and sanitation facilities; • Sanitation and hygiene awareness and promotion activities; • Special provisions such as for vegetable gardening, if any • Water user participation (m/f) • Establishment and organisational development of Water User Committees, training in operation and maintenance, bookkeeping, etc. (m/f) • Institutional arrangements for support: setup, roles and responsibilities, coordination, funding 	Project documentation Results of village-level data collection Results of interviews with key informants

<p>Outcome</p> <p>Increase in number of beneficiaries of improved facilities</p> <p>Quantity and quality of water consumed</p> <p>Sanitation and hygiene practices</p> <p>Social inclusion</p> <p>Status and functioning of Water User Associations</p> <p>Institutional support and sustainability</p>	<ul style="list-style-type: none"> • Number of users/beneficiaries of improved water sources and sanitation facilities • Changes in quantity of water consumption for drinking and hygiene • Quality of drinking water • Access to and use of sanitation facilities (m/f) • Changes in sanitation and hygiene practices • Poor/marginalised groups: who are the poorest, what is their access to the facilities • Legal status, rights and responsibilities of Water User Associations • Functioning of Water User Associations: <ul style="list-style-type: none"> • Male/female participation and membership • Organisational setup • Frequency of meetings • Relation with higher structures • Elections • Operation and maintenance • Breakdowns and how solved • Roles regarding hygiene and sanitation • Financial management for payment of recurrent costs and savings for repair and replacement of infrastructure • Conflict management • Institutional support and sustainability: implementation capacity, coordination and co-operation, arrangements for long term environmental, technical, financial and institutional sustainability, result-oriented monitoring and (follow-up) support 	<p>National and local statistical data</p> <p>Results of village-level data collection, focus group discussions and interviews of key informants</p>
<p>Impact</p> <p>Health, livelihoods, gender equality</p>	<ul style="list-style-type: none"> • Incidence of water and sanitation related diseases • Livelihood: use of extra time, water and financial savings for livelihood/productive purposes and benefits (m/f) • Gender equality: <ul style="list-style-type: none"> • girls' school attendance and enrolment 	<p>National and local statistical data</p> <p>Results of village-level data collection</p>

Annex 2 List of survey villages

From each village 10 households were randomly sampled and asked to participate in the survey. If preparatory investigations indicated that a number of village households were excluded from a water scheme, two of the excluded households were selected in the village household sample. If a water committee was present it was asked to participate in the committee survey. The lists below give village name, scheme presence or type and “triplet”: villages from the same triplet are located within a short distance from each other. See also the introduction to Chapter 4.

Hodeidah			
Number	Triplet	Village name	Scheme type
1	1	Qutant Al- Halisah	SURWAS
2	1	Dar Algheem	non-SURWAS
3	1	Al Gareeb	no scheme
4	2	Al Delasha	SURWAS
5	2	Alhamsa	non-SURWAS
6	2	Al Domaeenah	no scheme
7	3	Al-Dhiaby	SURWAS
8	3	Deer Al Wafee	no scheme
9	3	Daer Bane Ahmed	non-SURWAS
10	4	Al-Sheraiah	SURWAS
11	4	Mahal Alrwaid	non-SURWAS
12	4	Hdeemah	no scheme
13	5	Al Za’afran	SURWAS
14	5	Almdafen	no scheme
15	5	Aldarhamy	non-SURWAS
16	6	Deer Da’m	SURWAS
17	6	Altalibia	no scheme

Hodeidah			
Number	Triplet	Village name	Scheme type
18	6	Deer Mahdy	non-SURWAS
19	7	Aljanadih	SURWAS
20	7	Biot al haoasheem	no scheme
21	7	Alkababh	non-SURWAS
22	8	Aljomaniah	SURWAS
23	8	Alsaleekeah	non-SURWAS
24	8	Alfawashg	no scheme
25	9	Alkomah	SURWAS
26	9	Alsaid	non-SURWAS
27	9	Deer Alwat	no scheme
28	10	Bani Morair	SURWAS
29	10	Alshikh Omer	non-SURWAS
30	10	Al Mahabeb	no scheme
31	11	Al-Nihari	SURWAS
32	11	Mahal Albahary	no scheme
33	11	Deer Almahdaly	non-SURWAS
34	12	Al -Kobaitiah	SURWAS
35	12	Al menwab	non-SURWAS
36	12	Alkadaf	no scheme
37	13	Alhomarah	SURWAS
38	13	Deer Alhay	non-SURWAS
39	13	Kazaah	no scheme
40	14	Alhala - Alwakil	SURWAS
41	14	Al Mrafdah	non-SURWAS
42	14	Alraib deer	no scheme
43	15	Nafhan	SURWAS
44	15	Al Shreefea	non-SURWAS
45	15	Algarmodiah	no scheme
46	16	Alkhalifa	SURWAS
47	16	Alkarad	non-SURWAS
48	16	Azan	no scheme
49	17	Alred	SURWAS
50	17	Aldo'm	non-SURWAS
51	17	Deer Al zin	no scheme
52	18	Almadman	SURWAS

Hodeidah			
Number	Triplet	Village name	Scheme type
53	18	Aifa'ah	no scheme
54	18	Al Mahgoor	non-SURWAS
55	19	Almiglaf	SURWAS
56	19	Al Hirttah	non-SURWAS
57	19	Aldabaia	no scheme
58	20	Dir Al Maqbooli	SURWAS
59	20	Alhjmah	non-SURWAS
60	20	Alkwazea	no scheme
61	21	AL Bokariah	SURWAS
62	21	Al Mshreeg	non-SURWAS
63	21	Alsaolah	no scheme
64	22	Almadafn	SURWAS
65	22	Almaksab	non-SURWAS
66	22	Daer Alhabal	no scheme
67	23	Al-Madman	SURWAS
68	23	Alkadan	non-SURWAS
69	23	Hassan Yahia Ashraf	no scheme
70	24	Al Ghawanem	SURWAS
71	24	Alhosainia	non-SURWAS
72	24	Banee Mshafeel	no scheme
73	25	Alsakih	SURWAS
74	25	Algrwp	non-SURWAS
75	25	Alijam	no scheme
76	26	Amer Al Olia	SURWAS
77	26	Al Qarah	non-SURWAS
78	26	Maho Almashera'a	no scheme
79	27	Karos - Dogan	SURWAS
80	27	Alkhbal - Alatwia	non-SURWAS
81	27	Al kulaeeh	no scheme
82	28	Al Hajjajiah	SURWAS
83	28	Al mosia	non-SURWAS
84	28	Kadaff Al Mgahsah	no scheme

Dhamar			
Number	Triplet	Village name	Scheme type
1	1	Al-A'tla'a	SURWAS
2	1	Hemat ad Duhaymi	non-SURWAS
3	1	Gawl Al Malah	no scheme
4	2	Wathan	SURWAS
5	2	Qubalah	no scheme
6	3	Al Saifar	SURWAS
7	3	Harf Dhaba	non-SURWAS
8	3	Aybah	no scheme
9	4	Bani Swaid	SURWAS
10	4	Al Mahjar wa Aljadas	non-SURWAS
11	4	Rasab	no scheme
12	5	Bani Rafia'a	SURWAS
13	5	Akmat Rashed	non-SURWAS
14	5	Hujaira	no scheme
15	6	Bani Duhaïm	SURWAS
16	6	Shuaibah	non-SURWAS
17	6	Maswarh	no scheme
18	7	Al-Hawadith	SURWAS
19	7	Al medalah	no scheme
20	8	Samah	SURWAS
21	8	Thanban	non-SURWAS
22	8	Al kasheba	no scheme
23	9	Al-Asad	SURWAS
24	9	Almawafar	non-SURWAS
25	9	Albar	no scheme
26	10	Bani Hosaim	SURWAS
27	10	Watih	non-SURWAS
28	10	Alrr	no scheme
29	11	Ad Dholman	SURWAS
30	11	Bayt hatim	no scheme
31	12	Sahlat As-Smman	SURWAS
32	12	Al Mafrah	non-SURWAS
33	12	Almahal	no scheme
34	13	AL-Mardamah	SURWAS
35	13	Al Qanas	non-SURWAS

Dhamar			
Number	Triplet	Village name	Scheme type
36	13	An Nahidi	no scheme
37	14	Al-Jaheely	SURWAS
38	14	Hazim	non-SURWAS
39	14	Ajdah	no scheme
40	15	Al-Qubah	SURWAS
41	15	Ash Shahzah	non-SURWAS
42	15	al madarah	no scheme
43	16	Ehlal	SURWAS
44	16	Athien	non-SURWAS
45	16	Bani Ubid	no scheme
46	17	Hadran	SURWAS
47	17	Mahalit	non-SURWAS
48	17	Dhalman	no scheme
49	18	Bani Muwalad	SURWAS
50	18	Alhasa	non-SURWAS
51	18	Habyn	no scheme
52	19	Al Hamami	SURWAS
53	19	Sharaf Al Izar	non-SURWAS
54	19	Alhadab	no scheme
55	20	Homa	SURWAS
56	20	Al Karabah	non-SURWAS
57	20	Aknam	no scheme
58	21	Bayt Isa	SURWAS
59	21	Madwm	non-SURWAS
60	21	Aldabar	no scheme
61	22	Al Mashur	SURWAS
62	22	Alareqah	non-SURWAS
63	22	Bani Awad	no scheme
64	23	Bani Zaidan	SURWAS
65	23	Sabalt Bani Bakiet	non-SURWAS
66	23	Bait Daghef	no scheme
67	24	Zrajah	SURWAS
68	24	Rahah	non-SURWAS
69	24	Bayt Al Matuf	no scheme
70	25	Al-Dhoahera	SURWAS

Dhamar			
Number	Triplet	Village name	Scheme type
71	25	Ar Rakabayn	non-SURWAS
72	25	Saqatyn	no scheme
73	26	Bani Jala'ah	SURWAS
74	26	Bani bada	non-SURWAS
75	26	Bani Nussir	no scheme
76	27	Dhi Atha	SURWAS
77	27	Altalbi	non-SURWAS
78	27	Shib Jar	no scheme
79	28	Hussn Amran	SURWAS
80	28	Alshamahi	non-SURWAS
81	28	Almakak	no scheme

Annex 3 Balance between scheme and no-scheme village households within the household survey

	Scheme SURWAS	No scheme	Diff.	P-value	N scheme	N no scheme
Age of respondent (female)	35.824	36.855	-1.031	0.190	1089	558
Age of spouse (male)	34.455	35.953	-1.499	0.255	1089	558
Household size	7.335	7.179	0.156	0.411	1089	558
Number of boys aged 5-16 years	1.176	1.097	0.080	0.241	1089	558
Number of girls aged 5-16 years	1.067	1.002	0.065	0.293	1089	558
Literacy rate (age>12)	0.413	0.334	0.079	0.000	1088	558
Highest education equal or higher than secondary	0.369	0.284	0.085	0.001	1092	559
Assets						
Mobile phone	0.543	0.499	0.045	0.131	874	423
Radio	0.808	0.803	0.005	0.842	875	422
TV	0.105	0.088	0.018	0.322	874	422
Refrigerator	0.162	0.149	0.013	0.543	874	422
Car	0.163	0.161	0.002	0.945	873	422
Animals						
Cows	1.147	1.061	0.087	0.171	895	462
Sheep	2.903	3.056	-0.153	0.631	890	462

Goats	1.421	1.505	-0.085	0.677	891	463
Donkeys	0.790	1.017	-0.227	0.000	892	462
Horses	0.007	0.007	0.000	0.974	892	641
Camels	0.021	0.024	-0.003	0.857	893	462
Chicken	2.478	2.119	0.359	0.088	893	462

The table indicates that households from villages with water schemes and villages without water schemes are very similar in terms of family composition and asset ownership. The exceptions are donkeys which are more common in no-scheme villages (highly significant) and chicken (borderline significant).

Annex 4 Focus Group Discussions

In order to obtain specific data about women's perceptions, a total of 23 FGDs were conducted in Hodeidah and Dhamar. Between 10 and 13 women, gathered in a local house, participated in each meeting. The FGDs were primarily aimed at exploring the direct and indirect impact of water and sanitation schemes on household livelihood, most notably on the family unit and women. This qualitative information has been useful for the interpretation and further understanding of results obtained from other sources (e.g., household survey, GPS information).

In order to obtain a balanced perception about the water and sanitation schemes in the respective governorates, villages were divided into four categories that encompass all levels of functionality of the schemes for the duration of the projects. These categories include villages with: (1) Functional Schemes ("normal"), (2) Distinct-functional Schemes, (3) Seasonal-functional schemes/schemes with low water levels, (4) Broken Schemes. The number of FGDs conducted per each type of scheme was set based on previous information regarding the status of the schemes in each governorate and the situation found in the field. The "functional schemes" category includes six schemes of villages in Hodeidah that were financed by the Dutch government after 2001 and that are not included in the survey information.

Table 2 FGDs conducted, per governorate and type of scheme

Schematic Type Category Status	FGDs		Scheme Type		
	Dhamar	Hodeidah	Surwas	Yemeni	Post-2001
(1)Functional Schemes ("normal") ²⁵	0	11	3	2	6
(2)Distinct-functional Schemes ²⁶	5	2	5	2	0
(3)Seasonal-functional Schemes/Low water level (occasional & continuous low water levels) ²⁷	2	0	1	1	0
(4)Broken Schemes ²⁸	2	1	1	2	0
Total	9	14	10	7	6

Discussions were conducted following a semi-structured questionnaire with target topics that helped to guide the discussion. The proposed subjects included the impact of the schemes on livelihood, time saving, income and expenditure and health situation of the household.

²⁵ "Functional Schemes ("normal")" are those schemes that are currently operational and have not caused any specific problems.

²⁶ "Distinct-functional Schemes" are schemes with specific characteristics, such as good models, operational but villagers are not satisfied, recurrent breakdown and subsequent repair.

²⁷ "Seasonal-functional Schemes/Low water level (occasional & continuous low water levels)" refers to schedules developed to utilize spring sources, which suffer from recurrent diminishing annual seasonal water levels. This is the case in a number of schemes in Dhamar. In Hodeidah continuously diminishing water levels are the main problem.

²⁸ "Broken Schemes" refers to schemes that have not been operational (non-functional) and have not been repaired for a period of 4 years or less.

Annex 5 Institutional assessment: list of interviews

Persons met

M.S. al Aroosi	Embassy of the Kingdom of the Netherlands, Sana'a
M. A. Abdul-Razzak	Project Director, RWSSP, Sana'a
O.S. Al-Akbari	Ministry of Local Administration, Sana'a
M.M. Algbien	Manager, Thuran District, Dhamar
A. Almojahed	Social Fund for Development, Sana'a
Y. Al-Arequee	Director, GARWSP Branch Office, Hodeidah
A. Al-Asbat	General Secretary, Al Hada District Council, Dhamar
G. Al-Badanee	Community-Based Water Management Project, Dhamar
A.A. Badr	GARWSP Head Office, Sana'a
S.H. Bashuaib	Chairman, NWRA, Sana'a
A. Malik Faree	Director, GARWSP Branch Office, Dhamar
E. Gazee	Ministry of Health, Dhamar
M.I. Al-Hamdi	Deputy Minister, Ministry of Water and Environment
M.H. Al-Hammadi	Ministry of Local Administration, Sana'a
N. Abu Hatim	World Bank, Sana'a
A.Q.A. Hanash	Assistant Deputy Minister, Ministry of Water and Environment, Sana'a
T.H.S. Kotb	World Bank, Sana'a
T. Negenman	Embassy of the Kingdom of the Netherlands, Sana'a
A. Al-Rmah	NWRA, Dhamar
A.W.A. Al-Shami	Public Works Project, Sana'a
M.S. Shamlan	Governor, Hodeidah Governorate
A. M. Al-Suremi	Chairman, GARWSP, Sana'a
T.M. Taher	Water and Environment Centre, University of Sana'a
T. Vriens	Mott MacDonald, Sana'a

A.A. Al-Wajeeh	Decentralisation and Local Development Support Programme, Ministry of Local Administration
M.A.W. Zafir	National Democratic Institute

Water schemes visited

Hodeidah Governorate

Dir al Maqbali
Al Monirah
Al Ujeliah
Almdafen
Haninah
Madman Althanee
Almgla'f
Dir al Khodama

Dhamar Governorate

Jarf Isbeel
Markiz Utmah
Beit al Hajiri
Beit al Isa
Al Dira'a
Qwan

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