REPUBLIC OF YEMEN

RURAL WATER AND SANITATION SECTOR

SECTOR STUDY

JUNE-JULY 1996

REPORT FOR COMMENTS

Corrections of errors in fact and comments are invited.
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Sana'a
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Table of Contents

Abbreviations and Acronyms

BCM	Billion cubic meters
EPC	Environmental Protection Council
ERADA	Eastern Regional Agricultural Development Authority
GAREW	General Authority for Rural Electricity & Water
GDP	Gross Domestic Product
GTZ	German Agency for TechnicalCooperation
HQ	Headquarters
LDC	Local Development Council
MOAWR	Ministry of Agriculture and Water Resources
MOEW	Ministry of Electricity and Water
MOMR	Ministry of Oil and Mineral Resources
MOPD	Ministry of Planning and Development
NGO	Non-governmental organization
NORADA	Northern Regional Agricultural Development Authority
NWP	National Water Policy
NWRA	National Water Resources Authority
NWSA	National Water and Sewerage Authority
O & M	Operation and maintenance
RDA	Regional Development Authority
ROY	Republic of Yemen
RWSD	Rural Water Supply Department
SURDP	Southern Uplands Regional Development Project
TDA	Tihama Development Authority
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization
WQ	Water Quality
WR	Water Resources
WS	Water Supply
YR	Yemeni Riyal

YEMEN RURAL WATER AND SANITATION SECTOR STUDY

REPORT FOR COMMENTS
18/07/96

"Even when the solution is known, the problem hasn't been solved"
Anon.

1. Purpose of Sector Review and Approach

1.01 Yemen's water resources are scarce and rapidly depleting. Increasing competition between urban and rural households and irrigated agriculture is becoming a major development issue. Failure to meet demand for potable water supplies and sanitation would intensify health and environmental problems, while exhaustion of usable supplies would lead in the medium and long term to the collapse of much of the rural economy. The problem is exacerbated by the weak authority of the government, the prevalence of entrenched local rights, past lack of political will, weak institutional structures, the high rate of population growth, and the high profitability of water-intensive qat production. The country is in the process of developing a national water plan and strategy with the assistance of the UNDP, the World Bank and bilateral donors. This review of the rural water and sanitation sector is a contribution to the development of this strategy. Grants from the Netherlands and Japanese Governments financed the mission. The UNDP/World Bank Water and Sanitation Program provided some members of the mission.

1.02 The purpose of this review is to:

* Present an overview of the rural water and sanitation sector in Yemen
* Identify sector development constraints and make recommendations for dealing with them
* Propose short- and medium-term investment and technical assistance programs

1.03 Experience throughout the world has shown that water supply projects are sustainable when water is managed as an economic good, and in a participatory manner at the lowest appropriate level. These principles formed the framework within which the sector mission team conducted its work.

1.04 Interviews and reviews of existing reports during the first two weeks focused on learning about practices in Yemen concerned with:
- who has access to potable water and safe sanitation, and
- by whom and how it is provided.

1.05 The mission found that much good work has been done in recent years analyzing the needs of the sector. The Technical Secretariat of the High Water Council, with assistance under UNDP/DESD Project YEM/88/001, analyzed the full sector in Yemen in

a report titled Water Supply, Wastewater and Sanitation, published in June 1992. Even more relevant, from October 1992 to February 1993, Mr. Hassan Al Shamsy, WHO consultant, conducted a complete overview of the rural water sector. His findings and recommendations were included in a document entitled "Government of the Republic of Yemen, Proposed 5-Year Water Supply Plan, 1993-1997", dated January, 1993. Some of the recommendations of this report have been implemented. However, in general the passage of time has but exacerbated the serious situation described in that report.

1.06 During the next ten days, the mission[1] visited a representative group of 17 water supply systems to observe and evaluate the factors which may be responsible for the sustainability of projects in Yemen (or lack thereof). To collect information on this subject the mission divided itself into sub-groups who separately interviewed female users, male users and the community leaders/system managers from each system. Annex 1.1 is a map showing locations visited.

1.07 The Deputy Prime Minister and Minister of Planning sponsored a workshop near the end of the mission. It was attended by representatives of most of the interested government ministries and agencies and of a number of multilateral and bilateral agencies. The team reported back on its preliminary findings and those attending the workshop discussed its recommendations. This report incorporates recommendations and comments made at the workshop.

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[1] The members of the mission were:

National Staff
Eng. Abdullah A. Malik Badr, General Director for Water Supply, GAREW (P/T)
Mr.Fawzi Al Khirbash, Hydrologist, GAREW
Mr.Abdul Qadir Hanash, Engineer/technical specialist, GAREW
Dr. Mohamed Al Eryani, Hydrogeologist, institutional specialist and facilitator (consult)
Mr. Abdul Malik Al Makrami, Community Development/Participation Consultant
Dr. Ilham Ali Abdullah Basahi, Sanitary Engineer and WID Consultant

International Staff
Mr. William Cosgrove, Team Leader
Dr. Wendy Wakeman, Community Development and Participation Specialist, (UNDP/World Bank Water and Sanitation Program)
Mr. Piet Klop, Technical Specialist. (UNDP/World Bank Water & Sanitation Prog)
Mr. Toine Vriens, Resource Person, SURWAS

2. Overview of Water and Sanitation Sector

Sector Organization

2.01 Technically speaking, in the process of development planning in Yemen (which is led by the Ministry of Planning and Development), water is not yet recognized as a "sector" by itself but rather as a sub-sector of the Service Sector. The same also applies to sanitation. Until recently, responsibilities for *water planning and management* as opposed to those for *development and use* have remained undifferentiated. is, both functions remained mixed together and handled by three key ministries; namely:

a) the Ministry of Agriculture and Water Resources (MOAWR): which is mainly concerned with irrigation use;

b) the Ministry of Electricity and Water (MOEW): which focuses on urban and rural water supplies; and

c) the Ministry of Oil and Mineral Resources (MOMR): which is largely involved in water resources assessment studies and monitoring.

Thus, the MOAWR and MOEW are essentially "development- and use- oriented" while MOMR is more towards the "planning and management" support, without actually doing any planning or management.

2.02 Moreover, under the MOAWR and the MOEW, there are several institution which undertake various water-related activities. The MOAWR, for instance, has the Regional Development Authorities (e.g., TDA, NORADA and ERADA), as well as several regional projects (e.g., Wadi Hadramawt, Central Highlands, Southern Highlands, etc) and national projects (Land and Water Conservation, Small Dams, etc). Almost all of these institutions provide funds for various water-related development projects: for irrigation, rural water supply and even for water resources assessment studies. Similarly, the two main institutions under the MOEW (i.e., NWASA and GAREWS) are involved in water supply development activities (urban and rural), water resource assessment studies, and sanitation projects (mainly urban).

2.03 Consolidating the water planning and management functions into one entity wasn't carried out until very recently, when the National Water Resources Authority (NWRA) was established. Its goal, as stated in Article (5) of the establishing decree is:

> *"to conserve the water resources of the country; prescribing strategies, policies and plans to ensure proper management and sustainable development of these resources, within the context of socio-economic development plans."*

Further, Article (6) of the decree described NWRA as

> *"the sole governmental agency in the Republic responsible for the formulation of water resources policies and development strategies and the study, planning and management of water resources at national level."*

Moreover, in the same Article, it is stated that

> *"with the issuance of the present Decree, water resources activities presently undertaken by the Ministry of Agriculture and Water Resources, the Mineral*

Exploration Board of the Ministry of Oil and Mineral Resources, the National Water and Sanitation Authority, Rural Electricity and Water Supply Board, and other agencies which are similar to those of the Authority or impending on its functions and powers shall be hereby terminated."

2.04 In addition to the three entities mentioned above, there are other entities which play various roles in the sector. Annex 2.1 shows the key entities and their functions.

Water Resources in Yemen

2.05 Yemen's total annually renewed water resources are estimated at 2.1 billion m3 (BCM), of which 60% is groundwater. With a population of around 15 million, growing at a rate of 3.7%, available resources amount to little more than 140 m3 per person each year. This compares to 1,250 m3 for the Middle East and Northern Africa and to the worldwide average of 7,500 m3.

2.06 In 1994, water use was about 2.8 billion m^3 (BCM). With virtually all surface water resources harnessed and exploited, Yemen consumes 0.7 BCM of groundwater beyond the level of recharge. The country has an estimated 45,000 private wells and about 200 drilling rigs. Government's attempts to control over pumping have not been successful. The most stressed area is the western portion of the country - the highland plains, eastern slopes, western slopes and coastal plains, where 90% of the population lives. Groundwater overdraft ranges from 70% to 400% (in the Sana'a basin). In some wadis, agriculture has already been abandoned, threatening the existence of the rural economy. Coastal aquifers are at risk of sea water intrusion. Cities like Taiz struggle with acute water shortages that will have to be met at sharply increasing costs. Urban and industrial development is being constrained. And there is increasing conflict over water resources.

2.07 Table 2.1 below shows the relationship between estimated water use by sector and respective contributions to the Gross Domestic Product (GDP). Agriculture is by far the biggest user, while returning the least per unit of water. Tubewell technology and market opportunities have made possible the rapid expansion of profitable cash crops as vegetables, grapes and qat, which is estimated to account for 30% of total water use. Remittances from foreign workers and direct and indirect Government subsidies fueled this development, while social changes and powerful economic incentives relaxed traditional controls over resource use.

Table 2.1 Estimated Water Use and Sector Contribution to GDP

	agriculture	mining	manufacturing	services
share in GDP	21 %	8 %	13 %	58 %
share in employment	60 %	9%		31%
share in water use	93 %	2 %	1 %	4 %
relative return to water (agriculture =1)	1%	20%	147%	57%

source: HWC/UNDP 1992

Nation-wide Service Levels

2.08 Many people in the cities and the countryside do not have access to clean water or safe sanitation as the following two tables demonstrate:

Table 2.2 Access to Potable Water Supply

	1994 population	percentage of total population	percentage of people with source of water: public network	cooperative and private networks	well	surface water	percentage of people with access to potable water[2]
urban (i.e., > 30,000)	2,621,156	18 %	78 %	12 %	9 %	1 %	94 %
rural (i.e., <30,000)	11,966,651	82 %	8 %	19 %	44 %	29 %	49 %
total	14,587,807	100 %	21%	18 %	38 %	24 %	57 %

source: 1994 census

Table 2.3 Access to Safe Sanitation

	percentage of people with sewage facility: public network	closed pit	open pit or none	percentage of people with access to safe sanitation
urban (i.e., > 30,000)	47 %	44 %	9 %	91 %
rural (i.e., < 30,000)	2 %	18 %	80 %	20 %
total (1994)	10 %	22 %	67 %	32 %

source: 1994 census

2.09 In its 1996 Multiple Indicator Survey for Child Health, UNICEF tentatively reports that 88% of the urban population and 53% of the rural population have access to potable water. 17% of the rural population and just 47% of the urban population would have safe sanitation facilities. The 1994 census appears to strongly overrate the safety of urban sanitation.

2.10 The census may also overstate urbanites' access to potable water, as supply through public networks is often inadequate in quality and timing. In Sana'a, the National Water and Sanitation Authority supplies only 36% at very low rates: YR 12 per m3 for the first 10 m3/month (for water and sewerage). The others usually depend on private water vendors who charge much higher prices ranging from YR 50 to YR 200 per m3.

2.11 The inadequacy of water supplies is even more marked in rural areas where 82% of the population and most of the poor live. Only half of them are believed to enjoy access to potable water. In areas not served by piped systems, women and girls may spend up to 12 hours a day fetching water.

[2] 'Access' presumes that clean water is available within reasonable distance. The percentage of people with potable includes all those who are connected to a piped network, and 50% of those who obtain their water from a well. While hand-dug wells are obviously vulnerable, water from deep wells is not necessarily clean either. Of the 95 deep wells tested by GAREW in 1995, only 32 provide water that meets the maximum WHO standards, while water from 20 was found unfit for drinking. See Annex 4.1 for other definitions and caveats.

3. Population Characteristics

Demographics

3.01 Figures 3.1 to 3.4 inclusive show the population distribution by sex and age and the education levels of women and men in Yemen. These are taken from the 1994 census data. It will be noted that about 50% of the Yemen population is under 14 years of age. About 35% of men and 70% of women are illiterate.

Figure 3.1 - 1994 Total, Male and Female Population by Governorate

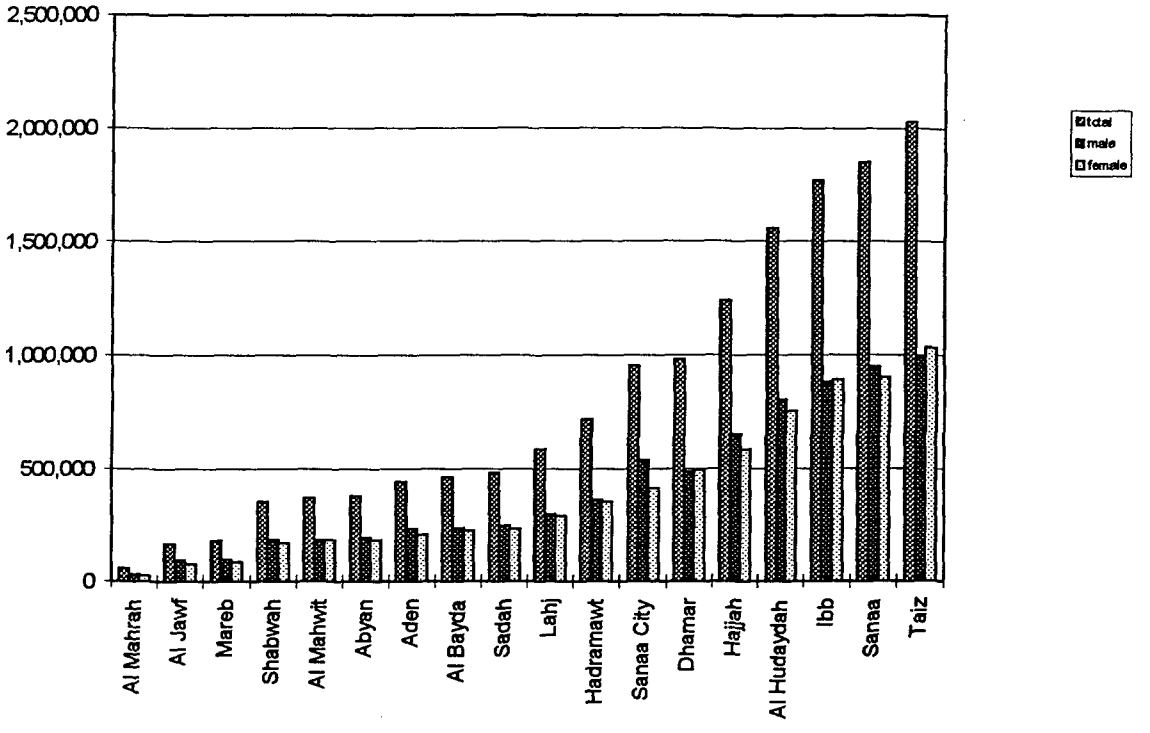


Figure 3.2 - 1994 Population Distribution by Age Groups, by Governorate

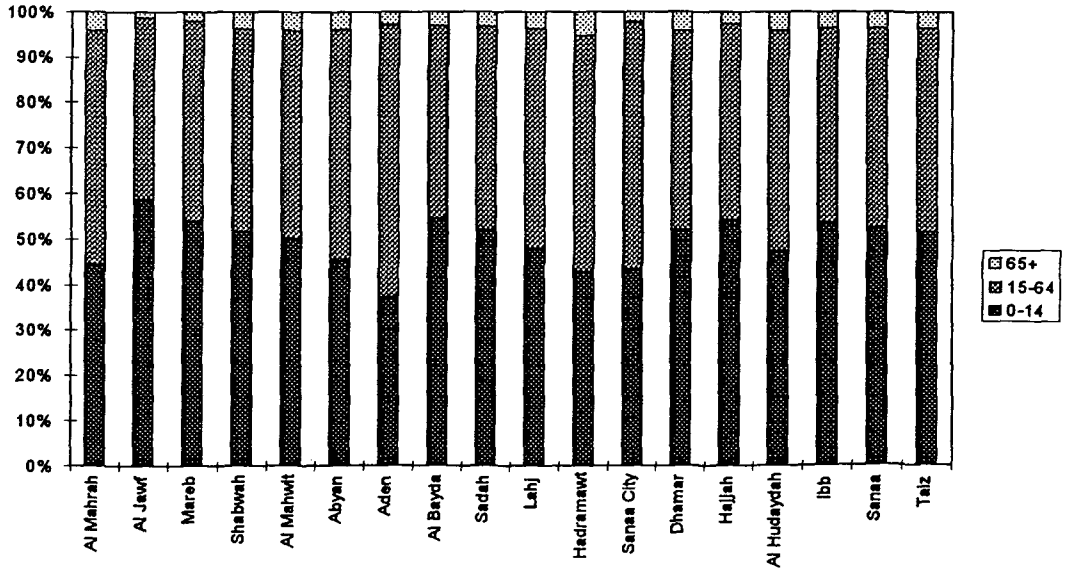


Figure 3.3
1994 Educational Status of Women over 10 Years Old, by Governorate

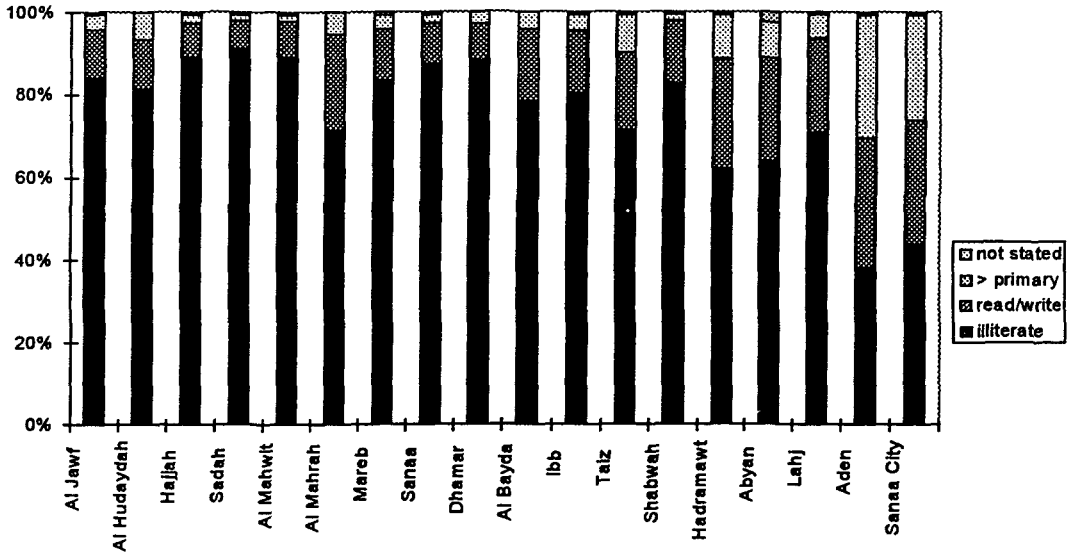
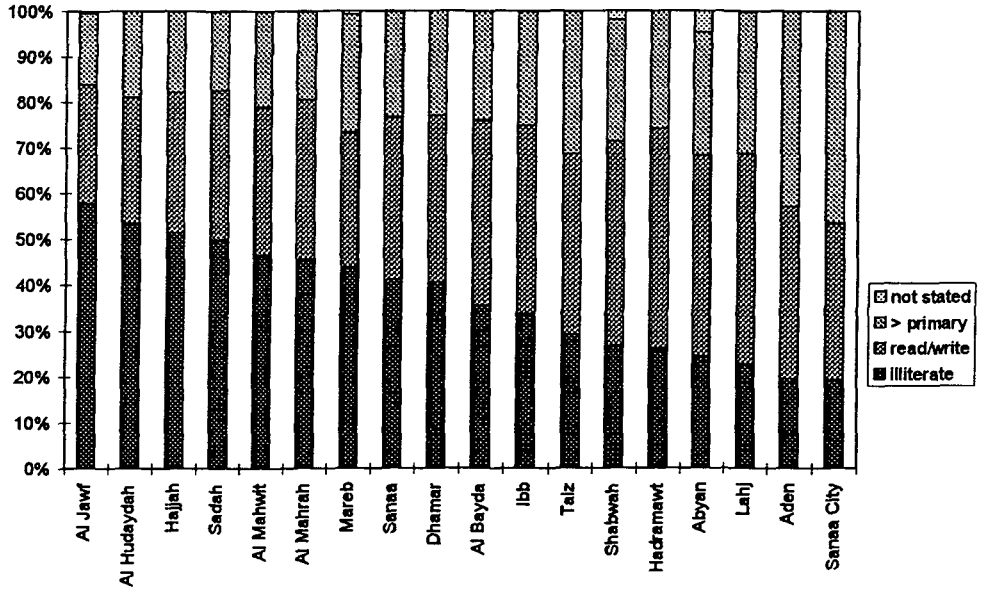


Figure 3.4
1994 Educational Status of Men over 10 Years Old, by Governorate



Health

3.02 In urban and rural areas respectively, 26.3% and 36.0% of children under five years had a diarrhea episode in the two weeks preceding the 1991/1992 Demographic and Maternal and Child Health Survey, about half of them severe. Diarrhea and vomiting, diseases that are closely related to water quality, environmental sanitation and personal hygiene, account for around 50% of under-five mortality.

3.03 Rural infant and child mortality rates (i.e., the number of deaths per 1,000 live births) vary in the expected direction with three key environmental variables as shown in Table (3.1):

Table 3.1 - Rural Infant and Child Mortality Rates

Sanitation Factor	Source/ Condition	Rural infant mortality rate	Rural non-infant chimortality rate	Rural under-five mortality rate
Drinking water source	piped	85.5	36.9	119.2
	well	104.8	45.5	145.5
	other	103.0	58.6	155.6
Toilet facility	flush	72.6	45.8	115.1
	bucket	97.6	34.5	128.7
	other	101.2	49.9	146.1
Area around house	clean	85.8	29.0	112.3
	dirty	107.4	55.7	157.2
stagnant water / sewage overflow		80.5	46.7	123.5

source: 1991/1992 Demographic and Maternal and Child Health Survey

3.04 Frequent pregnancies of young mothers with short periods between births causes serious health problems, especially in rural areas with inadequate health services. The 1985 maternal mortality rate of rural women between the ages of 15 and 50 was 1000/100,000, one of the highest rates in the world. Many factors contribute to the poor health conditions of females in rural Yemen, including: poverty, malnutrition, early age of marriage, long hours of labor, low levels of education, poor health services, and short periods between pregnancies.

Poverty

3.05 Measured against minimum food and non-food expenditure requirements[3] in rural and urban areas, poverty affects one out of every five persons (World Bank 1996 Poverty Assessment). Nine percent of the population lives in absolute poverty, being unable to meet basic food needs of 2200 calories per day per capita. Poverty is primarily a rural phenomenon: 80% of the poor live in the countryside. Average expenditures of the poor in 1992 are given in the Table 3.2. The situation to-day may be worse.

Table 3.2 Average Expenditures by Income Level

	Share of population	Average expenditures [YR/year/capita]	Average expenditures [US$/year/capital at 45 YR/US$]
Absolute poor	9 %	4,569	119
Poor	19 %	6,435	162
Non-poor	81 %	24,228	540
All Yemen	100 %	20,885	464

source: Household Budget Survey 1992

[3] Expenditures rather than income levels are used in poverty analysis as people tend to understate their incomes and, to some extent, can protect their living standards from income fluctuations.

3.06 GAREW is responsible for providing water and sanitation to villages or groups of villages with populations under 30,000 persons. According to the 1994 census, 12 million people, or 82% of the population live in centers of less than 30,000. This includes 800,000 who live in centers with populations between 5,000 and 30,000. The population growth rate overall is 3.7% per annum, and that of the rural population is about 3.0%. On this basis the rural population in the Year 2000 would reach 14.3 million.

The Role of Women in Rural Areas of Yemen

3.07 Rural women in Yemen play an extremely important role as an active working force. Sixty-eight percent of Yemeni females above the age of ten can be considered economically active. Ninety-nine percent of them work in agriculture and cattle breeding, while 88 % work as unpaid labor on their families' farms. The average work day for rural women is often 16 hours. Their daily tasks usually include:

- making several trips to carry water for domestic use
- collecting wood to be used as fuel in cooking
- working in the fields
- feeding and looking after animals, including milking cows, goats, etc.
- undertaking daily household tasks such as the grinding of seeds, food preparation,
- cleaning, caring for the sick, looking after children, preparing manure blocks

3.08 Rural women in Yemen often lead hard and short lives. The average life expectancy of women is about 46 years and can be as low as 38 in some governorates. These are among the lowest averages in the world. Females in Yemeni villages start carrying jerrycans of water at the early ages of five and six. Girls are also married at an early age for various socio-cultural reasons.

4. Access to Water and Sanitation

4.01 Figures 4.1 and 4.2 below summarize water and sanitation coverage data by governorate.

Figure 4.1
Percentage of People in Settlements Smaller than 30,000 with Access to Potable Water

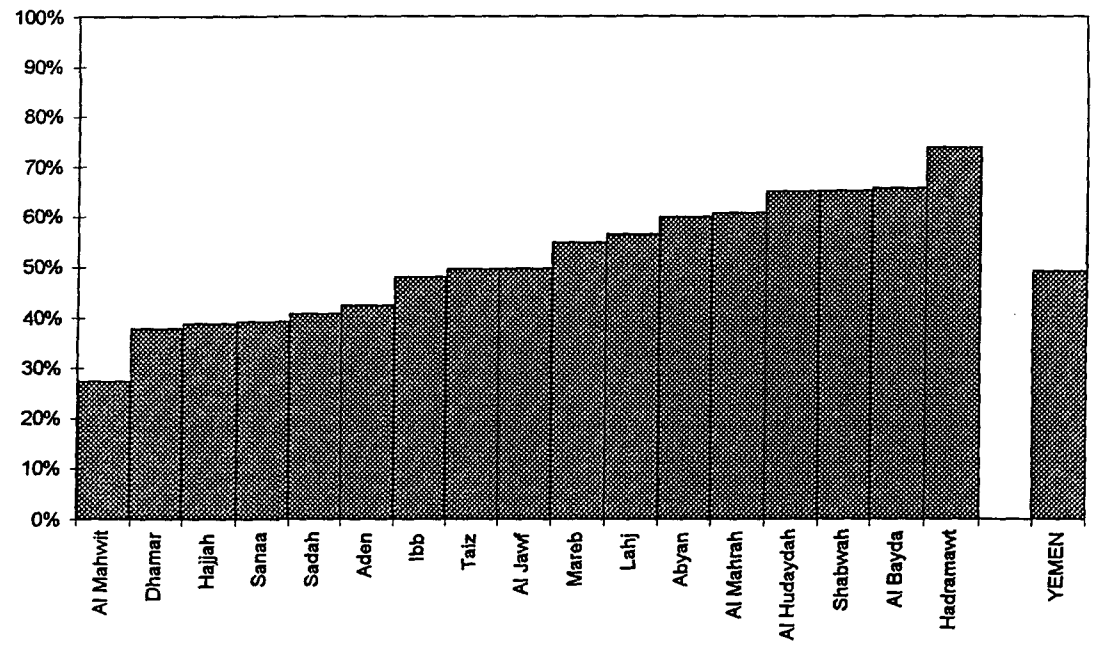
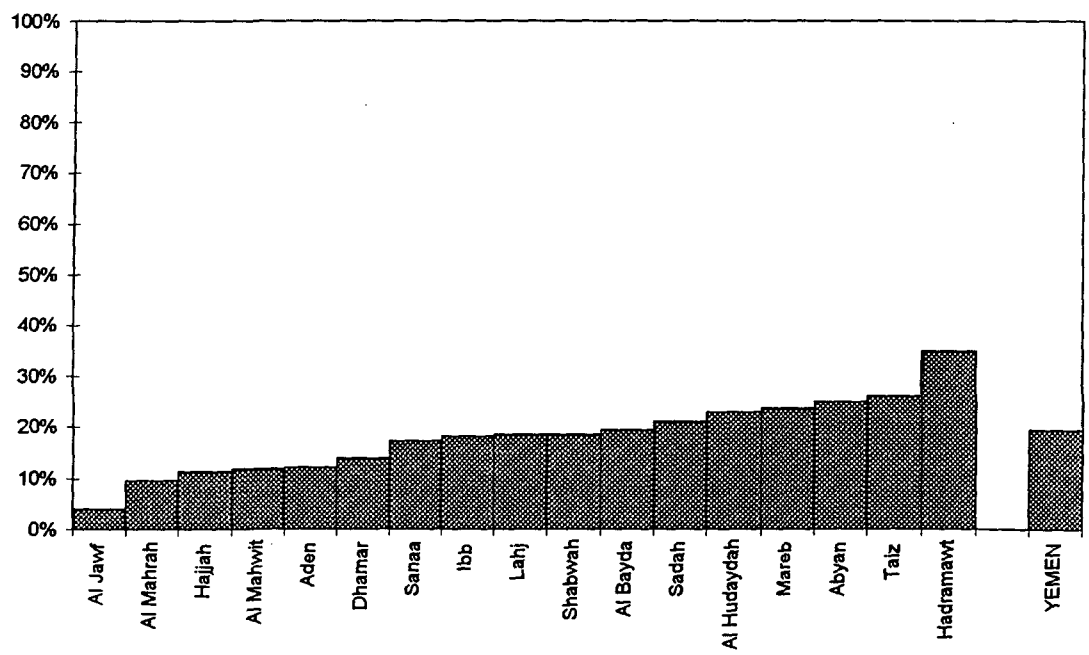


Figure 4.2
Percentage of People in Settlements Smaller than 30,000 with Access to Safe Sanitation



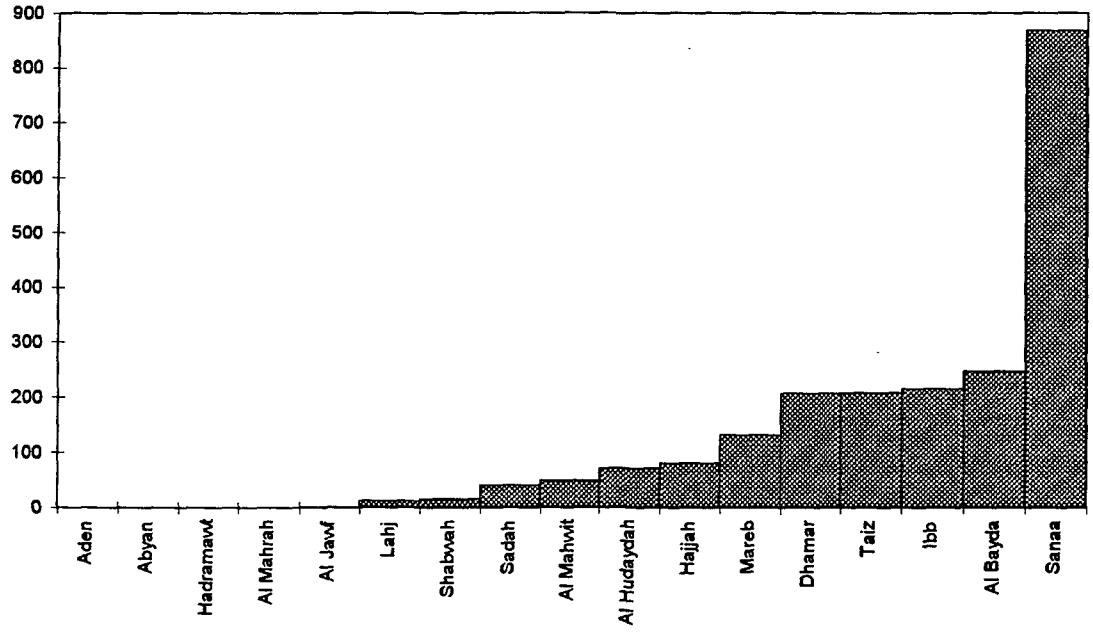
Annex 4.1 gives details of access and type of water supply by district and governorate.

Characteristics of unserved population and process for gaining access

4.02 The governorates of Al Mahwit, Hajjah and Sadah have few networked water supply systems; 30 to 60% of their population rely on mostly unclean surface water sources for drinking. Coverage in the south-eastern part of the country is generally higher than the national average. However, little is known about what differentiates served from unserved areas.

4.03 Communities have to submit a request to be considered for 'a project' by GAREW or another agency. The availability of alternative sources of water, as well as the political leverage a village can muster play a role in the prioritization of these requests. Poor community organization appears to be the major obstacle in gaining access. Other characteristics of unserved communities often include low incomes and remoteness (preventing village representatives from regularly going to Sana'a to promote a request) and water scarcity. Figure 4.3 below clearly demonstrates the latter effect.

Figure 4.3
Number of GAREW-built Water Supply Schemes by Governorate



Non-functioning systems

4.04 Next to the served and the 'never-served', there is a significant share of the rural population that is 'no longer served'. However, next to nothing is known about which of the many water supply schemes that have been constructed by GAREW, Regional Development Authorities, rural development projects and other support agencies are actually working. Of the 17 complete water supply schemes the mission has visited, only 10 turned out to be functioning (although not necessarily on a sustainable basis). GAREW began a survey of installations in Marib but it has been suspended because of lack of resources.

Box 4.1

"Even when the solution is known, the problem hasn't been solved."

Under the Transcentury-financed project Support to the Rural Water Supply Department in Dhamar, a village water-supply scheme was constructed in Khashran and Bani Saba in 1984. The scheme was designed and constructed according to the project's highly participatory procedures. The community provided its 30% share of the scheme's cost in labor and locally available construction materials. However, by the time the scheme was to be handed over officially, problems had arisen about its future management. Nobody ever turned up to collect the key until eight (!) years later when one of the villagers returned from Saudi Arabia to get all parties to agree on the way the scheme would be run and how its operation and maintenance would be paid for. Within a day, the scheme was ready to supply the village with clean water for the first time. By carefully watching each other for years, the conflicting parties had in effect kept the scheme from falling apart.

Capital costs: present, historical and trends

4.05 The typical rural water supply system in Yemen consist of a deep well, a mechanical pump with diesel engine (or electrical pump with generator), a pump house, main pipes, a reservoir, distribution pipes and house connections. Due to the country's hydrology, topography and settlement pattern, technical options are few and often costly.

4.06 Many system components are imported. With the depreciation of the Yemeni Rial (YR) from 12 YR per US dollar (1991) to 120 YR per US dollar (1996), 'average' system costs in Yemeni Rial have increased by a factor of ten. In US dollars, however, system costs have remained fairly constant and may even by lower than in 1991 (possibly because resources are used more economically). Table 4.1 is the best information which the mission could gather on project costs. Most of it comes from the Dutch-financed projects. The JICA projects, constructed with tied aid, cost about 50% more. GAREW statistics, do not provide total costs for complete systems (the records for boreholes, pumps and civil works are kept separately and are incompatible). GAREW used a figure of US$200 per capita in preparing its Five Year Plan.

4.07 It will be noted that the cost per capita of a project constructed with specially imported tax-free materials and equipment is only US$ 110. GAREW has considered purchasing such equipment in bulk lots directly by international tender, but has been unable to do so because it lacks a source of foreign currency.

Table (4.1): Typical System Construction Costs

system components	1991 price at local market		1996 price at local market		1996 tax-free import price
	[YR]	[US$]	[YR]	[US$]	[US$]
well, 250 m deep, with casing	750,000	62,500	7,500,00	62,500	idem
mechanical pump and diesel engine	1,300,000	108,300	6,600,000	55,000	18,300
pump house			700,000	5,800	idem
4" main pipes, 400			2,600,000	21,700	3,900
50 m3 masonry reservoir			350,000	2,900	idem
3" and 2" distribution pipes, 800			4,400,000	36,700	5,100
1" house connections, 1200			1,920,000	16,000	2,000
water meters, 100			800,000	6,700	idem
total civil works for 1000 people, 100 houses	1,000,000	83,300	10,770,000	89,800	26,400
total cost	3,050,000	254,100	24,870,000	207,300	107,200
total cost per capita	3,000	250	24,900	210	110

Operation and maintenance costs

4.08 The cost of operating and maintaining a pump and engine is estimated at YR 1000/day, including diesel, oil, operator's salary, regular cleaning and maintenance, spare parts and depreciation. Electrical submersible pumps (with generator) cost more, say YR 1500/day. Maintenance requirements of other system components are small by comparison.

5. Legal and Regulatory Framework

Decree No. 230 Establishing GAREW

5.01 The key document assigning responsibilities in the rural water and sanitation sector is Decree No. 230 of November 10, 1992 which established the General Authority for Rural Electricity and Water - GAREW. Annex 5.1 is a summary translation of the Decree. The Decree clearly establishes GAREW as the principal authority with responsibility for the provision of water to communities or groups of communities smaller than 30,000 persons. Other actors were to withdraw from the sector and transfer their resources to GAREW. The sole exceptions are the Regional Development Authorities. In practice, however, others continue to be active in the field, including in particular the National Water and Sewerage Authority NWSA which is responsible for the urban sector, and the Ministry of Agriculture.

5.02 Of particular importance in this Decree is the assignment of water systems to the local communities who are to be responsible for their operation and maintenance following transfer of the completed systems to them by GAREW. They are also to assure adequate financing of operations and maintenance. In practice the communities seem not to be aware of their responsibilities, or are reluctant to assume them when it comes to major repairs. They often fail to operate and maintain the systems properly, and most turn to GAREW or other outside help if they wish to restore them following their breaking down. It is questionable whether communities over 10,000 persons are capable of organizing themselves in the traditional manner to provide the financial and technical management required by systems of this size.

5.03 Local communities are also responsible under the decree for the construction, operation and maintenance of local sanitation systems. GAREW is responsible for protection of the environment against pollution, particularly the groundwater, and for providing technical advice to the communities re sanitation and public hygiene. Again, the communities are either unaware of their responsibilities or give them low priority. Village women are more interested in improved sanitation than village men. GAREW is not yet staffed to fulfill its responsibilities. Nor is it clear how these are to be divided with other responsible authorities, e.g. the Ministries of Health and of Education and the Environmental Protection Council.

5.04 GAREW has other technical assistance responsibilities under the Decree. These include training and retraining those responsible for the operation of rural water supply systems, and provide technical advice to private owners and cooperatives on the implementation, operation and maintenance of their projects.

Draft National Water Law

5.05 The draft water law was based on a "Draft Water Policy" (Annex 5.2). The draft law consists of 98 articles organized in 9 sections.

5.06 In section (I)- General Provisions and Goals- the basis and goals of the law are presented. There are three important points to be noted in this section:

- The first is that all water resources which exist within the boundaries of the Republic were considered natural resources. This means that they are owned as public property (as per the Constitution). In practice, surface water (baseflow, spring water, and flood water) is considered private property. It is inherited and is rationed according to specific rules which can vary from one region to the other. Subsurface water, on the other hand, is customarily considered property of the land owner. In other words, every landowner is entitled to access the groundwater provided that he will not harm a neighbor. Harm is determined by a minimum separation distance of the new well from existing wells. For community water supply projects, it is customary to drill the well or wells in community-owned land; i.e., common property of the community. Other conditions for the acceptance of a site is that it will not be "too close" to an existing well. The ball figure for the accepted separation distance is 500 metres.

- The second is the adoption the concept of organizing ***the utilization, development and management of water resources as an integrated and indivisible sector of economic development.***

- The third deals with groundwaters which, according to the law, were considered natural resources shared amongst their beneficiaries. This means that all beneficiaries shall share the duties and responsibilities to protect these resources against depletion and pollution so that individuals will not harm the interests of the society. For this purpose, the state intervenes to organize the utilization of these resources and prevent their exploitation except by prior permit.

5.07 Section (II)- Water Resources Management- deals with two aspects. The first concerns the Basics and Principles of Water Resources Management while the second concerns the Water Basin Committees. As for the basics and principles of water resource management, it was declared that water resources shall be managed and developed in such a way as to satisfy the intent of this law and in light of general policy proposed by NWRA and ratified through a cabinet resolution. Then, for the purpose of water management, the country is to be divided into water basins, and for each basin there should be a water committee which is linked to the appropriate branch of NWRA or any other institution as authorized by NWRA. These committees were than delegated the responsibility of studying and approving the draft water plans of the basins and the monitoring their execution.

5.08 Section (III)- which deals with Water Resources Planning- begins by requiring NWRA to prepare a water plan for each basin consistent with the water policy. Subsequently, it states the guiding principles which should be taken into consideration when preparing water plans, and the contents of such plans. In this section, NWRA would be given the authority to review water-related development projects and to give water-based opinion of these plans prior to their implementation. It also states that all projects should be evaluated according to the criteria of economic and social returns, with priority given to projects which produce the maximum economic and social return per cubic metre

of water. Finally, the last article of this section deals with an important aspect of the operation and maintenance of water structures which are constructed by the State. It makes the beneficiaries bear or contribute to the costs of operation and maintenance of these structures, in proportion to their respective benefits.

5.09 Section (IV) treats various aspects of water use. It is subdivided into five chapters which deal with: priorities for use, rights of servitude, permits, and technical criteria and specifications. In the chapter on priorities of use, it stated that the waters of each water basin shall be used in accordance with the priorities and for the purpose stated in the basin's water plan. In any case, the ***use of water for drinking purposes was given absolute priority over any other use.***

5.10 In the chapter on "Permits", the draft law requires that prior permits be obtained in order to extract groundwater, drill or develop wells, undertake related consulting work, or to sell water directly from wells or via pipe networks. It also gives NWRA the authority to regulate imports of well drilling equipment and materials. Finally, the fifth chapter deals with the criteria and technical standards for various works relating to water wells, protection zones around wells, well fields, springs and streamflows. This is in addition to criteria and standards for the construction of canals, dams, and reservoirs and all associated technical works of surface water structures and ***criteria and standards for drinking water, for water used in the food industry, irrigation water, treated municipal wastewater and industrial waste waters.***

5.11 Section (V)- Water Resources Conservation and Protection- treats two aspects, namely: water resources conservation against depletion and protection against pollution. With respect to water resources conservation and rationalization, the draft law would require NWRA to adopt techniques and measures to conserve water. Provision is also made to regulate the transfer of water within and between various basins. In this respect the law would grant NWRA the power to recommend permission for such transfers to the Cabinet. Several conditions were required for such permission; e.g. that the water is transferred for drinking and domestic uses, the water in the receiving basin be either insufficient to meet the need because of either water scarcity or unfitness for drinking, etc. Water transfer from one region to the other within the same basin would be subject to the same conditions but the power to grant permits for such transfers was given to NWRA.

5.12 As for water resources protection against pollution, the draft law prohibits any natural or legal entity to discharge any liquid waste, regardless of its source, if such wastes could potentially cause pollution of the water resources, directly or indirectly, or dispose or accumulate solid or liquid wastes, dead animals, or any other materials, or discharge any liquid wastes into the sea or dispose any other material into it which could potentially harm public health or marine life or hamper the investment or tourist activities along the coasts. The remaining articles of this chapter regulated the process for issuing waste discharge permits.

5.13 Section (VI)- Flood Control- outlines the role of the State in protecting the population and property against flooding disasters through various measures, including: the installation of early-warning stations, land use zoning, prevention of housing

construction in flood zones, periodic inspection of flood protection structures to ascertain their safety.

5.14 Section (VII)- Means to Enhance the Development of Water Resources- begins by creating or recognizing the water sector as one of the sectors of development planning. The budgetary allocations for this sector shall be part of the State's investment budget so as to enable the development and management of water resources as an *integrated and indivisible sector of economic development.* Moreover, a special fund called "The Water Resources Development Fund" would be established. The financial resources of this fund would consist of the allocations made by the Government to support water resources development, fees and charges approved by the Cabinet; such as: 1) water user fees on drinking and household consumption and on commercial and industrial uses; 2) water sale fee or charge, on water sales whether directly from wells or via private networks or after bottling by individuals and private sector companies; 3) a water resources quality-protection fee, for protection against pollution due to sanitary wastewater as well as commercial and industrial liquid wastes; etc.

5.15 In Section (VIII)- Enforcement Procedures and Penalties- authorized staff of NWRA who are charged with monitoring and inspection would be granted the powers of enforcement officers through a resolution issued by the Attorney General upon nomination by NWRA. These enforcement officers would be charged with the task of identifying infringements and offenses against the provisions of this law and preparing reports describing violations or offenses, including the locations where they are committed, the name of offender, date of infringement, and any other relevant data.

5.16 In chapter (2) of this section (Penalties), three types of penalties are proposed, namely: imprisonment plus fine, imprisonment alone, and fine alone. For the majority of violations, the upper limit on imprisonment and lower limit on fines were stated. However, it was left to the court to decide the length of imprisonment period or amount of fine.

5.17 In Section (IX)- General and Concluding Provisions- NWRA is described as the State's sole institution responsible for drafting of water resources policies and the strategies for their development as well as the study, planning and management of these resources at the national level. Meanwhile, all regulations and procedures pertaining to the implementation of this law are to be covered by by-laws. The draft law prohibits Board Members of NWRA or any of its staff from being a party in any of the contractual works it awards for its works or projects. It also states that the by-laws shall be issued by Presidential decree, upon Cabinet approval.

Draft law on local administration

5.18 Perhaps the most important piece of legislation affecting the organization of the rural water supply and sanitation sector is that which proposes decentralization of decision-making and budgets to the level of the governorates and their districts. The content of this draft law is described below in Paragraphs 6.07 to 6.12.

6. Regional and Local Institutions

6.01 The role of regional and district institutions in water supply and sanitation has changed somewhat over time. This is especially true for the Local Development Councils (LDCs). Currently they do not have much of an official role in sector activities, but proposed changes would create quite a different scenario.

Local Development Councils: The Past and Present Situation

6.02 Local Development Council's have been an important organizational feature at the district level for many decades. They began informally, initiated at the community level by activists who organized local development boards to implement basic infrastructure projects. They built road, schools, water systems, etc. Funding was obtained within the community and from its immigrants abroad. There was also financing from *zakat* income as well as supplemental central Government funding. These organizations were formalized in 1963, with a law giving them the right to operate freely in all fields of activity.[4] During their history they have been known by various names (including Local Development Association, and Local Cooperative Council for Development).

6.03 In the early 1970's Governorate Coordination Councils were formed, and in 1975 the Confederation of Yemeni Development Associations was created. In the early 1980's, the LDCs lost their non-governmental character and became part of the Government structure. Due to this change, they lost their ability to receive funding from zakat sources. Responsibility for the LDCs then shifted between several different ministries. They were under Local Government until 1986, the Ministry of Interior from 1986 until 1991, and subsequently responsibility reverted back to the Ministry of Local Government. The LDCs became inactive following the Civil War (May - July 1994).

6.04 Water supply activities were an important part of LDC work until November 1992, when Presidential Decree No. 230 put all rural water supply activities under the new General Authority for Rural Electricity and Water (GAREW). For example, according to one study, between 1977 - 1981, LDCs implemented 1,713 water projects. Other major accomplishments during this time period included construction of 19,505 km of roads, 4,800 classrooms, and 111 health projects. Annex 6.1 provides information which the mission gathered about a number of communities during its field visits. In some of the villages we visited, local councils has successfully managed water systems for a period of years. In some areas, however, people reported that they had problems with their local councils (e.g., money had been collected for projects which had not been implemented).

Regional Development Authorities

6.05 Some regional development organizations have been involved in rural water supply. There have been regional development initiatives in the northern, eastern, and southern uplands region as well as in the Tihama and Wadi Hadramaut. Usually these

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[4] The Cooperative Movement of Yemen and Issues of Regional Development, Dr. Muhammad Ahmed Al Saidi (ed.), Professors for World Peace Academy - Middle East, 1992

were established with donor funding, often as rural development projects. They were concerned with activities such as road construction, health, water supply, and agriculture. The ones which still exist come under the authority of the Ministry of Agriculture. As such, they are still able to work in the water sector, as they have been exempt from the November 1992 decree mentioned above.

6.06 The Southern Uplands Rural Development Project (SURDP) was established in 1976. By 1986 it had completed 166 village water supply schemes, serving 400,000 people in rural areas of Ta'iz and 'ibb. However, the Government may be planning to close SURDP by the end of the year.

6.07 From 1990-96 the Northern Regional Agricultural Development Authority (NORADA) completed and handed over to communities 60 projects serving 668 villages (354,000 users). Another 25 projects are just completed or underway, funded by the Government and the Arab Fund. These are/or will serve 231 villages, with 129,000 users. In the past, NORADA has worked in conjunction with the local councils. Each district identifies priorities, and NORADA tries to do at least one project per district. Before work begins, agreement is reached with the communities concerning their responsibilities, which usually include provision of house connections and sometimes the main pipes.

Local Development Councils: The Proposed Changes

6.07 At present, with the local councils mostly dysfunctional and with the Government not yet fully decentralized, villages wanting improved water supply usually take their requests all the way to the central government in Sana'a. Village representatives often make repeat trips, following up their requests, over a period of months or years. If the Government agrees to their request, their job is not yet over, as projects take place over several years, requiring community follow-up with the central government from one stage to another.

6.08 The draft law provides for an invigoration of the local councils. It would provide them with resources and authority, and as such forms an important part of the decentralization process. Under this law, local councils would operate at the district level, with approximately one elected representative for every 1,500 people. There would be a minimum of 31 representative per council. There would also be a council at the governorate level, formed of two members from each local council. The LC's would have responsibility for overseeing the construction, management, and O & M of village level water and sanitation, as well as duties related to other sectors. To carry out their tasks, they could raise money from local sources (O & M revenues, garbage collection fees, driver license fees, investments, etc.)

6.09 Villages who want water supply and sanitation projects could submit a request to their LC. The LC would then approve a batch of requests and submit them to the Council at the Governorate level. When approved at the Governorate level (with technical advisory assistance from GAREW), requests would go to the Ministry of Planning in Sana'a for final approval.

6.10 If this new system for local administration goes into effect and is implemented efficiently, it could greatly benefit the rural water and sanitation sector. It would provide a mechanism for bringing decision-making and management down to the lowest appropriate level. Villages could take their requests to their representative in the Local Council. Decisions for the whole district could be made at the Council level, and then could be approved at higher levels. When villagers need to follow-up with the authorities during the project cycle, they could go to their Local Council and to the governorate or regional office of GAREW. Thus it should be easier and quicker for the communities to make their requests and follow-up on them. Conversely, as the local councils and governorate or regional offices of GAREW will be located closer to the people than the central Government, they should be able to be more responsive to local demands and more familiar with the local context.

6.11 If the draft law is approved, a transition period will be needed. Local councils will need to be established where they do not exist, and reinvigorated where they have been languishing. In many cases this will involve a local election process, as well as a certain period for setting up council financial systems and budgets. Time will be needed to test and refine the process for selecting which community projects to undertake. The council apparatus at the Governorate level will also have to be created. GAREW will need to get its regional or governorate presence fully established, so that it can adequately fulfill its role in the new system. Working relationships and procedures for collaboration between GAREW and the local councils will also need to be developed and modified as lessons emerge.

6.12 If the new law is not approved, achieving the goals of the decentralization process will be more difficult. A strong GAREW regional or governorate presence would remain essential. Perhaps these GAREW offices could work with the administration of the governorates to select communities for projects. This would be taking the decision-making up one level, away from the district. However, it would still be better than today, when decisions are all handled centrally. During project implementation, communities could follow-up with the GAREWS regional offices and with the administration of the governorate.

Tribal/Village Structure in Rural Yemen

6.13 Yemen has a complex social structure based on ascribed status. The highest group is that of the *sada* families (*sada* are the group of families found throughout the Muslim world who claim direct descent from the Prophet Muhammad. They are traditionally the religious, educated classes, and often form the political elite). This group is not very numerous. The bulk of the population is formed of tribal people (*qabila*, pl. *qaba'il*) whose men in the past divided their time between farming and fighting. *Qabila* village women are not veiled and participate actively in production, particularly in agriculture and the building of their own houses. Below the true tribes are the tradesmen, whose status has improved markedly in recent decades. The lowest social stratum is composed of a variety of servicing specialists, active in occupations such as personal grooming, artistic

activities and cleaning. They are collectively known as muzzayin, akhdam and hujur, of various origins, some of them reputed to be descendants of slaves.

6.14 The tribal structure is strongest in the northern part of the country. (Its influence has not been as evident in the southern part of the country, although some say that the situation has been changing since unification). The sheikh is the leader at the village level. He is elected by the adult men, and should be considered to be upstanding and just, but not necessarily rich. The traditional leader at the district (or mudiriya) level is the *sheikh al mashaiekh*, who is expected to be wealthy. There are also village wise men (or *aghil*) who are responsible, along with the sheikh, for solving simple differences between people. The *aghils* are also elected by the adult men. Those in the positions of sheikh and aghil can hold them until their death and can be succeeded by their sons, providing they do not do anything considered detrimental to the common good. In reality it is very difficult to oust an unpopular sheikh.

6.15 During the field visits, sheiks and aghil were often found to be the leaders of village water systems. In many cases they had been successfully managing systems for a period of years. In one instance, however, the local sheiks had in effect taken over the water system after paying for a major repair. They were running it for their own benefit, even though the population had paid 30 % for its construction. In other areas disputes between village leaders had paralyzed the village, preventing repair of the system. Male consumers interviewed in one village mentioned that they had no way to re-elect system management, so there was no way to remove ineffectual leaders. Conversely, in one area with a successful water project, managed by a local cooperative, the women told us that one reason the system worked so well was that management was regularly re-elected. If one person causes problems, he is not elected again.

International Assistance for the Water and Sanitation Sector

6.16 Over the last twenty years a variety of international and bilateral donors have provided assistance to the sector (see Annex 6.2). They work with the bilateral department of GAREW (and in the past, with GAREW's predecessors). In most cases there are national counterparts for all projects. Some donors provide equipment only, while others finance all aspects of a project. Communities' contributions to projects varies. In our field visits, we saw that villagers were often responsible for providing the house connections. In other cases they also provided materials, food and salaries for workers, meters, and transport of the pump to the village. In some cases this added up to 30 % of capital costs, in others 20%. Villagers are usually responsible for O & M.

6.17 Currently local and international NGOs are not much involved in the water and sanitation sector in rural areas. There are some local NGOs involved in sector-related health education, and it may be useful to assess whether to involve them in sector projects for health education activities (particularly in schools). One international NGO, ADRA, has plans to finance some rural water projects. Local NGOs currently operate under the 1963 YAR Law no. 11. It provides the legal framework for the establishment, organization and registration of organizations and clubs of a cultural, social and charitable

nature, and defines their relationship with the state. The right of citizens to form NGOs is recognized in the constitution of Yemen, which was amended on September 29, 1994. A new draft law dealing with NGOs is currently under study by the Ministry of Legal Affairs.

Experiences with Implementing Community-Based Sector Activities in Rural Yemen

6.18 Within the organization of the Rural Water Supply Department (the former GAREW), two donors started with a community based approach in the 1980's. The community participation was introduced by the Americans and further elaborated by the Dutch project. Instead of contractors constructing the civil and mechanical works, water schemes were made by the beneficiaries under supervision of the project's technicians. This appeared more sustainable and cheaper then the traditional RWSD approach, since people were constructing their own scheme. By involving the villagers, both male and female, from the start and training them, a community is more likely to have a sense of ownership for their system. They will want to take care of it and will know how to operate and maintain it.

6.19 Experience in rural Yemen has shown that the best way to involve the community is by getting them to make a commitment early on. The request for a water scheme should come from the community. The project can do a technical and social survey and decide together with the community on a design. After that the project can make a contract with the beneficiaries in which both parties are committed to a certain contribution.

6.20 In the Dutch-assisted projects, for example, the village contributes local materials, transport and labor. The project provides the imported or expensive components of the system. The villagers have to do the first step and the project does the next. The villagers start constructing the tank; provide stones, gravel, sand and water; and they make an access road to the tank site. When all this is done, the project provides steel and cement, so the villagers can start building the tank. Then the project provides the pipes and so it continues, step by step, as a natural ongoing process. During construction the project's women's section gives health education, prepares the village for responsible water usage, and monitors the system of community participation through the female part of the village.

6.21 During its field visits the mission found several villages which had been managing their water supply system for a period of years. The villagers often provided the house connections. In some cases they provided cash, materials, and food for the workers. They were usually responsible for O & M, though some had received assistance from outside for major repairs or replacements. There were usually paid operators running the system, and others managing the accounts. Different types of administration were found, and in some cases these had changed over time: local councils, committees, cooperatives, and sheiks and village "wise men". Some of these involved elected members, others did not. Some did not provide mechanisms for re-election, making it difficult to oust poor leaders. Sometimes systems stopped functioning after ten or so years, when major replacements were needed and the villagers felt they could not afford them. In other cases relatively new systems broke down after one or two years, because of conflicts among

users or among the leadership. In these cases villagers did not seem to have an adequate institutional avenue for conflict resolution.

6.22 The findings of the field trip indicated that the following factors help promote sustainability of community-managed systems: efficient and effective (responsive) external assistance; community ownership of systems; good community leadership, selected by the people; good technical design and implementation; spare parts readily available; good management of the system (including well-kept accounts); metering with adequate cost recovery; user commitment up front to capital costs; and social cohesion in the village.

6.23 The field mission provided evidence that communities have been and are able to manage their own water systems over significant periods of time. However, devaluation, inflation and the deteriorating economic climate, along with drastically-reduced income from overseas workers, have severely affected the financial capacities of communities to make major repairs and replacements. Some communities that did so several years ago say that they are not able to today. Some kind of credit mechanism may help communities cope with this situation. Disputes among villagers or between their leaders have also been a major cause of system breakdown. Providing for regular re-election of community management committees provides a way for villagers to remove leaders who are causing problems. If local councils and governorate-level councils are established, perhaps they could provide an institutional mechanism for conflict resolution, giving communities an additional way to resolve disputes.

Role of Women in Rural Water Supply and Sanitation

6.24 Traditionally, women are the ones solely responsible for bringing water from nearby or distant sources for domestic water use. The number of trips to the water source depends on the quantity needed and the distance to the source. Women carry water containers on their heads or by loading them on animals (donkeys). Women may spend up to 12 hours daily fetching water. Therefore they are often the ones with a strong demand for an improved water system.

6.25 In many villages, women share in decision-making concerning water systems. This may include decisions about requesting government assistance, about level of service, and most concerning choice of operators. They may discuss these issues among themselves, and then let the men know their opinions. The men are usually the ones who go to the Government with requests and choose managers and operators of new systems.

6.26 Women may contribute to the capital costs of an improved system, selling their gold or a cow or by saving money from their household budget. As they are the ones using the new system, they will know if problems are occurring. They then tell their husbands or fathers, who go to the system operators or management. When an improved system is not functioning, the women will go back to using traditional sources.

6.27 In general, Yemeni women are usually quite well-informed about traditional and improved water sources. They are aware of the quality of the water in terms of taste, salt content, insects, and turbidity. They will strain the water if poor quality requires it. In most of the villages we visited, the women preferred house connections. They are very interested in the sustainability of improved systems, as these save them much time and effort and bring them good quality water. For projects to work effectively with women in the cultural context of Yemen, it is advisable to have female staff who can meet separately with the village women.

6.28 Yemeni women often are more interested in improved sanitation than men, and indicate a willingness to pay for an improved sanitation system. They would like to have an improved system inside the house for privacy reasons, as well as to improve the overall health situation in their villages. If men want improved sanitation facilities, it is often to provide privacy for the women. In general, the men did not seem as concerned about health benefits. Women usually prefer pour-flush latrines, although they said these were not always affordable. In villages with insufficient water, a few families have pour-flush latrines, but these are used only for the sick or for women who have just given birth. Others usually go outside, perhaps to the outskirts of the village or in some cases to a small stone structure within the house compound.

7. General Authority for Rural Electricity and Water

7.01 The January 1993 report of Hassan El-Shamsy described well the state of the institutions in the sector, including the then newly-established GAREW. Annex 7.1 which is the section of his report relevant to GAREW as an institution, remains largely valid to-day. The reader should consider it an integral part of this report except for those portions which are explicitly commented upon or changed by the remainder of this Chapter.

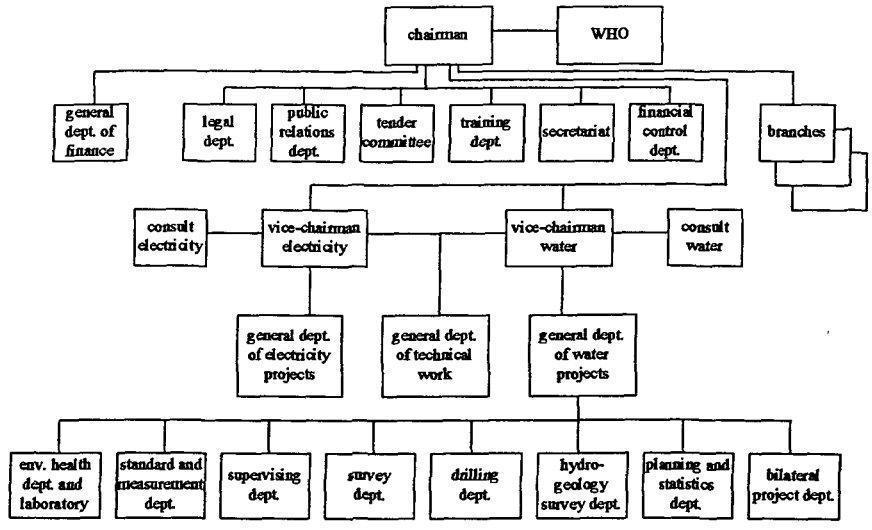
Constraints Identified in 1992

7.02 A number of the constraints described beginning on page 27 of the El-Shamsy report have been overcome or alleviated. GAREW now has a proposed organization chart. (See Figure 7.1). Responsibilities have been defined for each of the departments shown on this chart. Unfortunately, the organization chart has not been approved by the Authority's Board of Directors, and is not accepted by some of its senior staff. Moreover, some of the departments exist more on paper than in reality. This applies in particular to the Training, Environmental Health and Laboratory, and Planning and Statistics Departments. Computer services, the laboratory and the maintenance and training workshops are skeletons of what they should be and cannot possibly fulfill their functions properly. The proposed Five Year Plan (1996-2000) recognizes this and proposes the funding required for staffing, training and equipment required to develop the organization. Staffing would be increased from its current level of XXX including YYY professionals, to 686, including 264 university graduates.

7.03 The issue of responsibility and accountability for performance remains largely as described by the El Shamsy report. Every position on the organization chart is filled by an authority higher than the Chairman of GAREW. The budget constraints faced by GAREW as part of the Yemen civil service are real. It is difficult to hold staff accountable when their salaries are less than adequate to motivate them. Nevertheless, the establishment of clear responsibilities and accountability, coupled with transparent training and career development processes have been demonstrated to be effective even in volunteer organizations.

7.04 While the Decree establishing GAREW provides for the establishment of Board of Directors (Article 8 of the Decree), this apparently has not yet been done. This is unfortunate, since such a Board could undoubtedly exercise considerable influence in drawing attention to the needs of GAREW.

Figure 7.1
Organization of GAREW, July 1996



7.05 According to the El Shamsy report and information available from the Draft 1996 Public Expenditure Review, the budgets of GAREW since 1991 have been as shown in Table 7.1. As shown, if one takes account of inflation during this period, the GAREW budget in real terms remains essentially as it was in 1991. It is difficult to see how GAREW is going to increase its capacity to address the problems of the rural water supply sector without a real increase in its budget. Issues raised in the earlier report concerning lack of technical and office equipment, vehicles, training, maps and other publications will remain unresolved unless either the recurrent budget is increased in real terms, or it is recognized that the scale of GAREW implementation of projects will have to be scaled back to increase the quality and sustainability of projects.

TABLE (7.1): GAREW RECURRENT BUDGET

YEAR	BUDGET (million YR)	Percent Increase over 1991	CPI 1991=100
1991	90		100
1992	158	176	151
1993	N/A.	-	244
1994	207	230	420
1995	308	342	622
1996	748	831	803

7.06 GAREW is in the process of moving to larger quarters which should help to overcome the problems of overcrowding referred to in the El Shamsy report. In addition, the decentralization to Branch offices should reduce the number of personnel with

requirements for office space at headquarters (although they are most often in the field). It will also reduce the crowding and confusion which result from visitors arriving from all over Yemen seeking assistance for their villages.

Strategy, Policy and Objectives:

7.07 It is the strategy of GAREW that new projects should involve participation by communities in decisions and financing of water and sanitation projects. GAREW has prepared a policy paper in line with this strategy which:

- defines well the tasks of GAREW and of the communities;
- sets criteria for the selection of new project areas;
- defines the link between sanitation and water and the limits on GAREW' s responsibilities for sanitation; and
- proposes the sharing of capital costs between Government and the communities.

7.08 A copy of this paper entitled "Policies GAREW (Discussion Paper) appears as Annex 7.2. The mission agrees with the approach defined by the above policies. However, as the title of the document suggests, these policies have until now been discussed and agreed only internally within GAREW. The mission found few people outside GAREW and none at the local levels who were aware of the policy approach being adopted by GAREW. It would appear desirable that the policy paper be approved by the Board of GAREW. It should subsequently be widely publicized by informing all concerned ministries and local governments, and by the popular media.

7.09 GAREW has prepared a Five Year Plan based on a consistent and logical set of objectives. These objectives are to:

* Finish current projects
* Protect the environment and public health
* Rationalize water consumption
* Train rural operators
* Encourage cooperatives and private sector
* Develop new projects in accordance with prioritized plan

The objectives are consistent with GAREW's strategy and policy. A rough translation of the Plan is provided as Annex 7.3. However, as discussed later in this report, the Plan assumes a level of sector financing which is presently unrealistic. Moreover, it assumes a rate of project implementation which GAREW is not capable of delivering.

Project ImplementCapacity:

7.10 Perhaps the greatest challenge which GAREW faces is the fact that it does not control its work program. In his report of 1992, Mr. El Shamsy stated (Section 3.2.5):

"The availability of sufficient funds has always been a severe constraint since decision makers allocate financial resources without particular consideration for program needs, commitments and obligations. The selection of villages for inclusion in plans is done ad-hoc and is not based on approved selection criteria; the political factor being a predominant consideration."

GAREW has made laudable attempts to select projects in accordance with transparent and cost-effective criteria, as indeed the present plan attempts to do. Yet at all levels in GAREW and in its field visits the mission found that actual implementation still is driven mostly by external political considerations.

7.11 One of the consequences of this approach is that new projects are continuously being imposed on the organization when it has not completed those which it has started. Thus the completion of a project, from survey through drilling of the well, installation of the pumps, pumping main, reservoir and distribution system now takes years. For example in 1996, with about 500 projects still in various stages of completion, a further 145 villages are being advised that GAREW will undertake work to serve them. About 1000 wells have been drilled for which no systems have been developed. As a consequence, for example, the Dutch project is able to identify systems for support for which wells are already existing. While this piecemeal approach also makes it difficult to evaluate the actual capacity of GAREW to complete projects, it is the opinion of the mission that actual capacity is a maximum of 150 complete projects per year. Our field visits lead us to believe that the actual capacity may be significantly lower. It should also be evident that because of this approach, at any given time investments in incomplete and therefore unproductive projects are two or three times the annual GAREW investment budget.

Decentralization:

7.12 GAREW has recognized from the beginning the importance of serving the its clients from Branch offices. As shown in the El Shamsy report, Branch offices were included in the original organization structure in 1991. They were to carry out at the Governorate level all of the functions of GAREW to prepare designs and specifications and supervise projects. However it was not planned that they would have budget authority. Tender calls and awards were still to be managed from Sana'a. In the meantime, the Government has begun a general process of decentralization of service functions. Cabinet Resolution No. 36/96 adopted on March 31, 1996 (Annex 7.4) applies the principle of decentralization to the budget process for 1996. In addition, the draft law on local administration foresees that ministries and agencies such as GAREW will have branches in each governorate. Finally, decentralization is essential to getting to know the communities who under GAREW's strategy are to become partners in the decision-making and project financing process. GAREW will have to work closely with communities to ensure they understand their responsibilities and can organize themselves to make their projects sustainable.

7.13 Some progress has been made towards establishing the branch offices. The branches in Ta'iz and Aden are staffed and performing some functions. However the staff arrived in the Ta'iz Branch to find that they are lacking in transportation, office equipment, files on completed projects in their region, etc. Thus they can hardly carry out their functions in an efficient manner. The Aden Branch is staffed largely by the personnel who carried out rural water supply functions in NWSA and previously the Public Water Corporation. They are not completely in tune with the policy approach of GAREW. Nor do they carry their weight in terms of projects being implemented for the size of their staff. The Dhamar Branch, staffed by eight persons, is occupied over 95% of time by their responsibilities for the Dutch project. The Hodeida Branch, with a similar staff, serves only the Dutch project there. GAREW is in the process of establishing other branches at Hadramawt and Mahwit, for which the Directors have been designated.

7.14 The Five Year Plan contains provision for the establishment during the Plan period of 15 Branches with a staff of 396 persons. Given the situation described above, this appears to be an overly ambitious target. Perhaps it would be more realistic to aim for a smaller number of Branch offices, each serving 2-3 governorates, depending on the needs and geography of the area. The opening of these offices should be planned carefully, so that they are indeed properly resourced to carry out their functions from the time they are opened.

8. Sector Financing and Economics

Macro-economic Considerations:

8.01 The are a number of general economic realities which determine the context in which development of the rural water and sanitation sector must take place. The macroeconomic stabilization program being undertaken by the government involves expenditure controls through scaling back current and capital transfers, reduced subsidies, and limits on the civil service wage bill. Revaluation of the Rial from YR12/$ in 1994, to YR50/$ in 1995 and now to a market exchange rate currently approx. YR120/$ has increased the cost of imported equipment and materials for water and sanitation by a factor of ten when expressed in local currency, with consequent implications for the cost of constructing and maintaining systems and for tariffs. The high population growth rate (3.7%) and the preference of a significant part of the population to inhabit the tops of mountains (as opposed to the valleys) increase the demand for and the cost of supplying water. Finally the piecemeal approach to implementing projects over several budget years results in a high percentage of unproductive investments

Investment requirements

8.02 Based on the analysis given in Table 4.1, and GAREW's current practice, the required investments for water and sanitation are set at US$200 per capita. There is little experience on which to base cost estimates for sanitation. Moreover the types of systems which are feasible will vary widely depending on the geography. Many of the villages are built on rock which means that costs even for pit latrines will be higher than are usually expected. It is socially unacceptable in some parts of Yemen for women to satisfy their needs outside of the house. Since sanitation could cost anywhere from a few dollars to a several hundred per capita, depending on the situation, a cost of US$50 per capita has been taken for the purposes of a rough estimate.

8.03 The base year for investment requirement calculations has been taken as 1994, when 49% of the rural population had access to clean water (i.e., 5.9 million people) and 19% had access to safe sanitation (i.e., 2.3 million people). The growth rate of the total population is 3.7%, divided over rural areas (3.0%) and urban areas (6.0%). Table 8.1 gives projections of the required investments calculated on this basis.

Table (8.1): Investments Required to Meet Selected Service Levels

Service	Percentage of rural population with access to service	Required investments up to the year .... [million US$]		
		1996	2000	2014
clean water	49 %	72	228	946
	60 %	352	543	1,422
	80 %	859	1,114	2,286
	100 %	1,367	1,686	3,151
safe sanitation	19 %	5	21	90
	40 %	139	171	317
	60 %	266	313	533
	80 %	393	456	749
	100 %	520	599	966

Technological options / service levels and their costs

8.04 In Yemen physical factors or technical limitations largely dictate the choice of technology, and with that the costs and potential for community control. Table 8.2 below summarizes the costs and technical limitations of systems which are used in Yemen.

Table 8.2: Characteristics of Technologies Used in Yemen

technology / service level	capital cost	O&M and re-placement cost	technical limitation	community control potential
source				
deep well	30,000 YR/m			
hand-dug well	30,000 YR/m		up to 50 m deep	
roof water harvesting	YR 350,000			
closed cistern	YR 350,000			
pump and engine				
vertical mechanical, belt-driven	US$ 15,000	YR 1,000/day	up to 150 m	easy to maintain
vertical mechanical, shaft-driven	US$ 18,300	YR 1,000/day	up to 250 m	easy to maintain
electrical submersible, with generator	US$ 27,200	YR 1,500/day		maintenance by specialist
pump house	YR 700,000			
'booster' and engine				
mechanical centrifugal	US$ 7,100	YR 700/day	up to 350 m	easy to maintain
electrical centrifugal	US$ 13,100	YR 800/day	up to 500 m	maintenance by specialist
pipes				
galvanized steel	YR 1170/m (4") YR 760/m (3") YR 195/m (1")		non-corroding environment	
polyethylene (HDPE)			must be buried	
technology / service level	capital cost	O&M and re-placement cost	technical limitation	community control potential
reservoir				
masonry (50 m3)	YR 350,000			locally available materials/mason
reinforced concrete (50 m3)	YR 700,000			
steel			not bullet-proof	
distribution				
house connections, metered	YR 10,500			
house connect., not metered	YR 2,500			
standpipes, not metered	YR 20,000			
kiosks	YR 700,000			
sanitation				
on-site, dry pit	YR 30,000			
on site, poor flush	YR 35,000			
off-site, poor flush	YR 80,000			
off-site, full flush	YR 85,000			

Options for community contribution to capital cost

8.05 While technical options are few, there is a range of arrangements for community contributions to the financing of rural water supply schemes, and their operation, maintenance and replacement. GAREW is introducing a policy under which communities would be required to contribute 30% of the total capital cost of water supply schemes and assume full responsibility for their operation and maintenance. (As costs per capita vary wildly over Yemen, GAREW prefers not to set a maximum to its own investment per capita.)

8.06 Communities can contribute in cash or in kind. With the sharp increase of the per capita costs in Yemeni Rials, many communities can or prefer to contribute mostly in-kind. This may consist of the water source itself (and an agreement to use it), land, locally available construction materials, transport, labor and meals for the workers. In the Dutch-financed projects, completion of steps taken by the community is promptly followed by assistance by the supporting agency to ensure that systems are actually completed. In one World Bank financed project, the executing agency required a cash deposit by the community equal to the cost of their wells to demonstrate their commitment. This was returned upon completion of the project.

8.07 Public standpipes are hardly an option in Yemen: people simply do not want them as they may constitute a potential source of trouble within the community. Beneficiaries can be required to pay the full cost of house connections, and this could be made conditional upon the presence of facilities to safely remove wastewater. This was said to be the requirement in one village visited by the mission. Alternatively, water could be cut off if poor waste water removal poses an environmental risk.

Options for community financing of system operation, maintenance and replacement

8.08 Several approaches were in use in the villages visited by the mission. Water charges in some cases were 'flat', varying with the size of the house or household, and in others based on the metered water usage. The charges originally were sometimes set high enough to generate a surplus for depreciation and calamities. However, deflation of the Yemeni Rial has weakened the purchasing power of the savings so that the funds available will no longer cover the costs of major repairs or replacements. One village had invested in spare parts or land (for future well-drilling), an inflation-proof approach.

8.09 The suggestion of higher charges for the rich and lower ones for the poor did not prove to be particularly popular when suggested during focus sessions. That is not to say that informal cross-subsidizing (or water sharing) does not take place. Institutionalizing these arrangements, however, may be a bridge too far for many communities. There are villages that undertake communal activities, the profits from which are used to keep water charges low (e.g., As Sunah).

Willingness to pay

8.09 There is scant information on people's willingness to pay for the few and often costly technical options for rural water supply in Yemen. One measure of that willingness to pay might be the prices people pay for their water now. Prices vary with availability and quality of the water and distance to the source. People buy water from private vendors (from tankers or cars) at prices ranging from 125 to 700 YR/m3 (average YR 350/m3). Piped water, where available, costs only 25 to 130 YR/m3 (average YR 45/m3). Annex 8.1 lists some typical cost information collected during the field visits. It would be useful to undertake a willingness-to-pay in representative rural areas to obtain a more precise picture.

8.10 However vendor prices probably reflect the maximum people are prepared to pay only during those few months of the year when cisterns, shallow wells and springs fall dry. Then only do they start buying 'expensive' water for purposes other than drinking. Also, water use proves to be somewhat elastic: high rates do indeed keep usage low (e.g., Eryan). When asked, few people are willing to pay 'vendor prices' for a better, public service. Part of the reason lies in the above explanation. Part of it may be because the people have become conditioned to expect cheap water from 'the government'. Also many know that public services elsewhere charge less than private vendors.

Ability to pay

8.11 Based on the 1996 Poverty Assessment, some 10% of the rural population can not meet basic food needs, and will be unable to pay for water. This roughly corresponds with the percentage of the population in the communities visited by the mission who considered unable to pay and often are exempted from paying water charges. There was agreement almost everywhere that most people could and are willing to pay the current monthly charges.

Local Level Financing

8.12 Another possible source of financing is at the level of the governorates. The new law on local administration will empower the governorates to raise money from fees, taxes, borrowing, and grants. However, in 1996 YR 505 millions for water projects is in fact being provided from the national budget.

National Level Financing

8.13 GAREW submitted an investment budget request for 1996 which foresaw completion of 500 ongoing projects whose remaining cost is YR 2.2 billion (US$ 20 million) in 1996 terms. In addition, 145 new projects were authorized at a cost of YR 1.4 billion (US$ 12 million). GAREW understands that its approved capital budget is YR 1.3 billion. Even if it were successful in harnessing local contributions equal to the targeted 50% of its own budget, this would provide a total of only YR 1.95 billion - not enough to

complete the projects underway. In fact, more than half of the year is over and it is clear that the investment target will not be met. Moreover, much of the budget is being spent on starting new works in response to ad hoc pressures rather than on completing ongoing projects. This is a continuation of the situation referred to in Para. 7.10. Finally, contributions from the communities will be insignificant in 1996 as they are not aware of the GAREW policy and GAREW is not organized to apply it. In these circumstances it should be expected that less than half of the projects underway at the beginning of 1996 will be competed this year.

8.14 GAREW's Five Year Plan foresees capital investments of YR 40 billion. With only YR 1.3 billion in 1996, GAREW must make investments during the remainder of the Plan period at six times the rate budgeted for 1996 to achieve this target. This is unrealistic in the current climate. No budget is foreseen by GAREW for capital works for rural sanitation. Nor did the mission hear of budgets in other agencies or ministries for this purpose. If the assumptions which lie behind the calculations in Table 8.1 are correct, YR 7.5 billion investment would be required during the Plan period to maintain to-day's service levels for water and sanitation. Even this would require a higher level of investment than was budgeted for 1996. Otherwise, in spite of all efforts the situation will be deteriorating.

8.15 The water sector already absorbs a significant, and probably unsustainable portion of the national investment program. Preliminary results of the 1996 Public Expenditure Review show that water-related projects will be about YR 6,990 millions or about 20% of total investments planned for the year. This amount is constituted as follows:

MAWR	(75% foreign)	2,120
NWSA	(71% foreign)	3,563
GAREW	(5% foreign)	1,307

Two facts deserve attention from these numbers. First, it appears that the Government has decided to give far higher priority to the urban water and sanitation sector than to the rural. Per capita provisions are 12 times higher for the urban sector than for the rural. This can be partly explained on public health grounds, because of the danger of epidemics in more crowded urban environments. However this factor does not appear to be as significant in Yemen as in some other countries. Secondly, foreign donors too appear to be reluctant to become involved in the rural sector in Yemen. As noted earlier, to-day only the Dutch and Japanese provide bilateral-lateral assistance. The UN agencies and multilateral banks also play minor roles. The mission is of the opinion that this is because of the inefficient manner in which funds are invested in the sector and the proven unsustainablity of completed projects.

9. Conclusions and Recommendations

9.01 It is clear that there is a great need to improve access to water supply and sanitation in the rural areas of Yemen. In the current situation, service levels are being maintained at best. If one takes account of the probability that additional systems are failing because of drying up of wells, failure of equipment which has passed its normal life expectancy, poor operation and maintenance and constrained financial resources at the local level, the situation is almost certainly deteriorating. To reverse this situation will certainly require significant additional financing. But investing efficiently and effectively requires that the capacity of the sector institutions be increased. Building such capacity will require implementation of new policies, and strengthened institutions at the national and local levels.

Policies

9.02 The GAREW policy statement (Para 7.08) and the objectives of the Five Year Plan (Para 7.09) are logical and reasonable. If pursued they would most certainly facilitate investment in the sector and speed up project implementation and sustainability. Unfortunately, these policies and objectives are little known outside of GAREW. Moreover, they are not being supported responsibly by officials who continue to ask GAREW to set them aside in response to political pressure. It is recommended that a Board of Directors of competent and influential persons be appointed as soon as possible to support and oversee GAREW operations. One of its first tasks should be to review and ratify the policies and objectives established by GAREW management. These should then be given wide circulation in the popular media and via official channels to the concerned ministries, agencies and local government bodies.

9.03 Integrated management of the scarce water resources of Yemen to ensure their sustainability is a Government priority. The National Water Resources Authority has been established to oversee this function. A national water management strategy is being developed. It is recommended that GAREW, under the direction of NWRA, closely coordinate its activities in each water basin with those of other water users to ensure the sustainable development of the countries water resources.

Organization of GAREW

9.04 During the period since it was established GAREW has lived much of the time with operating budgets whose purchasing power was less than it was at the time of its establishment. While attempting to organize itself to perform effectively and efficiently, it has been subject to pressures to respond to ad hoc demands which made this difficult, if not impossible. In the meantime the decentralized approach to which GAREW aspired has become a Government priority for all sectors. This offers both new opportunities and new challenges to GAREW. It is recommended that a new organization philosophy and structure should be designed and implemented as soon as possible for GAREW which places responsibility and the needed resources for project planning, design and implementation with Branch Offices in the Governorates. The functions of Headquarters

should be integrated planning, coordination, monitoring, evaluation and quality control at the national level.
Care must be taken to maintain existing capacity for project implementation while carrying out the decentralization process.
Appropriate external technical assistance should be engaged to assist GAREW management in the planning and implementation of this new organization.
GAREW Branches:

9.05 As noted in Para 7.12, GAREW will have to work closely with communities to make sure they understand their responsibilities and can organize themselves to make their projects sustainable. This will be one of the most important functions of the Branches, who also must assist the decentralized local administration in planning and implementing its projects. Thus the Branches become critical to the success of any program to speed up implementation of rural water supply and sanitation. It is recommended that in designing and carrying out the organization of its decentralized structure, GAREW take into account the suggestions listed below. The first three were considered the highest priority by those attending the workshop.

* Training of future system managers and operators should take place in the regions. Where possible, existing training facilities should be used (e.g. Southern Uplands training facility in Ta'iz). Exchange visits with successful projects in the region and neighboring regions should be used as part of the training program. Mobile workshops/training centers might also be cost-effective

* Whenever possible, civil works should be carried out by the community under GAREW supervision. It is less expensive and ensures commitment.

* GAREW management should assign higher priority and resources to the planning, monitoring, coordinating and control functions of the organization.

* Community commitment to sanitation should be a required component in any water supply project to prevent pollution of the environment. Environmental and health education should also be provided appropriately to women and men. GAREW should also participate in a national program to create public awareness of the scarcity and value of water.

* Before staffing future Branch offices, a systematic survey should be carried out (preferably by the future Branch Director) of service levels and the state of existing systems in each of the villages of the governorate(s) the Branch is to serve. This would include identifying which systems are functioning satisfactorily. It would also determine what actions and investments are required to bring non-functioning or deficient systems into service.

* The time period should established for deciding which projects have been sustained by the community. Those communities successfully operating them for that period of time should be given priority when they seek assistance from GAREW for major

repairs or replacements. (This was a supplementary recommendation from the workshop).

* Branch offices should be assured of adequate staffing and support facilities (e.g. transport, office equipment) before they are opened. It may be desirable to optimize the functioning of Branch offices by having some Branches serve two or three Governorates.

* GAREW branches should be staffed to provide advice on maintenance to village system managers (extension activities) and to carry out major maintenance activities in regions where the local private sector capacity is not adequate.

* Branch offices should determine their annual and five-year work plans for the region they serve in collaboration with the District Councils and Governorates.

* GAREW's files for all existing projects in the region should be transferred to the Branch Office when it is opened and placed in a comprehensive filling system there.

* When contractors are required, tenders for projects in the area served by a Branch should be advertised in the region served by the appropriate means as well as nationally.

* GAREW staff should not be dependent on contractors for any support services (e.g. transport, meals).

* A standardized approach (and form) should be developed for involving the village communities in projects before a decision is taken to include them in GAREW work program. GAREW staff should be trained in the use of this approach.

GAREW Central Functions

9.06 Strengthening of GAREW will also require attention to the central functions. The mission has not carried out an extensive organization analysis or design. However. it recommends that GAREW management and its external organization development specialists pay attention to the following in carrying out the strengthening program:

* An adequate current budget should be developed and provided to assure the efficient functioning of GAREW. If the total budget cannot be increased, GAREW should reduce its implementation rate to permit better planning and quality control and a more efficient approach to building sustainable systems.

* GAREW needs to recruit and/or train a sufficient number of staff to carry out the environmental and public health functions assigned to them in coordination with other responsible ministries.

* Given the national budget constraint on salaries, it is important that other working conditions be made as attractive as possible to motivate staff, e.g. training, career planning, performance evaluation and merit awards, etc.

* Responsibility for monitoring quality of all drinking water sources must be established. If GAREW is to be responsible, a central laboratory must be equipped to standardize and monitor results from field and Branch equipment.

Strengthening Local Institutions: Sector Procedures/ rules which Help Promote Sustainability at the Community Level:

9.07 Based on its assessment of the factors which have been responsible for the sustainability of projects in Yemen in the past, the mission recommends the following six rules be applied to all projects in the future. They are presented in the order of priority assigned to them by the workshop.

* Community training in O & M and management/accounting should be an integral part of each project.

* A mechanism should be in place which holds the leaders of the community water system accountable to the people. The workshop suggested that one mechanism could be that leaders be elected by their communities for a specified period. Operators should have technical qualifications acceptable to GAREW. This would give the project managers official status in their dealings with consumers and the authorities.

* External assistance should be responsive to community initiative, acting promptly and constructing the complete project at one time.

* Communities should legally own the system, and should also demonstrate a strong sense of ownership through making a commitment up front to capital costs.

* Technical design should be based on locally-available equipment that can be repaired by the private sector.

* Adequate cost recovery should be part of the project plan.

Other recommendations re local institutions:

9.08 Participatory, community-based approaches become more complex as the size of the population grows. It is recommended that GAREW explore with NWSA mechanisms which can be used for the management of systems where the population to be served is over 10,000

9.09 The draft law on local administration includes important roles for local councils. A transition period will be needed to allow time for local councils to become fully operational, capable of carrying out these newly-designated responsibilities. The use of participatory approaches will require close interaction within communities between men and women, and between communities, local councils, and GAREW. Procedures for this

will need to be tested and adapted as lessons emerge. It is recommended that following adoption of the new law on local administration, the Ministry of Local Administration organize a series of workshops throughout the country to explain the law and to explore in detail the practical implications. Branches of government ministries and agencies, including GAREW, should participate in each of these workshops.

Financing:

9.10 Given the scarcity of financing, it is important that funds be used economically. One of the ways to ensure a high economic return on an investment is to complete a project which is partially completed (i.e. where there is a sunk investment). It is recommended by the mission and the workshop that in the short-term GAREW should:

- concentrate on completing the program of works to complete systems already started
- rehabilitate existing systems which are in need of repairs, new equipment or new sources of supply.

These two efforts will take at least two years to carry out and represent the most effective use of scarce financial and human resources. New projects should be undertaken only when these efforts are completed.

9.11 To ensure that the new policy direction is understood from the beginning, the mission, with the support of the workshop recommends that local communities be required to commit to contribute a percentage of the costs of new systems or of major repairs or upgrades before GAREW enters them in their work plan.

9.12 The workshop also agreed with the mission that since investments in the water sector in total are already 20% of the national investment budget, it is recommended that additional Government funding for rural water should come from transfers from the budgets of NWSA or Ministry of Agriculture.

9.13 The mission and the workshop also recommend that special efforts be made to obtain a greater percentage of foreign financing for rural water and sanitation. One possibility would be that foreign financing be sought for a pilot project to demonstrate the application by GAREW of the principles of village participation in a number of villages in one or more governorates. Another would be that external financing be sought to support a priority program of completion of projects in which there is already a sunk investment.

9.14 As noted in Para 4.06, the cost of materials and equipment purchased duty-free by international tender could be half the cost of the same materials purchased in the local markets. The problem for GAREW in the past has been to find a source of foreign currency to finance the purchase. It is recommended that GAREW explore with the Ministry of Finance a mechanism which will permit GAREW to take advantage of these savings. One possibility would be to seek a loan or credit from a multilateral or Arab development bank.

9.15 As per capita costs can be reduced by grouping villages into larger systems, it is recommended that this be done when it represents the least-cost solution

9.16 As noted in Para 8.06, many villages have been caught by the high rate of inflation and the impact of devaluation of the Rial on the cost of imported equipment. Yet they wish to behave responsibly and would be willing to pay their share of the cost of new or replacement equipment if it could be amortized, e.g. reimbursed through a surcharge on the water bill. It is recommended that credit facilities be designed and financed to facilitate access to credit for major maintenance by community water supply systems that demonstrate responsible financial management and ability to repay the loan.

9.17 Given that GAREW's existing Five Year Plan appears unrealistic, and that a new one must be prepared to cover priorities after the completion of ongoing projects and rehabilitation of existing ones, it is recommended that a new five-year investment plan be prepared based on consultations at the Governorate and District levels.

Next Steps

9.18 The rural water and sanitation sector in Yemen faces serious challenges. While the sector has stagnated, the population has come to believe that their problems will be resolved by Government intervention. Financially, at least, this is not possible. Thus the problems are ingrained in minds and behavior. They cannot be resolved during a brief mission. Rather they require the concerted attention and effort of senior Government officials and sector managers. This report has attempted to identify the issues and to propose some solutions. However, even if the solutions are the correct ones, the problems remain to be solved.

9.19 It is recommended that:

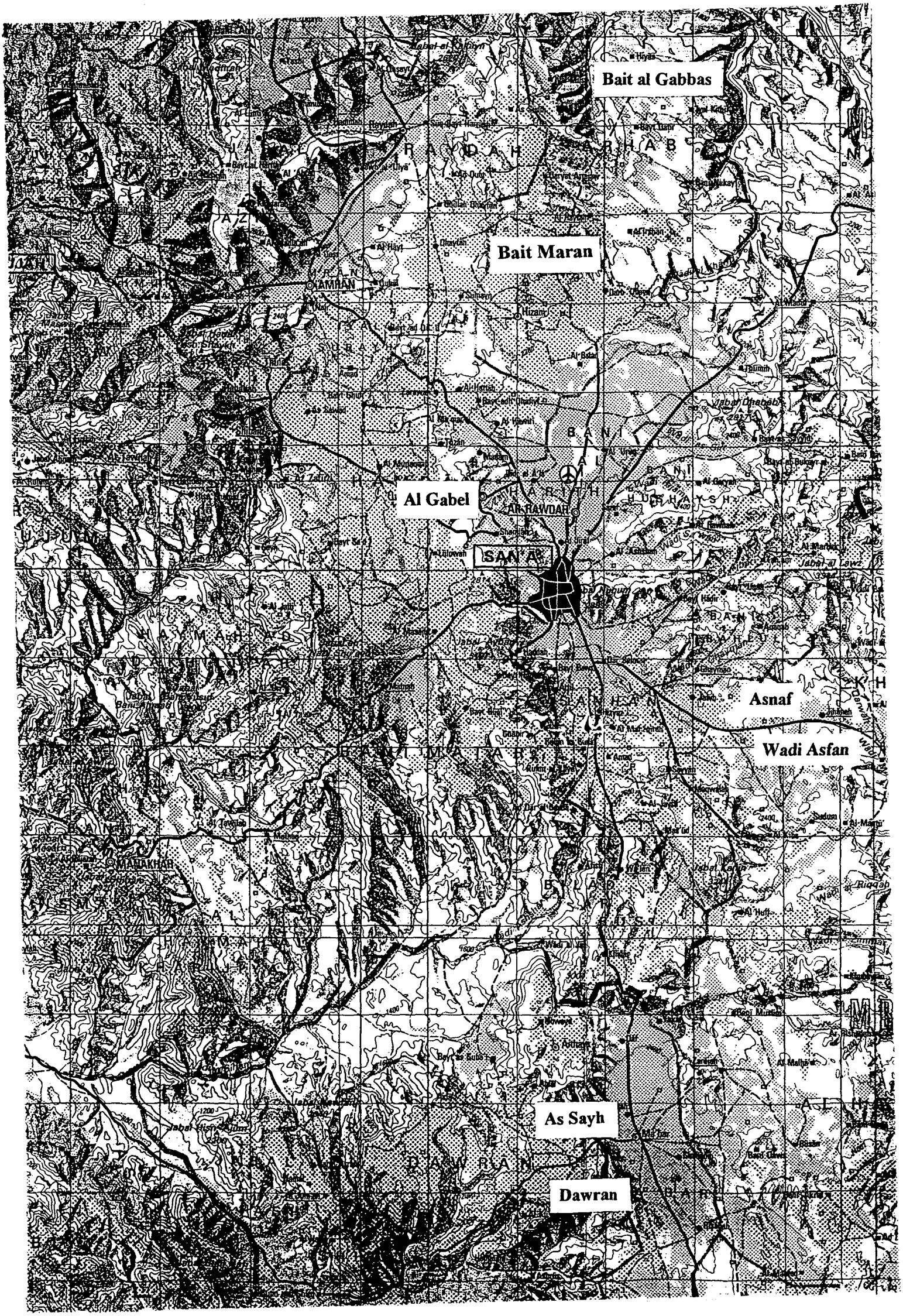
a) the management of GAREW, other concerned Government ministries and agencies, and the Multi-Donor Group for Yemen Water carefully consider the findings and recommendations of this report and their implications;
b) GAREW, in consultation with the Government, propose an action plan in response to the findings of the report and its recommendations; and

c) a meeting of the Multi-Donor Group and the Government be convened immediately thereafter to review the proposed action plan and determine how the donor community may assist GAREW in its implementation.

ANNEXES

ANNEX 1.1

MAPS SHOWING SITES VISITED BY MISSION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Dawran
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AMRAN
MANAKHA
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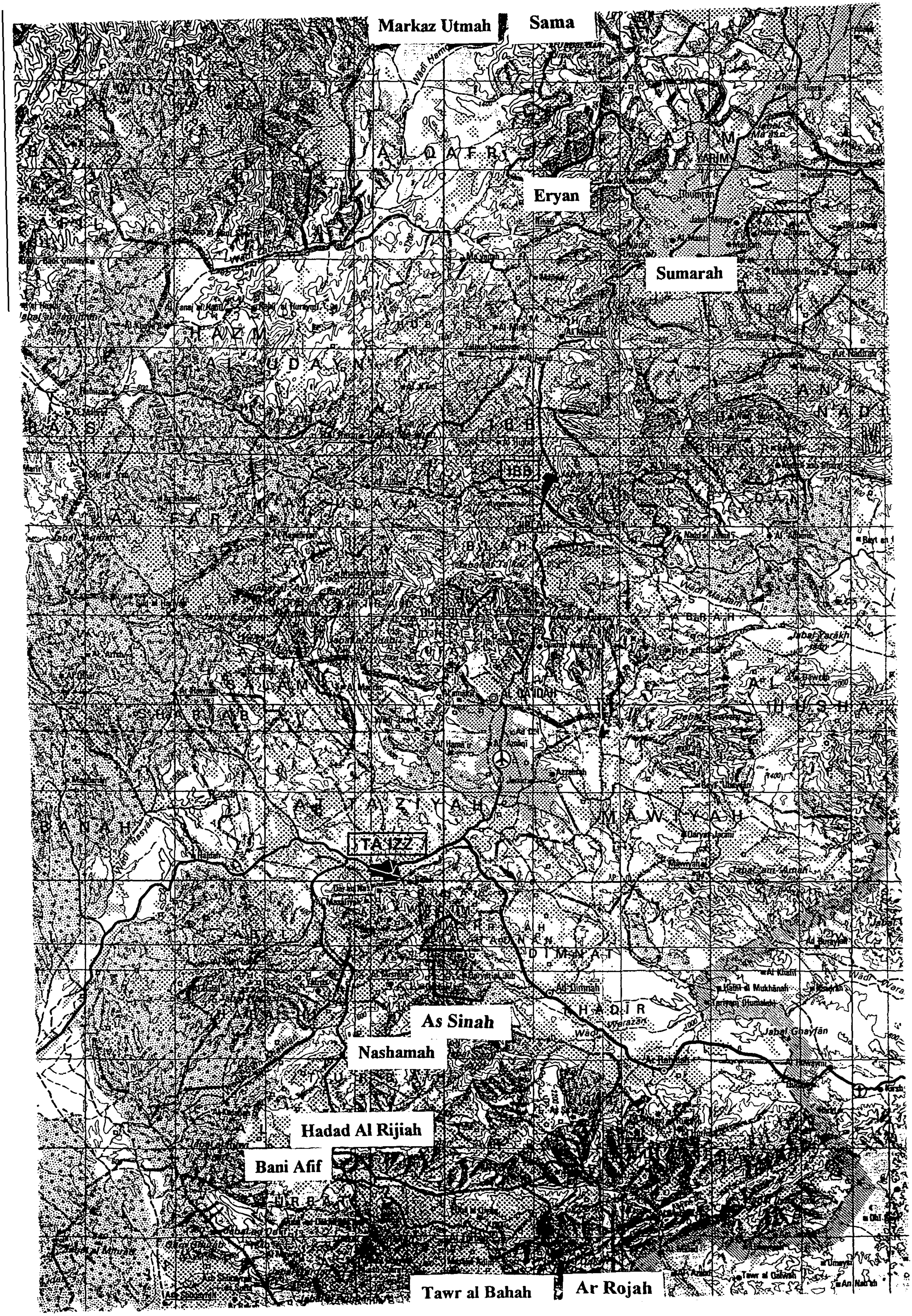
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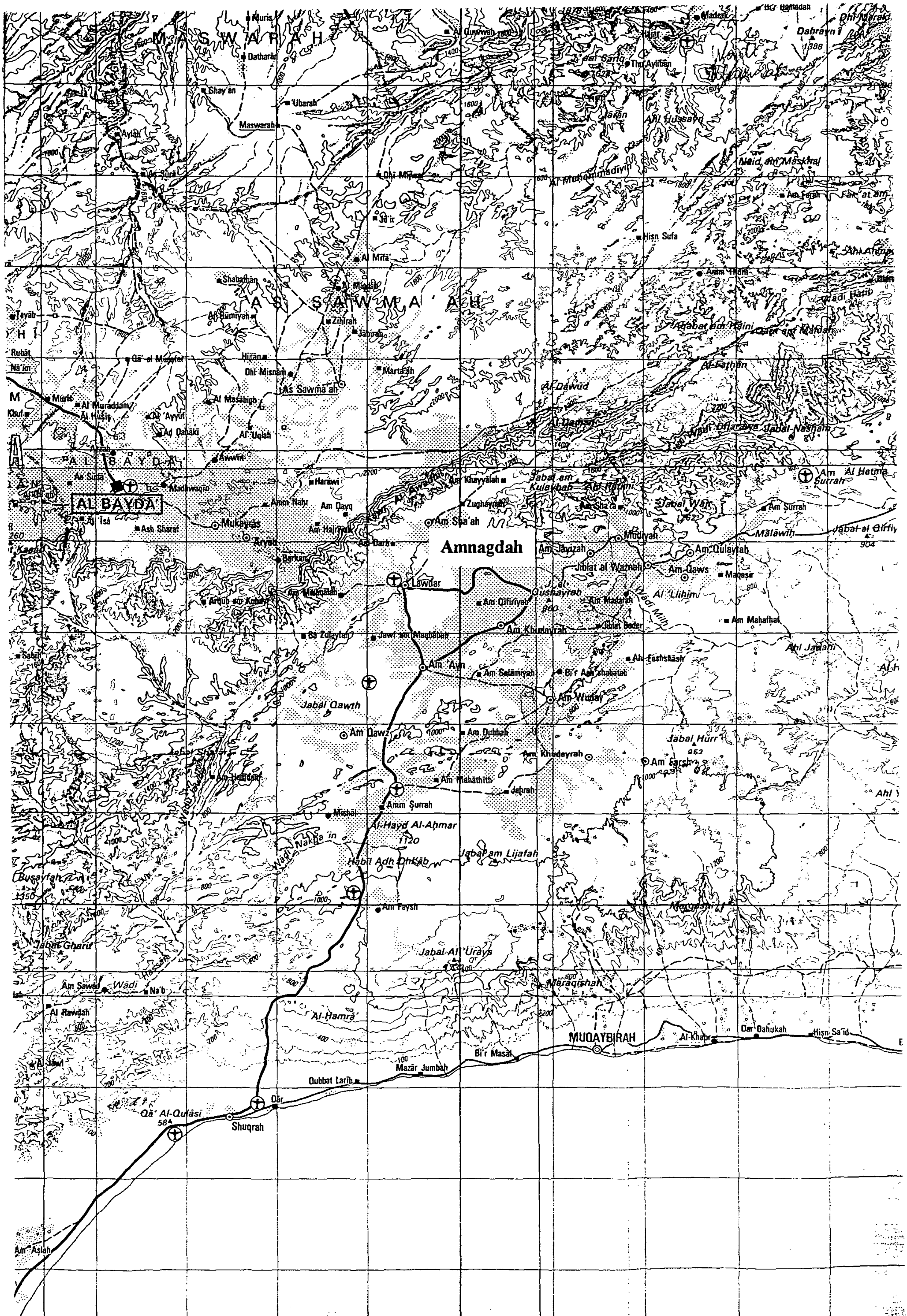
TAIZZ
As Sinah
Nashamah
Hadad Al Rijiah
Bani Afif
Tawr al Bahah
Ar Rojah



MASWARAH
Maswarah
Datharān
Shay'ān
'Ubarah
Aylān
As Sūrā
Dhī Mīfqā'
Al Mifā'
Hisn Sufa
Amm 'Hāmi
AS SAWMA'AH
Shabaḩān
Zihirah
Jabirah
Hijlān
Dhī Misnām
As Sawma'ah
Marta'ah
Al Dawud
Al Masābiqh
Al Muraddam
Al Husīs
Ad Dahākī
Al 'Uqlah
Awwin
AL BAYDA'
Al 'Isā
Ash Sharaf
Mukayras
Aryab
Barkan
Harawi
Amm Nahr
Am Dayq
Am Hajrayah
Am Khayyālah
Zughaynah
Am Sha'ah
Amnagdah
Am Jayizah
Mudiyah
Am Qulaytah
Am Qaws
Jiblat al Waznah
Jabal Wāḩr
Am Surrah
Mālāwih
Jabal al Qirfiy
904
Lawdar
Qushayrah
Am Qifiriyah
Am Madarah
Al 'Lihim
Maqaşir
Am Khuḑayrah
Am Mahafhal
Jawl am Maqbabah
Bā Zulayfah
Am 'Ayn
Am Selāmiyah
Bi'r Am'shabatah
Am Wuday
Jabal Qawth
Am Dawz
Am Dubbah
Am Khuḑayrah
Am Farsh
Jabal Hurr
962
Am Mahāthith
Jahrah
Amm Surrah
Mishāl
Al-Hayd Al-Aḩmar
1120
Wādī Nakha'in
Habil Adh Dhi'āb
Jabal am Lijafah
Am Faysh
Jabal Gharif
Jabal Al 'Urays
Am Sawad
Wādī
Na'b
Al Rawdah
Al-Hamra'
Maraqishah
MUQAYBIRAH
Al Khabr
Dar Bahukah
Hisn Sa'id
Bi'r Masal
Mazār Jumbah
Qubbat Larib
Dār
Qā' Al-Qulāsi
58
Shuqrah
Am Aslah
Busayfah
1350
Ahl Jadani
Jabal-Nasham
Wādī Ḑhi'arāwa
Al-Fathān
Najd am Maskhal
Ahl Husayn
Thī Aylibān
Dabrayn
1388

ANNEX 2.1

Key Institutions in the Rural Water Supply and Sanitation Sector

Institution (or entity)	Institution's Role or Area of Involvement what is it supposed to do (according to mandate) with respect to :				
	Water Supply (WS)		Sanitation		
	WS Systems	Water Quality	Wastewater	Solid Waste	Public Hygiene/ Health
Prime Minister's Office	Two policy- making entities (NWRA and EPC) which deal with planning and management (no resource development)				
• National Water Resources Auth. (NWRA)	resource planning & management, including licensing and quality monitoring		monitoring and regulation (licensing) of point sources to protect resource against pollution		monitor / inspect the quality of drinking water (vendors', networked, ...)
• Environmental Protection Council (EPC)	Same as NWRA but through "concerned entities"				water, air, food, ... qualities
Ministry of Planning & Development	Makes recommendations on financial allocations and disburses funds				
Ministry of Finance	Disburses funds				
Ministry of E & W	Sector policy and implementation				
• GAREWS	• builds WS systems for villages w/ population <30,000 major repairs/ replace.	analyse (and monitor) sources of supply	----	-----	protect public health and apply necessary public health controls
• NWASA	build WS systems for towns with population >30,000	analyse (and monitor) sources of supply	only in some cities and towns	----	----
Ministry of Ag & WR • HQ	build WS systems under certain conditions	----	----	----	----
• Regional Develop. Authorities, RDA's	build WS systems in rural areas	analyse (and monitor ?) supply sources	----	----	protect public health
• Projects	same as RDA's				

ANNEX 2.1 (Cont.)

Institution (or entity)	Institution's Role or Area of Involvement what is it supposed to do (according to mandate) with respect to :				
	Water Supply (WS)		Sanitation		
	WS Systems	Water Quality	Wastewater	Solid Waste	Public Hygiene/ Health
Ministry of Local Administration	• HQ: policy (?)				
• Governorates	Governorates do not implement projects and all activities are through offices of line ministries				
• Local Development Councils (LDC's)	build WS schemes	only when WQ is obviously poor	this area is ignored		
Ministry of Construc., Housing & Urban Plan.	• HQ: environmental health policy				
• Branch offices at governorates' level (i.e. **municipalities**)	----		----	collection and disposal, plus operation of landfills	environment-al health
Ministry of Health	----	----	----	----	used to have a public hygiene dept. but no more
Ministry of Education	Various concepts and messages concerning water projects, waste disposal and environmental aspects are part of the curriculum of the Basic and Secondary education.				
Universities	Water, wastewater and environmental engineering education as well as technical support services (consulting, chemical analyses, etc.)				
Ministry of Information	A large number of messages on water conservation, garbage collection, public hygiene,... etc were aired in TV. There is active participation from various news papers in environmental issues, ...				
Ministry of Industry	---	labs for water quality analyses	---	---	---
Private Sector	active role in water development	---	---	slowly moving to privatize the collection and processing of solid waste	---
NGO's	There are at least two NGO's with obvious roles in environmental and water fields; namely: the Yemeni Environmental Society (YES) and the Yemeni Water Protection Society.				

ANNEX 4.1

ACCESS TO WATER SUPPLY AND SANITATION BY GOVERNORATE AND DISTRICT

DEFINITIONS AND CAVEATS OF THE 1994 CENSUS AND INFORMATION DERIVED FROM IT

governorate	mudiriah	total	population in	population in	percentage of people in settlements < 30,000 with source of water										percentage of people in settlements			percentage of people in	
		population	settlements	settlements	public	cooperative	private	well	stream	closed pool	open pool	drain	dam	not stated	< 30,000 with source of water			settlements < 30,000 with	
			< 5,000	< 30,000	project	project	project		(ie, spring)						piped system	well	other	water that is	
																		clean	not clean
Sadah		**481,617**	**424,614**	**481,617**	**5.4%**	**4.2%**	**4.7%**	**52.9%**	**5.3%**	**8.3%**	**12.7%**	**5.7%**	**0.3%**	**0.1%**	**14.3%**	**52.9%**	**32.2%**	**40.8%**	**58.7%**
	Baqim	20,256	15,963	20,256	1.3%	9.3%	15.9%	50.8%	5.2%	0.8%	12.2%	3.6%	1.0%	0.0%	26.5%	50.8%	22.7%	51.9%	48.1%
	Qitabir	30,976	28,997	30,976	0.7%	1.2%	0.5%	62.6%	6.6%	10.4%	17.6%	0.2%	0.1%	0.0%	2.4%	62.6%	34.9%	33.8%	66.2%
	Munabbih	24,667	24,329	24,667	0.7%	0.2%	0.2%	31.1%	10.8%	25.5%	26.2%	4.9%	0.4%	0.0%	1.2%	31.1%	67.7%	16.7%	83.3%
	Ghamir	11,722	11,707	11,722	0.7%	0.6%	0.3%	73.6%	3.3%	4.1%	14.6%	2.8%	0.1%	0.0%	1.5%	73.6%	24.9%	38.3%	61.7%
	Razih	47,463	40,881	47,463	2.1%	0.9%	0.7%	12.6%	6.9%	45.0%	23.7%	6.6%	1.5%	0.0%	3.6%	12.6%	83.8%	9.9%	90.0%
	Shida	8,883	8,828	8,883	1.3%	0.4%	0.2%	3.2%	0.5%	6.8%	39.3%	48.3%	0.0%	0.0%	2.0%	3.2%	94.9%	3.5%	96.5%
	Az Zahir	14,547	12,804	14,547	8.6%	1.4%	0.9%	13.8%	1.5%	1.2%	11.9%	60.7%	0.1%	0.0%	10.8%	13.8%	75.4%	17.7%	82.3%
	Haydah	45,649	43,094	45,649	1.3%	4.2%	0.4%	44.5%	15.5%	4.3%	25.1%	4.7%	0.0%	0.0%	5.9%	44.5%	49.6%	28.1%	71.9%
	Saqayn	40,467	37,772	40,467	1.6%	1.5%	1.0%	56.4%	13.9%	8.2%	14.2%	3.2%	0.0%	0.0%	4.1%	56.4%	39.4%	32.3%	67.6%
	Majz	37,578	30,172	37,578	4.4%	2.4%	8.7%	75.5%	1.4%	2.9%	4.2%	0.4%	0.1%	0.0%	15.5%	75.5%	9.0%	53.2%	46.8%
	Sahar	118,272	90,651	118,272	16.2%	10.3%	10.4%	54.3%	1.0%	1.5%	4.8%	0.9%	0.1%	0.5%	37.0%	54.3%	8.2%	64.1%	35.4%
	As Safra	37,342	37,342	37,342	1.8%	5.3%	7.7%	75.9%	1.2%	0.8%	5.3%	1.6%	0.3%	0.0%	14.8%	75.9%	9.2%	52.8%	47.2%
	Al Hishuah	10,376	10,176	10,376	0.2%	0.7%	0.7%	92.1%	3.0%	0.1%	1.9%	1.1%	0.1%	0.0%	1.6%	92.1%	6.3%	47.7%	52.3%
	Kitaf	33,419	31,898	33,419	2.0%	0.8%	2.0%	84.1%	0.6%	0.5%	6.7%	3.1%	0.1%	0.0%	4.9%	84.1%	11.0%	46.9%	53.1%
Sanaa		**1,851,858**	**1,742,246**	**1,851,858**	**5.7%**	**9.4%**	**4.8%**	**38.8%**	**18.6%**	**4.2%**	**15.4%**	**2.7%**	**0.4%**	**0.0%**	**19.9%**	**38.8%**	**41.3%**	**39.2%**	**60.7%**
	Birat al Inan	48,757	43,264	48,757	2.5%	1.3%	0.5%	77.2%	1.3%	0.5%	14.9%	1.6%	0.1%	0.0%	4.3%	77.2%	18.5%	42.9%	57.1%
	Rajuzah	77,445	74,242	77,445	1.5%	0.5%	0.8%	82.0%	2.5%	1.7%	8.7%	2.4%	0.0%	0.0%	2.8%	82.0%	15.2%	43.8%	56.2%
	Kharab al Marashi	52,585	48,175	52,585	1.5%	2.1%	0.6%	78.0%	7.8%	2.0%	4.9%	3.1%	0.1%	0.0%	4.2%	78.0%	17.9%	43.2%	56.8%
	Harf Sufyan	26,830	24,477	26,830	1.9%	3.1%	1.3%	51.3%	4.9%	1.7%	24.7%	11.0%	0.1%	0.0%	6.3%	51.3%	42.4%	31.9%	68.0%
	Al Qahlaf	28,900	27,605	28,900	3.8%	0.9%	1.0%	77.2%	6.4%	2.0%	4.8%	3.8%	0.0%	0.0%	5.7%	77.2%	17.1%	44.3%	55.7%
	Al Ashshah	36,260	34,805	36,260	1.0%	0.4%	0.6%	69.7%	11.2%	0.8%	6.8%	9.4%	0.1%	0.0%	2.0%	69.7%	28.3%	36.9%	63.1%
	Huth	20,157	15,664	20,157	2.3%	3.6%	21.1%	33.1%	1.7%	9.2%	27.3%	1.0%	0.6%	0.0%	27.0%	33.1%	39.8%	43.6%	56.4%
	Khamir	101,603	90,700	101,603	9.8%	4.7%	2.0%	30.0%	5.4%	5.6%	41.6%	0.1%	0.7%	0.0%	16.5%	30.0%	53.5%	31.5%	68.5%
	Dhibin	26,474	25,054	26,474	5.8%	6.7%	4.5%	31.7%	5.8%	6.7%	47.7%	0.2%	0.0%	0.1%	17.1%	31.7%	60.4%	32.9%	76.3%
	Kharef	40,406	39,214	40,406	5.3%	0.9%	4.7%	35.7%	5.3%	0.9%	43.3%	0.0%	3.4%	0.0%	10.8%	35.7%	52.9%	28.7%	70.7%
	Raydah	31,514	22,684	31,514	4.3%	23.1%	7.4%	49.1%	4.3%	23.1%	13.6%	0.1%	0.0%	0.0%	34.8%	49.1%	41.2%	59.4%	65.8%
	Jabal Iyal Yazid	57,759	57,555	57,759	8.6%	11.0%	0.6%	36.9%	8.6%	11.0%	22.8%	0.2%	0.2%	0.1%	20.1%	36.9%	42.8%	38.6%	61.2%
	As Sudah	31,009	28,464	31,009	1.2%	0.4%	1.0%	12.6%	1.2%	0.4%	57.7%	6.4%	0.0%	0.0%	2.6%	12.6%	65.7%	8.9%	72.0%
	As Sawd	19,651	19,122	19,651	1.8%	0.3%	0.6%	9.6%	1.8%	0.3%	45.2%	6.9%	3.2%	0.0%	2.8%	9.6%	57.4%	7.6%	62.2%
	Maswar	36,941	34,960	36,941	2.6%	5.8%	1.5%	3.9%	2.6%	5.8%	7.4%	4.9%	0.0%	0.0%	9.8%	3.9%	20.7%	11.8%	22.7%
	Thula	31,430	19,866	31,430	37.0%	6.5%	2.1%	8.0%	37.0%	6.5%	16.3%	0.2%	0.2%	0.2%	45.7%	8.0%	60.2%	49.7%	64.2%
	Amran	56,856	28,644	56,856	8.9%	42.5%	4.4%	28.7%	8.9%	42.5%	4.0%	0.1%	0.5%	0.0%	55.8%	28.7%	56.1%	70.2%	70.5%
	Iyal Surayh	39,757	39,499	39,757	4.2%	21.3%	13.6%	19.7%	1.3%	0.3%	38.6%	1.0%	0.1%	0.0%	39.0%	19.7%	41.2%	48.9%	51.1%
	Hamdan	70,478	70,478	70,478	7.6%	34.2%	11.3%	33.7%	0.3%	1.2%	11.1%	0.0%	0.4%	0.1%	53.2%	33.7%	13.0%	70.0%	29.9%
	Arhab	66,940	65,013	66,940	4.5%	9.1%	2.1%	21.6%	0.6%	8.6%	50.3%	1.0%	2.1%	0.0%	15.7%	21.6%	62.7%	26.5%	73.5%
	Nehm	28,265	27,256	28,265	1.5%	1.0%	5.2%	75.7%	12.0%	0.6%	2.4%	1.2%	0.5%	0.0%	7.7%	75.7%	16.7%	45.5%	54.5%
	Bani Hushaysh	54,375	53,450	54,375	5.7%	33.6%	15.3%	44.7%	0.4%	0.1%	0.2%	0.0%	0.0%	0.0%	54.6%	44.7%	0.7%	76.9%	23.1%
	Bani Al Harith	49,179	49,179	49,179	14.4%	16.7%	24.3%	43.5%	0.3%	0.4%	0.4%	0.0%	0.0%	0.0%	55.3%	43.5%	1.1%	77.1%	22.9%
	Sanhan	46,518	45,132	46,518	6.4%	28.3%	14.8%	45.5%	3.7%	1.2%	0.0%	0.0%	0.0%	0.0%	49.5%	45.5%	5.0%	72.3%	27.7%
	Bani Bahlul	14,481	13,629	14,481	5.0%	20.4%	13.2%	59.4%	0.3%	0.1%	1.5%	0.0%	0.0%	0.0%	38.6%	59.4%	2.0%	68.3%	31.7%
	Khawlan	159,766	157,472	159,766	7.8%	7.7%	4.4%	64.9%	7.3%	1.3%	4.9%	1.4%	0.0%	0.2%	20.0%	64.9%	14.9%	52.4%	47.4%
	Bilad Ar Rus	22,060	21,860	22,060	14.2%	28.5%	8.8%	22.6%	19.4%	2.9%	3.3%	0.2%	0.0%	0.0%	51.5%	22.6%	25.8%	62.9%	37.1%
	Bani Matar	81,302	80,279	81,302	3.5%	17.8%	12.3%	41.1%	14.2%	0.6%	6.6%	3.1%	0.9%	0.0%	33.6%	41.1%	25.3%	54.2%	45.8%
	Al Haymah Ad Dak	60,658	59,884	60,658	4.1%	2.5%	3.9%	42.4%	32.9%	2.9%	3.7%	7.5%	0.0%	0.0%	10.6%	42.4%	47.0%	31.8%	68.2%
	Al Haydah Al Kharij	44,366	43,971	44,366	1.2%	1.7%	1.4%	54.3%	17.5%	0.7%	17.9%	5.3%	0.1%	0.0%	4.3%	54.3%	41.4%	31.4%	68.6%
	Manakhah	64,242	58,348	64,242	12.7%	2.1%	2.5%	21.1%	39.6%	5.2%	12.9%	3.2%	0.6%	0.0%	17.3%	21.1%	61.5%	27.9%	72.1%
	Safan	33,361	33,352	33,361	1.6%	0.7%	0.7%	18.8%	36.3%	27.9%	11.7%	1.3%	1.0%	0.0%	3.1%	18.8%	78.2%	12.5%	87.5%
	Bilad At Taam	24,035	23,934	24,035	1.5%	0.7%	2.9%	29.3%	21.6%	15.8%	13.1%	14.8%	0.3%	0.0%	5.1%	29.3%	65.6%	19.8%	80.2%
	Al Jabin	98,929	98,355	98,929	2.4%	4.1%	2.2%	17.9%	61.3%	2.1%	7.6%	2.2%	0.1%	0.0%	8.7%	17.9%	73.4%	17.6%	82.4%
	As Salafiyah	50,146	50,146	50,146	1.7%	1.3%	0.3%	45.2%	33.3%	4.4%	8.0%	5.8%	0.0%	0.0%	3.4%	45.2%	51.4%	26.0%	74.0%
	Kusmah	65,182	64,203	65,182	2.5%	1.9%	1.3%	10.7%	48.5%	6.6%	23.0%	5.4%	0.0%	0.0%	5.7%	10.7%	83.6%	11.0%	89.0%
	Al Jafariyah	53,241	52,311	53,241	3.5%	6.1%	1.3%	18.3%	30.3%	23.8%	12.7%	3.8%	0.1%	0.0%	10.9%	18.3%	70.8%	20.0%	79.9%

governorate	mudiriah	total population	population in settlements < 5,000	population in settlements < 30,000	percentage of people in settlements < 30,000 with source of water: public project	cooperative project	private project	well	stream (ie, spring)	closed pool	open pool	drain	dam	not stated	percentage of people in settlements < 30,000 with source of water: piped system	well	other	percentage of people in settlements < 30,000 with water that is: clean	not clean
Sanaa City		**954,448**	**0**	**0**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Hajjah		**1,238,114**	**1,129,092**	**1,238,114**	**5.7%**	**3.7%**	**1.9%**	**55.1%**	**13.9%**	**3.5%**	**8.1%**	**7.4%**	**0.7%**	**0.0%**	**11.3%**	**55.1%**	**33.6%**	**38.8%**	**61.1%**
	Bakil Al Mir	21,146	21,146	21,146	2.5%	0.2%	0.8%	29.8%	25.2%	0.2%	8.5%	32.8%	0.0%	0.0%	3.5%	29.8%	66.7%	18.4%	81.6%
	Harad	61,820	46,110	61,820	15.0%	19.2%	5.9%	47.1%	1.3%	0.2%	1.9%	9.4%	0.0%	0.0%	40.1%	47.1%	12.8%	63.6%	36.4%
	Midi	11,817	7,448	11,817	26.8%	14.3%	4.2%	52.8%	0.0%	0.2%	0.0%	0.2%	0.0%	1.5%	45.3%	52.8%	0.4%	71.7%	26.8%
	Abs	85,602	67,282	85,602	4.8%	1.9%	0.6%	90.5%	1.5%	0.2%	0.1%	0.4%	0.0%	0.0%	7.3%	90.5%	2.2%	52.6%	47.4%
	Khayran	10,331	8,946	10,331	1.3%	30.7%	1.9%	65.1%	0.9%	0.0%	0.0%	0.1%	0.0%	0.0%	33.9%	65.1%	1.0%	66.5%	33.5%
	Mustaba	22,666	22,270	22,666	2.0%	0.3%	0.6%	72.0%	6.7%	0.1%	0.2%	18.1%	0.0%	0.0%	2.9%	72.0%	25.1%	38.9%	61.1%
	Washhah	55,848	55,848	55,848	1.0%	0.6%	0.2%	64.3%	7.8%	13.6%	7.0%	5.7%	0.0%	0.0%	1.7%	64.3%	34.0%	33.8%	66.2%
	Kushar	55,139	53,195	55,139	1.3%	0.7%	0.2%	82.9%	4.6%	0.6%	4.3%	5.4%	0.0%	0.0%	2.2%	82.9%	14.9%	43.6%	56.3%
	Suwayr	17,257	16,990	17,257	0.9%	1.8%	2.7%	90.0%	3.9%	0.2%	0.1%	0.2%	0.0%	0.0%	5.5%	90.0%	4.5%	50.5%	49.5%
	Al Madan	31,297	28,381	31,297	1.2%	0.2%	0.2%	35.6%	20.1%	1.2%	28.4%	0.1%	13.0%	0.0%	1.5%	35.6%	62.8%	19.3%	80.7%
	Shaharah	43,170	41,419	43,170	10.4%	2.2%	0.6%	20.8%	17.0%	1.7%	40.6%	2.7%	4.0%	0.0%	13.2%	20.8%	66.0%	23.6%	76.4%
	Zulaymat Habur	54,602	49,024	54,602	1.0%	4.3%	0.8%	9.5%	8.2%	11.8%	54.1%	8.0%	1.9%	0.5%	6.1%	9.5%	84.0%	10.8%	88.7%
	Al Jamimah	26,518	24,291	26,518	0.6%	0.6%	1.4%	45.4%	8.5%	12.7%	20.0%	4.6%	6.3%	0.0%	2.6%	45.4%	52.0%	25.3%	74.7%
	Kuhlan Ash Sharaf	50,849	50,788	50,849	5.3%	0.5%	0.8%	44.1%	17.6%	12.5%	17.6%	1.6%	0.1%	0.0%	6.6%	44.1%	49.3%	28.7%	71.3%
	Aflah Ash Shawm	26,612	26,461	26,612	2.2%	0.5%	0.3%	73.1%	20.6%	0.2%	0.2%	3.0%	0.0%	0.0%	3.0%	73.1%	24.0%	39.5%	60.5%
	Kyaran Al Moharaq	101,967	99,600	101,967	0.9%	0.6%	0.4%	88.5%	4.4%	1.2%	2.6%	1.4%	0.0%	0.0%	1.9%	88.5%	9.5%	46.2%	53.8%
	Aslam	35,765	35,544	35,765	1.0%	0.7%	0.4%	95.2%	1.0%	0.0%	0.1%	1.7%	0.0%	0.0%	2.0%	95.2%	2.8%	49.6%	50.4%
	Qufl Shamar	33,676	33,604	33,676	0.7%	0.5%	2.8%	87.9%	5.4%	0.2%	0.0%	2.4%	0.1%	0.0%	4.0%	87.9%	8.1%	48.0%	52.0%
	Aflah Al Yaman	28,081	27,790	28,081	1.3%	1.1%	0.3%	71.3%	10.0%	2.3%	10.6%	3.0%	0.1%	0.0%	2.8%	71.3%	25.9%	38.4%	61.6%
	Al Mahabishah	36,321	23,403	36,321	0.9%	0.8%	1.1%	81.2%	14.3%	1.6%	0.1%	0.0%	0.0%	0.0%	2.8%	81.2%	16.0%	43.4%	56.6%
	Al Miftah	43,023	38,933	43,023	1.2%	4.3%	10.5%	52.2%	16.9%	10.3%	2.5%	0.9%	1.1%	0.0%	16.0%	52.2%	31.8%	42.1%	57.9%
	Al Maghrabah	32,774	32,005	32,774	1.8%	0.8%	0.5%	16.2%	9.0%	33.6%	5.3%	32.6%	0.2%	0.0%	3.1%	16.2%	80.7%	11.2%	88.8%
	Kuhlan Affar	26,693	25,365	26,693	0.5%	4.2%	0.3%	0.8%	60.1%	6.5%	20.3%	7.2%	0.1%	0.0%	5.0%	0.8%	94.2%	5.4%	94.6%
	Sharas	10,762	10,762	10,762	3.4%	2.2%	0.3%	14.7%	37.6%	0.4%	11.9%	29.5%	0.1%	0.0%	5.9%	14.7%	79.4%	13.3%	86.7%
	Mabyan	37,549	36,165	37,549	4.0%	22.7%	0.4%	24.1%	30.6%	0.3%	5.8%	12.0%	0.1%	0.0%	27.0%	24.1%	48.9%	39.0%	61.0%
	Ash Shahil	26,554	24,038	26,554	1.5%	3.8%	33.8%	48.7%	1.1%	0.7%	10.2%	0.0%	0.1%	0.0%	39.1%	48.7%	12.2%	63.5%	36.5%
	Kuaydinah	48,810	48,253	48,810	5.7%	2.1%	0.4%	80.8%	4.8%	0.5%	2.7%	2.9%	0.0%	0.0%	8.3%	80.8%	10.9%	48.7%	51.3%
	Wazrah	9,504	8,949	9,504	1.8%	1.6%	0.8%	4.6%	20.2%	10.9%	44.3%	15.7%	0.0%	0.0%	4.3%	4.6%	91.1%	6.6%	93.4%
	Al Tur	40,120	39,477	40,120	1.4%	0.5%	0.2%	65.2%	5.9%	0.1%	0.1%	26.5%	0.0%	0.0%	2.1%	65.2%	32.7%	34.7%	65.3%
	Ash Shaghadirah	35,959	35,105	35,959	1.1%	1.0%	0.2%	36.6%	35.3%	0.2%	0.5%	25.0%	0.2%	0.0%	2.2%	36.6%	61.1%	20.6%	79.4%
	Najrah	22,714	22,211	22,714	0.9%	1.7%	0.3%	16.3%	55.2%	1.2%	13.0%	11.2%	0.1%	0.0%	3.0%	16.3%	80.7%	11.1%	88.8%
	Hajjah	59,252	34,607	59,252	51.1%	2.2%	2.0%	19.6%	17.9%	2.1%	2.4%	2.4%	0.1%	0.1%	55.3%	19.6%	24.9%	65.1%	34.8%
	Bani Al Awwam	33,916	33,682	33,916	1.0%	3.2%	0.6%	5.2%	76.8%	0.1%	3.7%	9.3%	0.0%	0.0%	4.7%	5.2%	90.0%	7.3%	92.6%
Al Mahwit		**371,595**	**345,789**	**371,595**	**9.3%**	**3.7%**	**2.0%**	**24.6%**	**34.3%**	**11.4%**	**7.1%**	**6.1%**	**1.2%**	**0.1%**	**15.0%**	**24.6%**	**60.2%**	**27.3%**	**72.6%**
	Shibam & Kawkaba	30,538	24,494	30,538	27.1%	0.6%	14.9%	5.1%	28.7%	0.4%	14.7%	2.2%	6.3%	0.0%	42.6%	5.1%	52.3%	45.1%	54.9%
	Al Tawilah	42,106	38,004	42,106	10.2%	4.9%	1.0%	9.8%	56.7%	0.5%	15.9%	1.0%	0.0%	0.0%	16.1%	9.8%	74.1%	21.0%	79.0%
	Ar Rujum	60,939	58,522	60,939	19.4%	7.5%	3.0%	14.7%	30.8%	4.8%	16.3%	2.3%	1.3%	0.0%	29.8%	14.7%	55.5%	37.2%	62.8%
	Al Mahwit	56,468	47,408	56,468	18.0%	10.9%	1.0%	24.5%	26.8%	0.3%	6.2%	10.3%	2.1%	0.0%	29.9%	24.5%	45.6%	42.2%	57.8%
	Al Khabt	47,850	46,531	47,850	1.6%	0.6%	0.8%	27.2%	16.6%	44.1%	2.3%	5.3%	0.4%	1.0%	3.1%	27.2%	68.7%	16.7%	82.3%
	Milhan	55,518	54,468	55,518	1.4%	0.7%	0.2%	21.7%	49.4%	13.9%	3.6%	8.6%	0.5%	0.0%	2.3%	21.7%	76.0%	13.2%	86.8%
	Hufash	30,801	29,210	30,801	2.0%	0.8%	0.5%	15.1%	66.0%	6.9%	0.4%	8.3%	0.0%	0.0%	3.3%	15.1%	81.7%	10.8%	89.2%
	Bani Sad	47,375	47,152	47,375	1.8%	0.9%	0.5%	61.0%	15.1%	10.3%	1.9%	7.7%	0.8%	0.0%	3.1%	61.0%	35.9%	33.6%	66.4%
Al Hudaydah		**1,558,513**	**1,018,965**	**1,144,757**	**5.4%**	**25.2%**	**8.7%**	**51.6%**	**1.5%**	**2.3%**	**3.0%**	**2.0%**	**0.2%**	**0.1%**	**39.3%**	**51.6%**	**9.1%**	**65.1%**	**34.9%**
	Az Zahrah	94,498	87,238	94,498	5.4%	1.8%	0.2%	84.0%	1.6%	0.4%	1.8%	3.8%	0.9%	0.0%	7.4%	84.0%	8.5%	49.4%	50.5%
	Al Luhhayah	75,522	65,893	75,522	6.4%	17.8%	4.1%	70.4%	0.2%	0.1%	1.0%	0.0%	0.0%	0.0%	28.3%	70.4%	1.4%	63.4%	36.6%
	Kamaran	2,220	601	2,220	6.0%	8.7%	0.0%	85.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.7%	85.3%	0.0%	57.3%	42.7%
	As Salif	5,408	4,185	5,408	19.6%	27.5%	0.6%	51.2%	0.0%	0.0%	0.1%	0.1%	0.9%	0.0%	47.6%	51.2%	1.2%	73.2%	26.8%
	Al Munirah	28,011	21,709	28,011	2.4%	56.6%	3.7%	32.7%	0.2%	0.4%	4.0%	0.0%	0.0%	0.0%	62.7%	32.7%	4.6%	79.1%	20.9%
	Al Qanawis	50,483	47,447	50,483	3.6%	49.4%	11.2%	32.2%	0.3%	3.1%	0.2%	0.0%	0.0%	0.0%	64.2%	32.2%	3.6%	80.3%	19.7%
	Az Zaydiyah	67,718	53,806	67,718	3.2%	40.9%	12.5%	40.2%	0.2%	1.1%	1.8%	0.0%	0.0%	0.0%	56.6%	40.2%	3.2%	76.7%	23.3%
	Al Mighlaf	27,199	23,343	27,199	1.6%	31.6%	11.9%	50.3%	0.2%	0.6%	3.7%	0.0%	0.0%	0.1%	45.2%	50.3%	4.5%	70.3%	29.6%

governorate	mudiriah	total	population in	population in	percentage of people in settlements < 30,000 with source of water										percentage of people in settlements			percentage of people in	
		population	settlements	settlements	public	cooperative	private	well	stream	closed pool	open pool	drain	dam	not stated	< 30,000 with source of water			settlements < 30,000 with	
			< 5,000	< 30,000	project	project	project		(ie, spring)						piped system	well	other	water that is	
																		clean	not clean
	Ad Dahi	37,540	27,044	37,540	19.1%	25.2%	1.5%	34.1%	0.1%	3.1%	14.1%	2.7%	0.0%	0.0%	45.8%	34.1%	20.1%	62.8%	37.2%
	Bajil	120,553	79,992	79,992	5.2%	9.7%	4.1%	68.1%	0.3%	4.4%	8.1%	0.2%	0.0%	0.0%	19.0%	68.1%	12.9%	53.0%	46.9%
	Al Hajjaylah	6,374	5,009	6,374	3.4%	4.5%	0.1%	69.7%	1.2%	0.2%	1.0%	19.7%	0.3%	0.0%	7.9%	69.7%	22.3%	42.8%	57.2%
	Jabal Bura	37,984	37,477	37,984	1.0%	1.0%	0.5%	21.1%	29.4%	40.7%	1.0%	3.2%	2.1%	0.0%	2.4%	21.1%	76.5%	13.0%	87.0%
	Al Marawiah	95,583	65,079	65,079	14.7%	37.3%	5.2%	34.1%	0.7%	0.3%	4.5%	3.2%	0.0%	0.1%	57.2%	34.1%	8.6%	74.3%	25.6%
	Al Hudaydah	302,586	4,134	4,134	2.6%	41.1%	0.6%	50.9%	0.6%	4.2%	0.0%	0.0%	0.0%	0.0%	44.3%	50.9%	4.8%	69.7%	30.3%
	Ad Durayhimi	40,481	34,138	40,481	2.2%	46.2%	6.6%	43.7%	0.2%	0.5%	0.7%	0.0%	0.0%	0.0%	55.0%	43.7%	1.4%	76.8%	23.2%
	As Sukhnah	41,755	40,043	41,755	6.2%	27.1%	4.0%	52.2%	1.6%	0.0%	6.9%	2.0%	0.0%	0.0%	37.3%	52.2%	10.5%	63.4%	36.6%
	Al Mansuriyah	32,749	22,790	32,749	3.4%	34.6%	4.9%	52.3%	1.1%	0.0%	1.6%	0.8%	0.0%	1.2%	43.0%	52.3%	3.4%	69.2%	29.6%
	Bayt Al Faqih	169,219	140,446	169,219	5.5%	39.7%	3.4%	45.4%	0.7%	1.0%	2.1%	2.2%	0.0%	0.1%	48.7%	45.4%	5.9%	71.4%	28.6%
	Zabid	230,091	185,852	185,852	2.9%	16.6%	31.2%	46.8%	0.2%	0.2%	1.5%	0.5%	0.1%	0.0%	50.7%	46.8%	2.5%	74.1%	25.9%
	Jabal Ras	34,753	34,413	34,753	1.7%	2.7%	3.3%	64.0%	3.1%	2.7%	0.1%	20.3%	2.2%	0.0%	7.6%	64.0%	28.4%	39.6%	60.4%
	Hays	32,263	21,585	32,263	2.4%	16.6%	10.5%	61.3%	0.2%	0.1%	8.9%	0.1%	0.0%	0.0%	29.5%	61.3%	9.2%	60.1%	39.9%
	Al Khawkhah	25,523	16,741	25,523	1.3%	2.8%	0.4%	95.0%	0.3%	0.1%	0.1%	0.0%	0.0%	0.0%	4.5%	95.0%	0.4%	52.0%	48.0%
Dhamar		**981,674**	**878,552**	**898,754**	**6.2%**	**10.8%**	**4.0%**	**33.5%**	**23.2%**	**4.4%**	**12.0%**	**4.3%**	**1.1%**	**0.0%**	**21.0%**	**33.5%**	**45.0%**	**37.8%**	**61.7%**
	Al Hada	99,952	96,436	99,952	10.8%	22.9%	5.1%	49.0%	3.6%	1.7%	5.9%	0.3%	0.8%	0.0%	38.9%	49.0%	12.1%	63.4%	36.6%
	Ans	239,396	156,476	156,476	10.9%	28.7%	12.9%	27.0%	13.9%	2.3%	3.8%	0.5%	0.0%	0.0%	52.5%	27.0%	20.6%	65.9%	34.0%
	Mabar (Jahran)	51,723	42,046	51,723	14.9%	26.9%	4.6%	42.5%	6.7%	0.2%	0.0%	2.8%	0.0%	0.0%	46.5%	42.5%	9.8%	67.7%	31.0%
	Dawran	124,750	122,089	124,750	7.8%	6.7%	3.2%	32.3%	28.0%	1.7%	13.8%	3.6%	1.9%	0.0%	17.7%	32.3%	49.0%	33.8%	65.2%
	Jabal Ash Sharq	48,199	47,645	48,199	4.0%	3.5%	4.9%	21.3%	30.1%	0.5%	24.1%	5.3%	5.6%	0.0%	12.4%	21.3%	65.6%	23.0%	76.2%
	Maghirib Ans	42,934	41,993	42,934	2.1%	14.0%	1.4%	19.3%	41.7%	0.7%	10.7%	8.8%	1.3%	0.0%	17.5%	19.3%	63.2%	27.2%	72.8%
	Utmah	122,008	121,682	122,008	3.1%	2.1%	1.3%	9.4%	56.8%	1.6%	12.7%	11.9%	0.9%	0.1%	6.6%	9.4%	83.9%	11.3%	88.6%
	Wusab Al Ali	132,766	132,456	132,766	1.5%	1.1%	1.1%	22.0%	26.2%	16.9%	25.7%	5.4%	0.2%	0.0%	3.6%	22.0%	74.4%	14.6%	85.4%
	Wusab Al Safil	119,946	117,729	119,946	3.1%	1.9%	0.6%	70.1%	5.7%	4.6%	8.5%	2.4%	1.3%	0.1%	5.7%	70.1%	22.6%	40.7%	57.6%
Ibb		**1,771,861**	**1,544,552**	**1,636,586**	**5.9%**	**17.2%**	**9.2%**	**31.5%**	**22.0%**	**5.6%**	**2.4%**	**5.4%**	**0.8%**	**0.0%**	**32.2%**	**31.5%**	**36.2%**	**48.0%**	**52.0%**
	Al Qafr	80,265	75,894	80,265	1.4%	9.4%	4.4%	36.3%	21.1%	2.3%	6.4%	18.4%	0.2%	0.0%	15.1%	36.3%	48.5%	33.3%	66.7%
	Yarim	122,162	94,360	122,162	19.6%	22.7%	8.5%	21.6%	20.3%	2.1%	3.8%	1.4%	0.0%	0.0%	50.8%	21.6%	27.7%	61.6%	38.4%
	Ar Radmah	60,909	57,626	60,909	9.9%	5.6%	11.5%	48.0%	21.2%	2.0%	0.1%	0.8%	1.0%	0.0%	27.0%	48.0%	25.0%	51.0%	49.0%
	Damt	42,033	34,472	42,033	9.5%	19.7%	2.9%	50.0%	14.1%	0.7%	0.7%	2.2%	0.0%	0.1%	32.2%	50.0%	17.8%	57.2%	42.8%
	Qatabah	64,774	57,853	64,774	1.2%	3.0%	4.5%	87.6%	2.7%	0.2%	0.4%	0.1%	0.3%	0.0%	8.7%	87.6%	3.7%	52.5%	47.5%
	An Nadirah	63,491	58,184	63,491	1.8%	31.0%	2.1%	12.3%	45.1%	3.5%	1.1%	2.9%	0.0%	0.2%	34.9%	12.3%	52.7%	41.0%	58.8%
	Ash Shair	38,787	37,036	38,787	5.4%	29.3%	11.0%	24.4%	22.5%	0.5%	2.1%	4.5%	0.2%	0.1%	45.8%	24.4%	29.7%	58.0%	41.9%
	As Saddah	73,226	68,970	73,226	17.0%	6.3%	40.9%	6.6%	13.0%	2.3%	6.6%	1.8%	5.4%	0.1%	64.2%	6.6%	29.2%	67.5%	32.5%
	Al Makhadir	84,600	81,558	84,600	4.8%	19.2%	18.1%	25.2%	27.2%	0.2%	0.3%	4.9%	0.0%	0.0%	42.2%	25.2%	32.6%	54.8%	45.2%
	Hubaysh	88,557	83,362	88,557	2.4%	2.1%	3.3%	40.0%	37.5%	3.5%	3.2%	6.1%	2.0%	0.1%	7.7%	40.0%	52.2%	27.7%	72.2%
	Hazm Al Udayn	63,248	63,169	63,248	4.6%	3.9%	1.7%	53.4%	13.8%	12.3%	3.8%	6.4%	0.0%	0.0%	10.3%	53.4%	36.4%	36.9%	63.1%
	Far Al Udayn	68,207	68,146	68,207	1.6%	1.1%	0.4%	60.2%	5.1%	23.4%	1.4%	6.7%	0.1%	0.0%	3.1%	60.2%	36.7%	33.2%	66.8%
	Al Udayn	116,143	111,716	116,143	2.1%	4.0%	3.3%	32.3%	16.9%	19.7%	6.1%	13.3%	2.3%	0.1%	9.4%	32.3%	58.2%	25.6%	74.4%
	Jiblah	114,894	106,030	114,894	6.8%	36.2%	13.2%	12.1%	26.1%	2.7%	0.2%	2.6%	0.0%	0.0%	56.2%	12.1%	31.6%	62.3%	37.7%
	Ibb	240,891	137,579	137,579	2.8%	24.1%	8.3%	19.5%	34.3%	3.7%	0.6%	6.4%	0.3%	0.0%	35.2%	19.5%	45.3%	44.9%	55.0%
	Badan	107,390	103,895	107,390	13.3%	17.9%	7.1%	22.0%	26.8%	7.6%	0.8%	4.4%	0.2%	0.1%	38.3%	22.0%	39.7%	49.3%	50.7%
	As Sabrh	55,326	52,759	55,326	2.2%	11.0%	6.2%	66.8%	8.7%	0.1%	0.6%	3.6%	0.8%	0.0%	19.3%	66.8%	13.8%	52.7%	47.2%
	As Sayyani	91,717	89,929	91,717	1.8%	21.9%	5.4%	42.2%	16.9%	6.0%	1.3%	3.7%	0.9%	0.0%	29.1%	42.2%	28.7%	50.2%	49.8%
	Dhi Sufal	129,870	97,907	97,907	4.2%	45.2%	15.1%	8.5%	23.7%	1.3%	0.0%	1.6%	0.3%	0.0%	64.5%	8.5%	27.1%	68.7%	31.3%
	Mudhaykhirah	65,371	64,107	65,371	3.4%	20.2%	15.6%	15.5%	26.1%	4.1%	7.1%	7.0%	0.9%	0.1%	39.2%	15.5%	45.2%	47.0%	53.0%
Taiz		**2,026,991**	**1,653,834**	**1,709,420**	**4.4%**	**13.5%**	**3.5%**	**56.3%**	**9.5%**	**8.4%**	**1.7%**	**2.2%**	**0.4%**	**0.1%**	**21.4%**	**56.3%**	**22.2%**	**49.6%**	**50.4%**
	Al Husha	42,535	40,849	42,535	4.4%	1.1%	1.3%	85.2%	5.3%	0.0%	1.9%	0.2%	0.5%	0.0%	6.8%	85.2%	7.9%	49.5%	50.5%
	Mawiyah	95,562	92,994	95,562	2.4%	4.9%	0.8%	83.1%	7.8%	0.1%	0.5%	0.3%	0.0%	0.1%	8.1%	83.1%	8.7%	49.6%	50.3%
	At Taziyah	453,957	136,386	136,386	4.6%	7.9%	5.7%	76.7%	3.0%	0.2%	0.6%	1.2%	0.2%	0.0%	18.1%	76.7%	5.2%	56.5%	43.5%
	Sharab As Salaam	96,930	96,930	96,930	1.7%	2.2%	2.4%	65.4%	8.1%	14.4%	0.7%	5.0%	0.1%	0.0%	6.3%	65.4%	28.3%	39.0%	61.0%
	Sharab Ar Rawnah	123,677	119,919	123,677	4.6%	8.8%	7.0%	66.4%	3.6%	6.5%	0.3%	2.5%	0.1%	0.3%	20.4%	66.4%	13.0%	53.5%	46.2%
	Maqbanah	150,359	150,359	150,359	4.2%	15.9%	3.4%	59.9%	1.5%	9.9%	0.9%	3.3%	1.0%	0.1%	23.5%	59.9%	16.6%	53.4%	46.5%
	Al Mukha	47,120	36,765	47,120	19.3%	10.8%	4.1%	64.5%	0.3%	0.0%	0.6%	0.0%	0.2%	0.2%	34.2%	64.5%	1.2%	66.4%	33.4%

governorate	mudiriah	total	population in	population in	percentage of people in settlements < 30,000 with source of water										percentage of people in settlements			percentage of people in settlements < 30,000 with	
		population	settlements	settlements	public	cooperative	private	well	stream	closed pool	open pool	drain	dam	not stated	< 30,000 with source of water			water that is	
			< 5,000	< 30,000	project	project	project		(ie, spring)						piped system	well	other	clean	not clean
	Dhubab	11,955	9,312	11,955	8.8%	12.3%	0.5%	74.0%	0.4%	0.4%	3.7%	0.0%	0.0%	0.0%	21.6%	74.0%	4.5%	58.6%	41.4%
	Mawza	27,881	24,044	27,881	4.8%	1.6%	4.9%	78.4%	4.4%	0.0%	3.8%	2.1%	0.0%	0.0%	11.3%	78.4%	10.3%	50.5%	49.5%
	Al Mawasit	221,255	220,521	221,255	3.2%	19.5%	4.1%	53.7%	12.1%	2.6%	3.6%	1.0%	0.2%	0.0%	26.8%	53.7%	19.4%	53.7%	46.3%
	Jabal Habashi	98,414	96,459	98,414	1.7%	2.8%	2.7%	57.3%	17.4%	11.9%	2.2%	3.8%	0.2%	0.0%	7.2%	57.3%	35.5%	35.8%	64.2%
	Mashraah & Hadna	21,270	21,270	21,270	2.5%	2.0%	0.8%	2.9%	5.7%	80.5%	0.4%	5.1%	0.1%	0.0%	5.2%	2.9%	91.9%	6.7%	93.3%
	Sabir Al Mawadim	89,539	89,539	89,539	1.8%	3.1%	1.1%	39.1%	26.2%	20.2%	3.5%	2.6%	2.3%	0.0%	6.0%	39.1%	54.9%	25.5%	74.4%
	Al Misrakh	80,133	77,373	80,133	4.9%	9.7%	5.4%	55.7%	8.6%	6.9%	3.0%	5.7%	0.1%	0.0%	19.9%	55.7%	24.4%	47.8%	52.2%
	Dimnat Khadir	81,747	66,096	81,747	5.9%	15.1%	3.8%	64.7%	3.9%	3.4%	0.3%	2.9%	0.0%	0.0%	24.8%	64.7%	10.6%	57.1%	42.9%
	As Silw	42,854	42,854	42,854	1.5%	3.4%	3.1%	43.1%	34.2%	5.5%	5.8%	3.2%	0.3%	0.0%	8.0%	43.1%	48.9%	29.6%	70.4%
	Al Qabbaytah	125,196	123,611	125,196	4.1%	8.6%	2.5%	39.1%	11.0%	31.4%	1.6%	1.2%	0.5%	0.1%	15.3%	39.1%	45.6%	34.8%	65.1%
	Al Maqatirah	49,258	49,258	49,258	2.0%	3.7%	4.8%	51.5%	23.3%	9.7%	2.6%	2.4%	0.0%	0.0%	10.5%	51.5%	38.0%	36.3%	63.7%
	Ash Shimayatayn	147,729	139,675	147,729	6.7%	58.7%	2.7%	18.8%	10.2%	0.4%	0.8%	1.6%	0.1%	0.0%	68.0%	18.8%	13.1%	77.4%	22.5%
	Alwaziiyah	19,620	19,620	19,620	16.9%	5.9%	0.4%	68.8%	5.5%	0.1%	1.4%	1.1%	0.0%	0.0%	23.2%	68.8%	8.1%	57.6%	42.4%
Lahj		**588,746**	**557,740**	**588,746**	**20.5%**	**2.5%**	**1.3%**	**64.5%**	**3.7%**	**1.9%**	**1.9%**	**1.8%**	**1.7%**	**0.1%**	**24.3%**	**64.5%**	**11.1%**	**56.6%**	**43.4%**
	Yafa	163,491	163,256	163,491	3.6%	2.3%	0.6%	75.9%	7.0%	6.2%	3.0%	0.7%	0.4%	0.1%	6.6%	75.9%	17.4%	44.6%	55.4%
	Ad Dali	147,403	138,532	147,403	8.3%	2.1%	2.2%	77.5%	2.5%	0.2%	0.5%	2.6%	4.1%	0.1%	12.6%	77.5%	9.8%	51.3%	48.6%
	Radfan	101,186	98,637	101,186	17.7%	2.1%	0.8%	62.1%	2.7%	1.1%	6.2%	3.5%	3.7%	0.1%	20.5%	62.1%	17.3%	51.6%	48.3%
	Tuban	106,986	87,980	106,986	67.3%	1.5%	0.3%	24.8%	3.6%	0.3%	0.1%	2.0%	0.1%	0.0%	69.1%	24.8%	6.1%	81.5%	18.5%
	Tawr Al Bahah	69,680	69,335	69,680	3.2%	5.7%	3.2%	85.5%	0.9%	0.7%	0.3%	0.2%	0.1%	0.0%	12.2%	85.5%	2.2%	55.0%	45.0%
Aden		**441,880**	**38,455**	**43,586**	**16.9%**	**1.3%**	**0.8%**	**46.8%**	**6.9%**	**1.5%**	**21.8%**	**4.0%**	**0.0%**	**0.0%**	**19.0%**	**46.8%**	**34.2%**	**42.4%**	**57.6%**
	Ash Shaab	233,146	5,858	5,858	94.1%	1.6%	0.4%	3.8%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	96.1%	3.8%	0.1%	98.0%	2.0%
	Sirah	91,970	0	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Al Mina	79,141	105	105	0.0%	4.8%	0.0%	95.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%	95.2%	0.0%	52.4%	47.6%
	Suqutra	37,623	32,492	37,623	2.2%	1.2%	0.9%	54.9%	8.2%	1.8%	26.0%	4.8%	0.0%	0.0%	4.3%	54.9%	40.8%	31.7%	68.2%
Abyan		**379,815**	**309,526**	**329,469**	**20.0%**	**8.9%**	**9.3%**	**43.7%**	**3.1%**	**7.4%**	**3.3%**	**2.9%**	**1.3%**	**0.1%**	**38.1%**	**43.7%**	**18.0%**	**60.0%**	**39.9%**
	Mudiyah	60,611	49,540	60,611	27.9%	8.5%	13.0%	36.1%	2.2%	5.1%	2.7%	4.2%	0.3%	0.1%	49.4%	36.1%	14.4%	67.5%	32.5%
	Lawdar	127,732	119,648	127,732	18.6%	10.5%	12.2%	36.0%	2.5%	11.7%	5.1%	3.2%	0.1%	0.0%	41.3%	36.0%	22.7%	59.3%	40.7%
	Rasad	70,205	69,417	70,205	1.7%	1.3%	3.2%	72.2%	7.9%	6.8%	0.9%	0.7%	5.0%	0.3%	6.2%	72.2%	21.3%	42.3%	57.4%
	Khanfar	121,267	70,921	70,921	33.0%	13.7%	8.0%	34.3%	0.4%	3.3%	3.3%	3.5%	0.3%	0.1%	54.7%	34.3%	10.8%	71.9%	28.0%
Al Bayda		**460,892**	**384,172**	**421,665**	**7.7%**	**22.1%**	**9.9%**	**52.4%**	**2.0%**	**1.4%**	**3.2%**	**1.2%**	**0.0%**	**0.0%**	**39.6%**	**52.4%**	**7.8%**	**65.8%**	**34.0%**
	Naman	18,004	17,376	18,004	0.9%	0.4%	0.5%	79.0%	3.1%	1.1%	2.7%	12.3%	0.0%	0.0%	1.8%	79.0%	19.2%	41.3%	58.7%
	Nata	14,574	14,285	14,574	1.5%	0.7%	0.5%	77.9%	0.9%	1.8%	14.5%	2.3%	0.0%	0.0%	2.7%	77.9%	19.4%	41.7%	58.3%
	Mashwarah	8,618	8,316	8,618	0.4%	1.4%	19.3%	58.8%	0.1%	10.1%	0.2%	9.6%	0.0%	0.1%	21.1%	58.8%	20.0%	50.5%	49.4%
	Markhah	10,154	9,494	10,154	1.7%	1.1%	1.6%	79.5%	0.4%	2.4%	5.3%	7.9%	0.0%	0.0%	4.4%	79.5%	16.1%	44.1%	55.9%
	As Sawmaah	39,491	34,971	39,491	6.8%	48.4%	20.4%	20.9%	0.4%	0.0%	3.0%	0.1%	0.0%	0.0%	75.5%	20.9%	3.6%	86.0%	14.0%
	Al Bayda	50,214	30,920	50,214	28.9%	30.4%	10.4%	28.0%	0.7%	0.4%	1.1%	0.0%	0.0%	0.0%	69.7%	28.0%	2.3%	83.7%	16.3%
	As Zahir	19,187	17,746	19,187	8.0%	8.8%	3.5%	78.9%	0.4%	0.3%	0.1%	0.0%	0.0%	0.0%	20.2%	78.9%	0.8%	59.7%	40.3%
	Dhi Naim	18,903	15,828	18,903	9.8%	39.5%	7.6%	40.2%	0.7%	2.0%	0.2%	0.0%	0.0%	0.0%	56.9%	40.2%	2.9%	77.0%	23.0%
	At Taffah	30,267	30,044	30,267	4.3%	0.5%	1.4%	85.3%	0.6%	0.1%	7.2%	0.0%	0.0%	0.0%	6.2%	85.3%	7.9%	48.9%	50.5%
	As Sawadiyah	46,798	46,163	46,798	5.9%	3.0%	2.5%	84.5%	0.8%	0.5%	0.5%	0.8%	0.0%	0.1%	11.3%	84.5%	2.6%	53.6%	44.9%
	Rada	171,365	132,138	132,138	4.8%	31.9%	9.3%	43.2%	4.3%	2.5%	3.3%	0.6%	0.1%	0.0%	46.0%	43.2%	10.8%	67.6%	32.4%
	Juban	33,317	26,891	33,317	1.9%	7.4%	28.4%	56.5%	0.9%	0.1%	4.5%	0.2%	0.0%	0.2%	37.6%	56.5%	5.6%	65.9%	33.9%
Mareb		**181,740**	**161,159**	**181,740**	**2.8%**	**6.9%**	**13.7%**	**63.1%**	**3.4%**	**2.5%**	**5.6%**	**1.4%**	**0.5%**	**0.1%**	**23.4%**	**63.1%**	**13.4%**	**55.0%**	**45.0%**
	Majzar	6,443	6,232	6,443	1.1%	0.2%	1.8%	76.8%	4.9%	4.6%	1.6%	1.1%	7.9%	0.0%	3.1%	76.8%	20.1%	41.5%	58.5%
	Raghwan	5,031	3,445	5,031	0.0%	0.5%	0.9%	89.5%	5.8%	0.2%	1.2%	1.6%	0.2%	0.0%	1.4%	89.5%	9.1%	46.2%	53.8%
	Medkhel Algedaan	4,538	4,054	4,538	0.2%	13.9%	0.7%	54.6%	3.7%	25.0%	1.1%	0.9%	0.0%	0.0%	14.8%	54.6%	30.6%	42.1%	57.9%
	Harib Al Qaramish	5,294	5,080	5,294	0.2%	0.0%	8.0%	85.0%	1.4%	1.1%	4.0%	0.0%	0.2%	0.2%	8.2%	85.0%	6.6%	50.7%	49.1%
	Bid Bidah	30,719	30,719	30,719	0.7%	0.4%	0.8%	69.7%	13.8%	3.3%	9.5%	1.4%	0.4%	0.1%	2.0%	69.7%	28.3%	36.8%	63.1%
	Sirwah	11,803	11,478	11,803	0.5%	1.1%	11.3%	62.5%	1.9%	8.6%	11.9%	2.0%	0.0%	0.1%	12.9%	62.5%	24.5%	44.2%	55.8%
	Mareb	46,789	39,793	46,789	7.0%	12.7%	22.0%	48.7%	0.1%	0.7%	8.6%	0.0%	0.1%	0.1%	41.7%	48.7%	9.5%	66.1%	33.9%
	Al Jubah	13,962	11,989	13,962	0.9%	16.7%	35.7%	39.5%	2.1%	1.1%	3.8%	0.1%	0.1%	0.0%	53.3%	39.5%	7.2%	73.1%	26.9%
	Rahabah	14,488	12,064	14,488	0.8%	5.5%	0.9%	82.0%	1.5%	0.4%	0.2%	7.5%	0.8%	0.4%	7.2%	82.0%	10.4%	48.2%	51.4%
	Harib	21,828	16,129	21,828	3.5%	7.2%	20.8%	61.0%	2.7%	1.5%	2.0%	1.3%	0.0%	0.0%	31.5%	61.0%	7.5%	62.0%	38.0%

governorate	mudiriah	total population	population in settlements < 5,000	population in settlements < 30,000	percentage of people in settlements < 30,000 with source of water: public project	cooperative project	private project	well	stream (ie, spring)	closed pool	open pool	drain	dam	not stated	percentage of people in settlements < 30,000 with source of water: piped system	well	other	percentage of people in settlements < 30,000 with water that is: clean	not clean
	Al Mahaliyah	8,992	8,323	8,992	0.5%	0.3%	3.4%	91.7%	0.2%	0.3%	1.0%	2.6%	0.0%	0.0%	4.2%	91.7%	4.0%	50.1%	49.9%
	Al Abdiyah	11,853	11,853	11,853	0.6%	0.4%	3.0%	85.6%	6.8%	0.4%	2.3%	0.9%	0.1%	0.0%	4.0%	85.6%	10.5%	46.7%	53.3%
Al Jawf		**168,852**	**141,011**	**168,852**	**3.1%**	**2.9%**	**4.8%**	**78.0%**	**1.8%**	**1.2%**	**4.6%**	**3.2%**	**0.4%**	**0.0%**	**10.8%**	**78.0%**	**11.2%**	**49.8%**	**50.2%**
	Khabb Washaf	71,569	68,654	71,569	0.7%	0.2%	0.3%	88.9%	1.0%	1.3%	3.8%	3.8%	0.1%	0.0%	1.2%	88.9%	10.0%	45.6%	54.4%
	Al Hamidat	19,238	16,437	19,238	0.5%	0.2%	0.2%	82.9%	4.9%	0.3%	10.8%	0.2%	0.0%	0.0%	0.9%	82.9%	16.2%	42.3%	57.7%
	Al Matammah	21,272	17,352	21,272	1.0%	7.6%	1.2%	58.0%	3.7%	2.6%	14.0%	9.1%	2.8%	0.0%	9.9%	58.0%	32.1%	38.9%	61.1%
	Az Zahir	11,474	10,771	11,474	1.4%	0.5%	0.4%	91.5%	4.0%	0.1%	0.4%	1.7%	0.1%	0.0%	2.3%	91.5%	6.2%	48.0%	52.0%
	Al Hazm & Asayl	14,039	8,194	14,039	20.5%	21.0%	13.7%	40.2%	0.5%	2.2%	0.1%	1.7%	0.0%	0.1%	55.1%	40.2%	4.6%	75.2%	24.7%
	Al Matun	11,535	8,869	11,535	3.5%	1.0%	1.5%	93.4%	0.3%	0.1%	0.2%	0.0%	0.0%	0.0%	6.0%	93.4%	0.6%	52.7%	47.3%
	Al Maslob	4,647	3,124	4,647	1.8%	0.3%	16.7%	80.5%	0.0%	0.1%	0.6%	0.0%	0.0%	0.0%	18.8%	80.5%	0.7%	59.0%	41.0%
	Al Ghayl	4,687	2,388	4,687	13.5%	0.9%	28.7%	51.7%	3.0%	0.1%	0.1%	1.9%	0.0%	0.0%	43.1%	51.7%	5.2%	68.9%	31.1%
	Al Khalaq & Al Faq	10,391	5,222	10,391	0.7%	0.1%	45.7%	46.8%	0.1%	2.1%	2.5%	1.8%	0.1%	0.0%	46.6%	46.8%	6.6%	70.0%	30.0%
Shabwah		**354,778**	**316,704**	**354,778**	**12.1%**	**20.5%**	**18.7%**	**27.7%**	**3.5%**	**3.2%**	**10.6%**	**2.4%**	**1.1%**	**0.3%**	**51.3%**	**27.7%**	**20.8%**	**65.1%**	**34.6%**
	Armah	34,401	33,752	34,401	0.6%	0.5%	3.7%	5.3%	13.2%	1.4%	67.2%	2.1%	6.0%	0.0%	4.8%	5.3%	89.9%	7.4%	92.6%
	Bayhan	95,782	83,097	95,782	13.1%	7.4%	23.0%	46.5%	0.2%	3.4%	3.5%	2.5%	0.2%	0.1%	43.5%	46.5%	9.9%	66.8%	33.2%
	Nisab	82,153	76,226	82,153	12.8%	24.7%	14.4%	38.0%	2.2%	1.8%	3.0%	2.6%	0.2%	0.4%	51.8%	38.0%	9.8%	70.8%	28.8%
	As Said	74,479	60,484	74,479	14.7%	28.1%	21.2%	22.1%	0.5%	5.5%	4.4%	2.8%	0.6%	0.0%	64.0%	22.1%	13.9%	75.0%	24.9%
	Mayfaah	67,963	63,145	67,963	13.1%	32.3%	23.3%	12.7%	6.6%	3.0%	5.2%	1.8%	1.2%	0.7%	68.7%	12.7%	17.8%	75.1%	24.2%
Hadramawt		**718,008**	**479,745**	**488,689**	**29.0%**	**20.9%**	**20.8%**	**6.1%**	**5.2%**	**1.4%**	**11.5%**	**3.6%**	**1.5%**	**0.0%**	**70.7%**	**6.1%**	**23.2%**	**73.8%**	**26.2%**
	Thamud	21,826	21,272	21,826	10.8%	0.2%	0.1%	14.1%	0.1%	0.0%	73.7%	0.2%	0.6%	0.0%	11.2%	14.1%	74.7%	18.2%	81.8%
	Al Abr	3,792	3,707	3,792	0.3%	9.7%	3.4%	39.5%	0.2%	0.2%	33.5%	0.0%	13.4%	0.0%	13.4%	39.5%	47.2%	33.1%	66.9%
	Al Qatn	64,649	60,517	64,649	60.7%	28.1%	0.9%	1.7%	1.2%	0.6%	6.8%	0.0%	0.0%	0.0%	89.7%	1.7%	8.7%	90.5%	9.5%
	Sayun	205,797	147,414	147,414	42.6%	18.7%	30.6%	3.9%	0.1%	0.6%	2.1%	1.3%	0.0%	0.0%	92.0%	3.9%	4.1%	93.9%	6.1%
	Dawan	95,703	93,203	95,703	2.2%	10.1%	51.9%	2.0%	1.2%	2.7%	23.4%	0.7%	5.8%	0.0%	64.3%	2.0%	33.7%	65.3%	34.7%
	Ash Shahir	120,490	71,913	71,913	13.2%	42.0%	3.2%	17.0%	9.9%	2.1%	7.9%	4.4%	0.3%	0.0%	58.5%	17.0%	24.6%	67.0%	33.0%
	Al Mukalla	171,727	49,368	49,368	55.6%	6.6%	6.7%	5.3%	16.9%	1.6%	5.7%	1.6%	0.1%	0.0%	68.8%	5.3%	25.9%	71.5%	28.5%
	Hajar	34,024	32,351	34,024	10.2%	33.8%	2.8%	2.2%	17.0%	1.0%	4.3%	27.8%	0.8%	0.0%	46.9%	2.2%	50.9%	48.0%	52.0%
Al Mahrah		**56,425**	**38,133**	**56,425**	**23.3%**	**16.7%**	**0.7%**	**40.1%**	**3.4%**	**1.6%**	**9.8%**	**3.7%**	**0.7%**	**0.0%**	**40.8%**	**40.1%**	**19.1%**	**60.8%**	**39.2%**
	Al Ghaydah	21,787	14,002	21,787	46.4%	0.6%	0.5%	41.0%	2.1%	3.6%	5.2%	0.1%	0.6%	0.0%	47.4%	41.0%	11.6%	67.9%	32.1%
	Sayhut	16,593	11,492	16,593	6.2%	52.5%	0.5%	14.7%	5.2%	0.2%	8.6%	11.6%	0.5%	0.0%	59.2%	14.7%	26.1%	66.5%	33.5%
	Qashan	14,082	9,227	14,082	2.5%	0.4%	0.7%	77.6%	0.1%	0.6%	17.5%	0.1%	0.4%	0.0%	3.6%	77.6%	18.7%	42.4%	57.6%
	Hawf	3,963	3,412	3,963	67.5%	0.5%	3.5%	0.4%	14.8%	1.8%	8.4%	0.0%	3.1%	0.0%	71.5%	0.4%	28.2%	71.7%	28.3%
YEMEN		**14,587,807**	**11,164,289**	**11,966,651**	**7.9%**	**12.8%**	**6.3%**	**44.3%**	**12.6%**	**4.8%**	**6.8%**	**3.7%**	**0.7%**	**0.1%**	**27.0%**	**44.3%**	**28.6%**	**49.2%**	**50.7%**
			76.5%	**82.0%**															

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Sadah		**481,617**	**424,614**	**481,617**	**1.5%**	**19.5%**	**29.8%**	**48.9%**	**0.0%**	**21.0%**	**78.6%**
	Baqim	20,256	15,963	20,256	0.4%	12.0%	54.3%	33.3%	0.0%	12.4%	87.6%
	Qitabir	30,976	28,997	30,976	0.3%	22.2%	20.4%	57.1%	0.0%	22.5%	77.5%
	Munabbih	24,667	24,329	24,667	0.4%	1.6%	14.7%	83.4%	0.0%	2.0%	98.0%
	Ghamir	11,722	11,707	11,722	0.2%	19.0%	21.1%	59.7%	0.0%	19.2%	80.8%
	Razih	47,463	40,881	47,463	1.4%	23.9%	16.2%	58.5%	0.0%	25.3%	74.7%
	Shida	8,883	8,828	8,883	0.1%	2.5%	1.3%	96.1%	0.0%	2.6%	97.4%
	Az Zahir	14,547	12,804	14,547	1.5%	3.0%	5.4%	90.1%	0.0%	4.5%	95.5%
	Haydah	45,649	43,094	45,649	0.8%	4.0%	20.7%	74.6%	0.0%	4.8%	95.2%
	Saqayn	40,467	37,772	40,467	0.5%	9.7%	34.6%	55.2%	0.0%	10.2%	89.8%
	Majz	37,578	30,172	37,578	0.8%	29.4%	32.8%	37.0%	0.0%	30.2%	69.8%
	Sahar	118,272	90,651	118,272	3.9%	33.6%	34.0%	28.5%	0.0%	37.5%	62.5%
	As Safra	37,342	37,342	37,342	1.1%	17.4%	52.3%	29.2%	0.0%	18.5%	81.5%
	Al Hishuah	10,376	10,176	10,376	0.1%	24.8%	52.9%	22.2%	0.0%	24.9%	75.1%
	Kitaf	33,419	31,898	33,419	0.4%	21.8%	36.5%	41.2%	0.0%	22.3%	77.7%
Sanaa		**1,851,858**	**1,742,246**	**1,851,858**	**1.7%**	**15.6%**	**24.4%**	**58.4%**	**0.0%**	**17.2%**	**82.8%**
	Birat al Inan	48,757	43,264	48,757	0.6%	12.4%	44.1%	42.9%	0.0%	13.0%	87.0%
	Rajuzah	77,445	74,242	77,445	0.4%	4.6%	13.7%	81.2%	0.0%	5.0%	95.0%
	Kharab al Marashi	52,585	48,175	52,585	0.4%	1.6%	12.4%	85.6%	0.0%	2.0%	98.0%
	Harf Sufyan	26,830	24,477	26,830	0.5%	11.4%	40.7%	47.4%	0.0%	11.9%	88.1%
	Al Qahlaf	28,900	27,605	28,900	0.3%	1.5%	16.8%	81.5%	0.0%	1.8%	98.2%
	Al Ashshah	36,260	34,805	36,260	0.2%	2.3%	25.2%	72.3%	0.0%	2.5%	97.5%
	Huth	20,157	15,664	20,157	1.0%	11.9%	29.6%	57.5%	0.0%	12.9%	87.1%
	Khamir	101,603	90,700	101,603	2.1%	19.4%	31.7%	46.7%	0.0%	21.6%	78.4%
	Dhibin	26,474	25,054	26,474	1.0%	10.3%	14.3%	74.4%	0.0%	11.3%	88.7%
	Kharef	40,406	39,214	40,406	4.6%	11.1%	30.8%	53.5%	0.0%	15.7%	84.3%
	Raydah	31,514	22,684	31,514	1.1%	40.8%	23.9%	34.2%	0.0%	41.9%	58.1%
	Jabal Iyal Yazid	57,759	57,555	57,759	1.0%	18.0%	17.5%	63.4%	0.0%	19.0%	81.0%
	As Sudah	31,009	28,464	31,009	0.2%	6.6%	40.6%	52.6%	0.0%	6.8%	93.2%
	As Sawd	19,651	19,122	19,651	0.5%	4.5%	13.8%	81.2%	0.0%	5.0%	95.0%
	Maswar	36,941	34,960	36,941	0.9%	8.1%	26.5%	64.5%	0.0%	9.1%	90.9%
	Thula	31,430	19,866	31,430	16.3%	23.5%	27.8%	32.4%	0.0%	39.8%	60.2%
	Amran	56,856	28,644	56,856	5.2%	62.8%	10.3%	21.7%	0.0%	68.0%	32.0%
	Iyal Surayh	39,757	39,499	39,757	0.2%	19.2%	39.5%	41.0%	0.0%	19.4%	80.6%
	Hamdan	70,478	70,478	70,478	1.8%	29.5%	24.4%	44.3%	0.0%	31.3%	68.7%
	Arhab	66,940	65,013	66,940	1.1%	9.7%	23.6%	65.6%	0.0%	10.7%	89.3%
	Nehm	28,265	27,256	28,265	0.4%	14.7%	17.9%	67.0%	0.0%	15.0%	85.0%
	Bani Hushaysh	54,375	53,450	54,375	1.4%	25.0%	33.9%	39.7%	0.0%	26.4%	73.6%
	Bani Al Harith	49,179	49,179	49,179	5.7%	69.9%	13.9%	10.5%	0.0%	75.6%	24.4%
	Sanhan	46,518	45,132	46,518	2.5%	30.0%	32.1%	35.3%	0.0%	32.6%	67.4%
	Bani Bahlul	14,481	13,629	14,481	0.7%	22.2%	49.2%	27.9%	0.0%	22.9%	77.1%
	Khawlan	159,766	157,472	159,766	1.8%	10.9%	22.5%	64.8%	0.0%	12.8%	87.2%
	Bilad Ar Rus	22,060	21,860	22,060	2.3%	19.9%	49.3%	28.5%	0.0%	22.2%	77.8%
	Bani Matar	81,302	80,279	81,302	2.3%	17.3%	32.5%	47.9%	0.0%	19.6%	80.4%
	Al Haymah Ad Dak	60,658	59,884	60,658	0.6%	4.8%	14.5%	80.1%	0.0%	5.4%	94.6%
	Al Haydah Al Kharij	44,366	43,971	44,366	0.5%	7.8%	18.9%	72.8%	0.0%	8.3%	91.7%
	Manakhah	64,242	58,348	64,242	1.9%	6.3%	23.5%	68.3%	0.0%	8.2%	91.8%
	Safan	33,361	33,352	33,361	0.6%	20.4%	36.9%	42.0%	0.0%	21.0%	79.0%
	Bilad At Taam	24,035	23,934	24,035	0.3%	2.7%	6.5%	90.4%	0.0%	3.0%	97.0%
	Al Jabin	98,929	98,355	98,929	0.6%	7.4%	11.0%	81.0%	0.0%	8.0%	92.0%
	As Salafiyah	50,146	50,146	50,146	0.8%	8.8%	24.1%	66.3%	0.0%	9.6%	90.4%
	Kusmah	65,182	64,203	65,182	0.5%	4.2%	29.6%	65.7%	0.0%	4.8%	95.2%
	Al Jafariyah	53,241	52,311	53,241	0.6%	11.5%	25.7%	62.2%	0.0%	12.1%	87.9%

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Sanaa City		**954,448**	**0**	**0**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Hajjah		**1,238,114**	**1,129,092**	**1,238,114**	**2.3%**	**9.1%**	**17.6%**	**71.0%**	**0.0%**	**11.4%**	**88.6%**
	Bakil Al Mir	21,146	21,146	21,146	1.9%	12.2%	29.0%	56.8%	0.0%	14.1%	85.9%
	Harad	61,820	46,110	61,820	4.9%	10.3%	14.4%	70.4%	0.0%	15.2%	84.8%
	Midi	11,817	7,448	11,817	3.9%	19.5%	6.5%	70.2%	0.0%	23.3%	76.7%
	Abs	85,602	67,282	85,602	0.8%	14.9%	13.3%	71.0%	0.0%	15.7%	84.3%
	Khayran	10,331	8,946	10,331	0.3%	3.4%	14.0%	82.2%	0.0%	3.7%	96.3%
	Mustaba	22,666	22,270	22,666	0.4%	0.9%	8.2%	90.4%	0.0%	1.4%	98.6%
	Washhah	55,848	55,848	55,848	0.4%	1.9%	24.7%	73.0%	0.0%	2.3%	97.7%
	Kushar	55,139	53,195	55,139	0.3%	6.0%	8.6%	85.1%	0.0%	6.3%	93.7%
	Suwayr	17,257	16,990	17,257	0.0%	2.1%	8.7%	89.1%	0.0%	2.1%	97.9%
	Al Madan	31,297	28,381	31,297	2.6%	13.2%	34.1%	50.1%	0.0%	15.8%	84.2%
	Shaharah	43,170	41,419	43,170	2.4%	11.4%	48.7%	37.5%	0.0%	13.8%	86.2%
	Zulaymat Habur	54,602	49,024	54,602	0.9%	6.4%	21.6%	71.2%	0.0%	7.2%	92.8%
	Al Jamimah	26,518	24,291	26,518	0.4%	1.8%	8.4%	89.4%	0.0%	2.2%	97.8%
	Kuhlan Ash Sharaf	50,849	50,788	50,849	4.8%	5.8%	44.3%	45.1%	0.0%	10.6%	89.4%
	Aflah Ash Shawm	26,612	26,461	26,612	1.0%	13.2%	14.6%	71.3%	0.0%	14.1%	85.9%
	Kyaran Al Moharaq	101,967	99,600	101,967	0.4%	6.6%	23.1%	69.9%	0.0%	7.0%	93.0%
	Aslam	35,765	35,544	35,765	0.4%	1.4%	16.4%	81.8%	0.0%	1.8%	98.2%
	Qufl Shamar	33,676	33,604	33,676	0.1%	7.2%	8.6%	84.1%	0.0%	7.3%	92.7%
	Aflah Al Yaman	28,081	27,790	28,081	0.2%	5.8%	29.0%	64.9%	0.0%	6.1%	93.9%
	Al Mahabishah	36,321	23,403	36,321	0.1%	22.1%	36.9%	40.9%	0.0%	22.2%	77.8%
	Al Miftah	43,023	38,933	43,023	0.8%	42.8%	20.8%	35.7%	0.0%	43.5%	56.5%
	Al Maghrabah	32,774	32,005	32,774	1.5%	4.3%	0.8%	93.4%	0.0%	5.8%	94.2%
	Kuhlan Affar	26,693	25,365	26,693	0.1%	7.0%	14.4%	78.5%	0.0%	7.1%	92.9%
	Sharas	10,762	10,762	10,762	0.6%	2.1%	1.5%	95.8%	0.0%	2.7%	97.3%
	Mabyan	37,549	36,165	37,549	0.5%	9.4%	25.9%	64.2%	0.0%	9.9%	90.1%
	Ash Shahil	26,554	24,038	26,554	2.0%	18.8%	19.4%	59.7%	0.0%	20.9%	79.1%
	Kuaydinah	48,810	48,253	48,810	1.6%	2.1%	16.2%	80.1%	0.0%	3.8%	96.2%
	Wazrah	9,504	8,949	9,504	0.9%	1.6%	0.3%	97.1%	0.0%	2.5%	97.5%
	Al Tur	40,120	39,477	40,120	0.3%	1.5%	4.7%	93.5%	0.0%	1.8%	98.2%
	Ash Shaghadirah	35,959	35,105	35,959	0.4%	6.4%	7.5%	85.7%	0.0%	6.9%	93.1%
	Najrah	22,714	22,211	22,714	0.6%	11.5%	2.0%	85.9%	0.0%	12.1%	87.9%
	Hajjah	59,252	34,607	59,252	24.5%	18.2%	17.0%	40.3%	0.0%	42.7%	57.3%
	Bani Al Awwam	33,916	33,682	33,916	0.7%	4.4%	8.3%	86.7%	0.0%	5.0%	95.0%
Al Mahwit		**371,595**	**345,789**	**371,595**	**1.8%**	**10.0%**	**16.3%**	**71.8%**	**0.0%**	**11.9%**	**88.1%**
	Shibam & Kawkaba	30,538	24,494	30,538	3.3%	19.8%	47.1%	29.9%	0.0%	23.0%	77.0%
	Al Tawilah	42,106	38,004	42,106	5.0%	15.5%	41.9%	37.6%	0.0%	20.5%	79.5%
	Ar Rujum	60,939	58,522	60,939	3.8%	7.4%	25.0%	63.8%	0.0%	11.2%	88.8%
	Al Mahwit	56,468	47,408	56,468	1.4%	14.7%	10.3%	73.6%	0.0%	16.1%	83.9%
	Al Khabt	47,850	46,531	47,850	0.9%	21.1%	7.4%	70.6%	0.0%	22.0%	78.0%
	Milhan	55,518	54,468	55,518	0.3%	0.7%	2.0%	97.0%	0.0%	0.9%	99.1%
	Hufash	30,801	29,210	30,801	0.9%	6.8%	11.7%	80.6%	0.0%	7.7%	92.3%
	Bani Sad	47,375	47,152	47,375	0.8%	1.1%	9.8%	88.3%	0.0%	1.9%	98.1%
Al Hudaydah		**1,558,513**	**1,018,965**	**1,144,757**	**0.9%**	**22.0%**	**7.7%**	**69.4%**	**0.0%**	**22.9%**	**77.1%**
	Az Zahrah	94,498	87,238	94,498	1.7%	9.1%	7.0%	82.2%	0.0%	10.8%	89.2%
	Al Luhhayah	75,522	65,893	75,522	0.3%	12.9%	9.2%	77.6%	0.0%	13.2%	86.8%
	Kamaran	2,220	601	2,220	0.2%	90.4%	0.2%	9.1%	0.0%	90.7%	9.3%
	As Salif	5,408	4,185	5,408	0.2%	55.9%	1.4%	42.5%	0.0%	56.1%	43.9%
	Al Munirah	28,011	21,709	28,011	0.3%	19.8%	1.3%	78.7%	0.0%	20.1%	79.9%
	Al Qanawis	50,483	47,447	50,483	0.6%	22.5%	7.1%	69.7%	0.0%	23.1%	76.9%
	Az Zaydiyah	67,718	53,806	67,718	0.2%	23.1%	3.1%	73.6%	0.0%	23.3%	76.7%
	Al Mighlaf	27,199	23,343	27,199	0.4%	7.1%	0.8%	91.7%	0.0%	7.5%	92.5%

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					public	closed pit	open pit	none	not stated	safe	not safe
	Ad Dahi	37,540	27,044	37,540	1.5%	28.7%	4.7%	65.2%	0.0%	30.1%	69.9%
	Bajil	120,553	79,992	79,992	0.8%	4.5%	6.0%	88.8%	0.0%	5.2%	94.8%
	Al Hajjaylah	6,374	5,009	6,374	0.9%	7.2%	2.1%	89.8%	0.0%	8.1%	91.9%
	Jabal Bura	37,984	37,477	37,984	0.6%	13.4%	10.5%	75.5%	0.0%	14.1%	85.9%
	Al Marawiah	95,583	65,079	65,079	1.1%	27.9%	2.6%	68.4%	0.0%	29.0%	71.0%
	Al Hudaydah	302,586	4,134	4,134	0.0%	53.1%	1.6%	45.3%	0.0%	53.1%	46.9%
	Ad Durayhimi	40,481	34,138	40,481	0.3%	26.5%	4.3%	68.9%	0.0%	26.8%	73.2%
	As Sukhnah	41,755	40,043	41,755	0.3%	19.6%	12.2%	68.0%	0.0%	19.9%	80.1%
	Al Mansuriyah	32,749	22,790	32,749	0.5%	27.3%	5.5%	66.7%	0.0%	27.8%	72.2%
	Bayt Al Faqih	169,219	140,446	169,219	1.9%	25.2%	5.4%	67.4%	0.0%	27.2%	72.8%
	Zabid	230,091	185,852	185,852	1.0%	33.2%	16.8%	49.1%	0.0%	34.2%	65.8%
	Jabal Ras	34,753	34,413	34,753	0.4%	8.5%	12.6%	78.5%	0.0%	8.9%	91.1%
	Hays	32,263	21,585	32,263	0.7%	26.5%	13.8%	59.0%	0.0%	27.2%	72.8%
	Al Khawkhah	25,523	16,741	25,523	0.6%	46.6%	2.5%	50.3%	0.0%	47.2%	52.8%
Dhamar		**981,674**	**878,552**	**898,754**	**0.7%**	**13.2%**	**27.3%**	**58.6%**	**0.0%**	**13.9%**	**85.9%**
	Al Hada	99,952	96,436	99,952	0.9%	15.9%	27.2%	56.1%	0.0%	16.8%	83.2%
	Ans	239,396	156,476	156,476	0.6%	23.1%	34.6%	41.7%	0.0%	23.7%	76.3%
	Mabar (Jahran)	51,723	42,046	51,723	1.8%	41.6%	13.4%	43.2%	0.0%	43.4%	56.6%
	Dawran	124,750	122,089	124,750	0.8%	15.1%	11.4%	72.7%	0.0%	15.9%	84.1%
	Jabal Ash Sharq	48,199	47,645	48,199	0.7%	4.5%	43.4%	51.4%	0.0%	5.2%	94.8%
	Maghirib Ans	42,934	41,993	42,934	0.6%	7.4%	18.1%	73.9%	0.0%	8.0%	92.0%
	Utmah	122,008	121,682	122,008	0.5%	4.2%	23.3%	72.0%	0.0%	4.7%	95.3%
	Wusab Al Ali	132,766	132,456	132,766	0.6%	7.6%	30.0%	61.8%	0.0%	8.2%	91.8%
	Wusab Al Safil	119,946	117,729	119,946	0.3%	8.5%	36.7%	52.8%	0.0%	8.8%	89.5%
Ibb		**1,771,861**	**1,544,552**	**1,636,586**	**1.2%**	**17.0%**	**23.8%**	**52.7%**	**0.0%**	**18.1%**	**76.5%**
	Al Qafr	80,265	75,894	80,265	1.0%	8.6%	14.3%	71.0%	0.0%	9.7%	85.2%
	Yarim	122,162	94,360	122,162	1.8%	14.6%	17.1%	45.1%	0.0%	16.4%	62.2%
	Ar Radmah	60,909	57,626	60,909	0.8%	19.3%	18.9%	55.8%	0.0%	20.2%	74.7%
	Damt	42,033	34,472	42,033	0.3%	14.6%	23.3%	41.7%	0.0%	14.9%	64.9%
	Qatabah	64,774	57,853	64,774	1.1%	8.3%	16.7%	63.6%	0.0%	9.4%	80.3%
	An Nadirah	63,491	58,184	63,491	0.4%	14.5%	12.7%	64.1%	0.0%	14.8%	76.8%
	Ash Shair	38,787	37,036	38,787	1.5%	25.1%	29.4%	39.2%	0.0%	26.6%	68.6%
	As Saddah	73,226	68,970	73,226	0.7%	14.0%	33.9%	45.9%	0.0%	14.6%	79.7%
	Al Makhadir	84,600	81,558	84,600	2.3%	26.5%	21.7%	46.1%	0.0%	28.8%	67.8%
	Hubaysh	88,557	83,362	88,557	1.9%	8.0%	20.7%	64.2%	0.0%	9.9%	84.9%
	Hazm Al Udayn	63,248	63,169	63,248	0.4%	10.9%	22.9%	65.7%	0.0%	11.3%	88.6%
	Far Al Udayn	68,207	68,146	68,207	0.2%	10.5%	15.3%	73.9%	0.0%	10.7%	89.2%
	Al Udayn	116,143	111,716	116,143	0.7%	13.5%	38.1%	44.2%	0.0%	14.2%	82.3%
	Jiblah	114,894	106,030	114,894	1.2%	24.1%	26.8%	39.6%	0.0%	25.3%	66.4%
	Ibb	240,891	137,579	137,579	1.1%	23.6%	25.9%	49.5%	0.0%	24.6%	75.4%
	Badan	107,390	103,895	107,390	2.2%	32.8%	20.8%	41.1%	0.0%	35.0%	61.9%
	As Sabrh	55,326	52,759	55,326	0.6%	17.1%	27.1%	50.8%	0.0%	17.6%	77.9%
	As Sayyani	91,717	89,929	91,717	0.5%	18.9%	29.7%	48.9%	0.0%	19.4%	78.6%
	Dhi Sufal	129,870	97,907	97,907	2.7%	19.9%	24.7%	52.7%	0.0%	22.6%	77.4%
	Mudhaykhirah	65,371	64,107	65,371	1.1%	6.4%	29.8%	60.9%	0.0%	7.4%	90.7%
Taiz		**2,026,991**	**1,653,834**	**1,709,420**	**1.4%**	**24.7%**	**29.4%**	**44.5%**	**0.0%**	**26.1%**	**73.9%**
	Al Husha	42,535	40,849	42,535	3.1%	12.3%	22.1%	62.5%	0.0%	15.4%	84.6%
	Mawiyah	95,562	92,994	95,562	0.3%	12.7%	28.7%	58.3%	0.0%	13.0%	87.0%
	At Taziyah	453,957	136,386	136,386	1.5%	24.5%	26.9%	47.0%	0.0%	26.1%	73.9%
	Sharab As Salaam	96,930	96,930	96,930	0.5%	26.9%	46.9%	25.7%	0.0%	27.5%	72.5%
	Sharab Ar Rawnah	123,677	119,919	123,677	0.6%	20.2%	24.5%	54.6%	0.0%	20.9%	79.1%
	Maqbanah	150,359	150,359	150,359	1.6%	25.0%	21.3%	52.0%	0.0%	26.6%	73.4%
	Al Mukha	47,120	36,765	47,120	3.3%	19.5%	3.8%	73.4%	0.0%	22.8%	77.2%

governorate	mudiriah	total population	population in settlements < 5,000	population in settlements < 30,000	percentage of people in settlements < 30,000 with sewage facility					percentage of people in settlements < 30,000 with sanitation that is	
					public	closed pit	open pit	none	not stated	safe	not safe
	Dhubab	11,955	9,312	11,955	2.9%	15.3%	2.7%	79.2%	0.0%	18.2%	81.8%
	Mawza	27,881	24,044	27,881	0.3%	12.7%	8.6%	78.3%	0.0%	13.0%	87.0%
	Al Mawasit	221,255	220,521	221,255	1.3%	35.0%	22.4%	41.3%	0.0%	36.3%	63.7%
	Jabal Habashi	98,414	96,459	98,414	0.8%	30.0%	31.9%	37.3%	0.0%	30.8%	69.2%
	Mashraah & Hadna	21,270	21,270	21,270	0.9%	67.9%	14.3%	16.8%	0.0%	68.9%	31.1%
	Sabir Al Mawadim	89,539	89,539	89,539	1.2%	31.4%	23.6%	43.8%	0.0%	32.6%	67.4%
	Al Misrakh	80,133	77,373	80,133	5.3%	34.6%	20.7%	39.3%	0.0%	39.9%	60.1%
	Dimnat Khadir	81,747	66,096	81,747	1.1%	32.0%	24.6%	42.3%	0.0%	33.1%	66.9%
	As Silw	42,854	42,854	42,854	0.8%	18.5%	46.3%	34.4%	0.0%	19.3%	80.7%
	Al Qabbaytah	125,196	123,611	125,196	1.3%	13.7%	61.7%	23.3%	0.0%	15.0%	85.0%
	Al Maqatirah	49,258	49,258	49,258	0.8%	22.2%	54.5%	22.5%	0.0%	23.0%	77.0%
	Ash Shimayatayn	147,729	139,675	147,729	1.2%	21.0%	32.3%	45.4%	0.0%	22.2%	77.8%
	Alwaziiyah	19,620	19,620	19,620	1.0%	9.3%	6.9%	82.8%	0.0%	10.2%	89.8%
Lahj		**588,746**	**557,740**	**588,746**	**5.2%**	**13.2%**	**10.4%**	**71.2%**	**0.0%**	**18.5%**	**81.5%**
	Yafa	163,491	163,256	163,491	0.9%	4.5%	11.3%	83.2%	0.0%	5.5%	94.5%
	Ad Dali	147,403	138,532	147,403	4.3%	9.1%	17.6%	69.0%	0.0%	13.4%	86.6%
	Radfan	101,186	98,637	101,186	1.7%	12.1%	4.8%	81.5%	0.0%	13.8%	86.2%
	Tuban	106,986	87,980	106,986	17.0%	36.0%	4.7%	42.2%	0.0%	53.0%	47.0%
	Tawr Al Bahah	69,680	69,335	69,680	0.3%	2.1%	11.3%	86.3%	0.0%	2.5%	97.5%
Aden		**441,880**	**38,455**	**43,586**	**1.3%**	**10.8%**	**15.8%**	**72.1%**	**0.0%**	**12.1%**	**87.9%**
	Ash Shaab	233,146	5,858	5,858	5.5%	59.5%	5.2%	29.9%	0.0%	64.9%	35.1%
	Sirah	91,970	0	0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Al Mina	79,141	105	105	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%	0.0%
	Suqutra	37,623	32,492	37,623	0.5%	1.1%	17.9%	80.5%	0.0%	1.7%	98.3%
Abyan		**379,815**	**309,526**	**329,469**	**6.3%**	**18.6%**	**12.7%**	**62.3%**	**0.1%**	**24.8%**	**75.0%**
	Mudiyah	60,611	49,540	60,611	12.7%	22.3%	11.8%	53.1%	0.0%	35.0%	64.9%
	Lawdar	127,732	119,648	127,732	7.2%	24.8%	8.3%	59.6%	0.1%	32.0%	67.9%
	Rasad	70,205	69,417	70,205	0.6%	4.3%	11.2%	83.8%	0.1%	4.9%	95.1%
	Khanfar	121,267	70,921	70,921	5.6%	19.9%	21.2%	53.1%	0.2%	25.5%	74.3%
Al Bayda		**460,892**	**384,172**	**421,665**	**4.7%**	**14.6%**	**18.9%**	**61.8%**	**0.0%**	**19.3%**	**80.7%**
	Naman	18,004	17,376	18,004	0.3%	0.9%	0.4%	98.4%	0.0%	1.2%	98.8%
	Nata	14,574	14,285	14,574	0.6%	1.7%	23.0%	74.7%	0.0%	2.3%	97.7%
	Mashwarah	8,618	8,316	8,618	0.2%	4.3%	36.3%	59.2%	0.0%	4.5%	95.5%
	Markhah	10,154	9,494	10,154	0.8%	1.2%	3.3%	94.7%	0.0%	2.0%	98.0%
	As Sawmaah	39,491	34,971	39,491	0.5%	25.3%	18.8%	55.5%	0.0%	25.7%	74.3%
	Al Bayda	50,214	30,920	50,214	31.6%	25.4%	14.7%	28.3%	0.0%	57.0%	43.0%
	As Zahir	19,187	17,746	19,187	1.3%	5.9%	11.5%	81.3%	0.0%	7.2%	92.8%
	Dhi Naim	18,903	15,828	18,903	3.1%	30.9%	12.9%	53.0%	0.0%	34.1%	65.9%
	At Taffah	30,267	30,044	30,267	0.5%	3.0%	8.7%	87.8%	0.0%	3.5%	96.5%
	As Sawadiyah	46,798	46,163	46,798	3.5%	3.0%	2.8%	90.7%	0.0%	6.5%	93.5%
	Radda	171,365	132,138	132,138	0.6%	17.7%	27.9%	53.8%	0.0%	18.3%	81.7%
	Juban	33,317	26,891	33,317	0.8%	10.1%	28.6%	60.5%	0.0%	10.9%	89.1%
Mareb		**181,740**	**161,159**	**181,740**	**1.0%**	**22.6%**	**7.7%**	**68.5%**	**0.1%**	**23.6%**	**76.3%**
	Majzar	6,443	6,232	6,443	8.1%	2.6%	3.0%	86.2%	0.1%	10.7%	89.2%
	Raghwan	5,031	3,445	5,031	0.2%	1.2%	24.7%	73.9%	0.0%	1.4%	98.6%
	Medkhel Algedaan	4,538	4,054	4,538	0.4%	15.8%	30.8%	53.0%	0.0%	16.2%	83.8%
	Harib Al Qaramish	5,294	5,080	5,294	0.5%	4.6%	20.9%	74.0%	0.0%	5.1%	94.9%
	Bid Bidah	30,719	30,719	30,719	0.5%	0.3%	2.0%	97.1%	0.1%	0.8%	99.2%
	Sirwah	11,803	11,478	11,803	0.1%	14.0%	13.2%	72.6%	0.1%	14.1%	85.8%
	Mareb	46,789	39,793	46,789	1.5%	44.3%	8.3%	45.9%	0.1%	45.8%	54.1%
	Al Jubah	13,962	11,989	13,962	0.1%	47.8%	6.0%	45.9%	0.2%	47.9%	51.9%
	Rahabah	14,488	12,064	14,488	0.0%	0.8%	3.1%	95.3%	0.8%	0.8%	98.4%
	Harib	21,828	16,129	21,828	0.7%	31.3%	9.2%	58.8%	0.0%	32.0%	68.0%

governorate	mudiriah	total population	population in settlements < 5,000	population in settlements < 30,000	percentage of people in settlements < 30,000 with sewage facility					percentage of people in settlements < 30,000 with sanitation that is	
					public	closed pit	open pit	none	not stated	safe	not safe
	Al Mahaliyah	8,992	8,323	8,992	0.1%	2.1%	2.8%	95.1%	0.0%	2.2%	97.8%
	Al Abdiyah	11,853	11,853	11,853	0.0%	1.0%	2.0%	97.0%	0.0%	1.0%	99.0%
Al Jawf		**168,852**	**141,011**	**168,852**	**0.3%**	**3.7%**	**9.8%**	**70.6%**	**0.0%**	**4.0%**	**80.4%**
	Khabb Washaf	71,569	68,654	71,569	0.2%	2.5%	10.9%	81.9%	0.0%	2.8%	92.8%
	Al Hamidat	19,238	16,437	19,238	0.1%	0.1%	0.1%	85.0%	0.0%	0.2%	85.1%
	Al Matammah	21,272	17,352	21,272	0.2%	7.1%	15.4%	62.0%	0.0%	7.3%	77.3%
	Az Zahir	11,474	10,771	11,474	0.5%	5.0%	12.8%	76.5%	0.0%	5.5%	89.3%
	Al Hazm & Asayl	14,039	8,194	14,039	1.1%	7.9%	1.3%	50.2%	0.0%	9.0%	51.4%
	Al Matun	11,535	8,869	11,535	0.0%	2.3%	2.4%	71.6%	0.0%	2.3%	74.0%
	Al Maslob	4,647	3,124	4,647	0.3%	0.4%	0.7%	68.9%	0.0%	0.7%	69.6%
	Al Ghayl	4,687	2,388	4,687	0.4%	3.0%	40.1%	3.3%	0.0%	3.4%	43.4%
	Al Khalaq & Al Faq	10,391	5,222	10,391	0.1%	11.4%	12.3%	26.5%	0.0%	11.6%	38.9%
Shabwah		**354,778**	**316,704**	**354,778**	**4.6%**	**13.9%**	**38.4%**	**42.9%**	**0.2%**	**18.5%**	**81.3%**
	Armah	34,401	33,752	34,401	0.1%	1.3%	26.1%	72.4%	0.1%	1.4%	98.5%
	Bayhan	95,782	83,097	95,782	8.2%	19.2%	29.5%	43.0%	0.2%	27.3%	72.5%
	Nisab	82,153	76,226	82,153	1.2%	19.7%	23.6%	55.3%	0.2%	20.9%	78.9%
	As Said	74,479	60,484	74,479	4.8%	16.8%	47.6%	30.6%	0.2%	21.6%	78.2%
	Mayfaah	67,963	63,145	67,963	6.4%	5.2%	60.4%	27.9%	0.1%	11.6%	88.3%
Hadramawt		**718,008**	**479,745**	**488,689**	**3.1%**	**31.8%**	**32.8%**	**32.2%**	**0.0%**	**34.9%**	**65.1%**
	Thamud	21,826	21,272	21,826	0.5%	7.2%	2.7%	89.7%	0.0%	7.7%	92.3%
	Al Abr	3,792	3,707	3,792	0.0%	2.1%	6.3%	91.6%	0.0%	2.1%	97.9%
	Al Qatn	64,649	60,517	64,649	2.4%	48.2%	13.4%	36.0%	0.0%	50.6%	49.4%
	Sayun	205,797	147,414	147,414	3.6%	43.7%	40.1%	12.6%	0.0%	47.3%	52.7%
	Dawan	95,703	93,203	95,703	2.9%	11.8%	63.8%	21.5%	0.0%	14.7%	85.3%
	Ash Shahir	120,490	71,913	71,913	1.1%	35.8%	26.1%	37.0%	0.0%	36.8%	63.2%
	Al Mukalla	171,727	49,368	49,368	8.1%	45.7%	7.7%	38.5%	0.0%	53.8%	46.2%
	Hajar	34,024	32,351	34,024	2.3%	5.0%	21.7%	71.1%	0.0%	7.2%	92.8%
Al Mahrah		**56,425**	**38,133**	**56,425**	**1.0%**	**8.5%**	**10.4%**	**46.0%**	**0.0%**	**9.5%**	**56.4%**
	Al Ghaydah	21,787	14,002	21,787	1.8%	7.3%	16.2%	39.4%	0.0%	9.1%	55.6%
	Sayhut	16,593	11,492	16,593	0.6%	11.1%	5.7%	52.8%	0.0%	11.7%	58.4%
	Qashan	14,082	9,227	14,082	0.1%	1.4%	9.2%	46.7%	0.0%	1.4%	55.9%
	Hawf	3,963	3,412	3,963	2.6%	31.8%	6.0%	46.6%	0.0%	34.4%	52.7%
YEMEN		**14,587,807**	**11,164,289**	**11,966,651**	**1.9%**	**17.5%**	**21.7%**	**57.8%**	**0.0%**	**19.4%**	**79.5%**
			76.5%	**82.0%**							

Definitions and Caveats of the 1994 Census and Information Derived from It

term	definition
rural, according to 1994 census	settlements < 5,000 people
urban, according to 1994 census	settlements > 5,000 people, as well as the governorate, and other district centers that may be smaller than 5,000
rural for purposes of this review (i.e., GAREW's mandate)	< 30,000 people (possibly spread over several settlements) served by one scheme[1]
urban for the purposes of this review (i.e., NWSA's mandate)	> 30,000 people served by one scheme
source of water	supposedly mutually exclusive sources and systems for supplying water to the house
public network	supply of piped water from a network constructed by the Government
cooperative network	supply of piped water from a network constructed or operated by the cooperative (i.e., LCCD or LDA)
private network	supply of piped water from a network constructed by one or more individuals to make a profit, provide a service or as a charity
well	supply of water from a well, either inside or outside the house. This includes houses supplied with water by tankers and other water carriers if the source is a well.
stream	water supplied from spring or perennial source
closed pool	water supplied from covered cistern (lined reservoir)
open pool	water supplied from open cistern (lined reservoir)
drain	water supplied from baseflow in flood channel
dam	water supplied from reservoir behind dam
sanitation facilities	supposedly mutually exclusive ways to dispose of waste outside the house
public system	disposal of water (from bathroom, kitchen, etc.) through a sewage network constructed by the Government
closed pit	disposal of water through pipe from house to a constructed, covered pit
open pit	disposal of water to an open pit or flood channel (no pipes)
none	no bathroom exists in the house
closed pit	
caveat	assumption
the actual cleanliness of piped water supplies is unknown	all piped systems are assumed clean
the number of hand-dug & deep wells and the cleanliness of the water they produce is unknown	due to poor generally poor well construction and protection, only 50% of total number of wells is assumed clean
the distance (or travel time) to wells is unknown	all presumably clean wells are judged accessible
the sources 'network' and 'well' are not mutually exclusive	
people may identify a public network as their source of water, even though it may be malfunctioning-functioning	

[1] However, in quite a few centers with populations under 30,000, in the northern as well as in the southern governorates, the water supply is managed by NWSA. (e.g., Sadah, Amran, Hajjah, Bayt al Faqih, Al Mansuriyah, Yarim, Al Mokha, Lahj, Ad Dali, Tawr Al Bahah, Lawdar, Amnagdah, Al Bayda).

ANNEX 5.1
PRESIDENTIAL DECREE NO. 230/ 1992
(Unofficial Translation)

GENERAL AUTHORITY FOR RURAL ELECTRICITY AND WATER

Head of the Presdential Council

After approval of the Presidential Council

- DECIDED -

Article (1) For the purpose of this Decree the following is meant unless otherwise indicated:

The Republic	: Republic of Yemen
The Minister	: Minister of Electricity and Water
The Authority	: The General Authority for Rural Electricity and Water
Chairman of the Board	: The Chairman of the Authority's Board of Directors
Board	: Authority's Board of Directord

Article (2) There will be established according th this Decree a General Authority called the General Authority for Rural Electricity and Water which will be an independent entity and will have a separate financial status and will be un der the supervision of the Minister. Its headquarters will be in the capital Sana'a, an can establish branches throughout the Republich by a Ministerial decision.

Article (3) The Authority will fulfil the following objectives:

a- Provide electric power for illumination and clean water suitable for domestic consumption and in sufficient quantities for all rurarai population, also electric power and water for commercial and industrial purposes.

b- promote investment by providing dacilities and technical consultations to the private sector for the purpose of impementing service projects in the area of electricity and water within the general direction of development plans and programmes so as to secure integrated rural development according to applicable laws.

Article (4) for fulfiling is objectives, the Autority will have the following obligations and responsibilities:

First: In the Area of Electricity:

Second: In the Area of Water:

1- Water exploration, abstraction and storage for drinking and domestic purposes in the rural areas and in coordination with concerned agancies.

2- Preparation of studies and technical designs for the development and implementation of rural watre supply projects for population conglomerations not) thirty thousand personswhich coulde be served by one single watre supply project and which could be directly implemented or by the private or the corporate sector.

3- To take all necessary measures to monitor and protect water sources for rural projects which it will implement or supervise, and jprotect the sources from pollution and any quantitative or qualitative effects in coordination with concerned agencies.

4- Selection of suitable locations to erect water installations and carry out necessry excavation to implement proiects in roads and main and branch stretts and

passages and in any other location which public interest requires in rural areas in coordination with concerned agencies.

5- To take all necessary measures to protect against environmental pollution resulting from improper use of water in order to preserve public health in rural areas and to apply necessary public health controls and systems.

6- Training and rehabilitation of those working in the water sector in rural areas to enable them to carry out maintenance and operation work and promote implementation and development of projects by the public and cooperative sectors.

7- Provide technical opinion and advice to both private and cooperative sectors and to small rural population conglomerations which themselves carry out implementation, operation and maintenance of their projects.

Article (5) The Authority's capital will consist of:

A- Clear assets of the following Directorates General:

1- Rural Water Supply Directorate General unter the Ministry of Electricity and Water according to the 1991 stocktaking.

2- Directorate General of Engineering of the branch office of the National Water and Sewerage Authority in Aden Governorate.

3- Directorate General of General Services of the Ministry of Local Administration.

4- Department of Rural Water of the National Water and Sewerage Authority.

5- Department of Rural Electrification of the General Authority for Electricity.

6- Directorates General of the Governorates which have activities similar to the Authority's.

B- Funds allocated by the State to the Authority

Article (6) After implementation, projects will be operated by the local authorities according to economic basis which guarantee a financial return for their operation and maintenance.

Article (7) The Authority will have a special budget the preparation of which will be according to principles used for the preparation of the national budget.

Article (8) The Authority will be run by a board of directors to be formed according to a Council of Ministers decision based on the Minister's proposal. The board will exercise the authority granted it according to applicable laws and decisions.

Article (9) The Chairman of the Board will run the Authority and its administrative, technical and financial affairs under the applicable laws and decisions.

Article (10) The Board will convene and will carry out its business according to what was decreed by the Presidential Decree of Law No. (35) of 1991 in connection with Authorities, Institutions and Public Companies regarding methods of convening Authorities'Boards of Directors.

Article (11) -A- The Authority is considered the only government agency entrusted with implementation of government projects in the electricity and water sectors in the rural areas, and, accordingly, all similar activities carried out by each of the Ministry of Agriculture and Water Resources, Ministry of Local Administration, Ministry of Housing and Urban Planning or any other government agency shall cease.

B- The Authority for Development of Rural Areas shall be exempt from the obligation of the previous item.

Article (12) -A- The Authority will replace the following Directorates:

1- The Rural Water Supply Directorate General of the Ministry of Local Administration.

2- Directorate of Rural Electricity of the General Authority of Electricity.
3- Directorate General of General Services of the Ministry of Local Administration.
4- Directorate of Rural Water of the National Water and Sewerage Authority.
5- General Directorates of the Governorates which have activities similar to the Authority's and which are under any other ministry or government agency.

B- The Authority shall, after its establishment and during 1992, study the organizational, financial, administrative and technical situation of the projects supervised by the Ministry of Local Administration and the General Authority of Electricity for the purpose of seeking proper means for their operation and maintenance and for studying the possibility of surrendering some of them to the private or cooperative sectors to operate and maintain them through official and complete receipt procedure together with stocktaking and evaluation of their assets.

Article (13) -A- The 1992 financial allocations for the Rural Water Supply Directorate General and allocations for the Department of Rural Water of the National Water and Sewerage Authority and of the Rural Electrification Department of the General Authority of Electricity and the Directorate General of General Services of the Ministry of Local Administration, also any other financial allocations for the studies, planning, programming and execution of electric and rural water in the referred to ministries or any other government agency, shall be integrated and shall constitute in their totality the yearly budget of the Authority.

B- (All rights and obligations of previous departments reverting to the Authority ...)

Article (14)

(Exemptions from customs, taxes, etc...)

Article (15) The Minister will issue the organizational regulations for the Authority and the orders and decisions necessary for implementing the provisions of this Decree according to the applicable laws, decrees and regulations.

Article (16) The Presidential Decree No. (35) for 1991 concerning Authorities, Institutions and Public Companies shall apply where no specific reference is made in this Decree.

Article (17) This Decree shall be applied from the date it is issued and published in the official gazette.

Issued at the Republican Presidency in Sana'a

on 10 November, 1992

(Signature)	(Signature)
Heider Abu-Bakr Al-Attas	General Ali Abdullah Saleh
Head of the Council of Ministers.	Head of the Presidential Council

ANNEX 5.2

DRAFT WATER - POLICY FRAMEWORK

1.0 Premise: In essence, the renewable water resources in many regions of the country are insufficient to meet the current demands on sustainable basis. Consequently, many groundwater aquifers in the country are being depleted so that the wells in some areas are running dry. To further aggravate the problem, water demand continues to grow as a result of rapid population growth and economic development, leading to more competition among different use sectors/ users (irrigation vs. domestic, rural vs. urban) and more depletion.

In short, the country is confronted with a water crisis which is already felt by the urban and rural populations in many cities and basins (Taiz, Rada and Sa'adah Basins, ...). A crisis which threatens many other regions (Sana'a basin, ...) and can have serious adverse impact on the welfare of the Yemeni people (social, economic, health, etc).

It is realized that this crisis is largely the result of more than 30 years of ad hoc water policy which focused on supply-development to meet the requirements for development of various use sectors (domestic supply, irrigation, ...), with little or no consideration to demand management demand or sustainability of the resource. This policy proved to be counter-productive, as it led to depletion of the groundwater aquifers in many regions... to the extent that jeopardizes agricultural investments and disrupts the daily life in several cities.

Thus, it is imperative that a National Water Policy (NWP) be developed. Such policy should promote a more active role for the Government in the planning and management of water resources, to abandon the fragmented demand-driven water planning and integrate water planning into the macro-economic level of development planning.

2.0 Sectoral Objectives: The ultimate sectoral goal is to attain optimum and sustainable patterns of water use. Specifically, the following major objectives may be identified:

a) protect the water resources from over-exploitation and quality degradation,

b) allocate water resources among different uses to sustain economic growth with equitable distribution of benefits and balanced demographic distribution, and

c) satisfy society's needs for water, food, and ecological stability by meeting drinking water requirements, by providing for safe disposal of wastewater and solid waste, by increasing productivity per units of land and water, and by maintaining an ecological balance.

3.0 National Water Policy Framework In order to provide guidance to all water related institutions and water users, the Government should adopt a water policy leading to the

realization of sectoral objectives set out in the preceding section. The policy formulation is viewed as a continuous and iterative process, and it will always be subject to adjustment in the light of evolving conditions. The following guiding principles, however, set out the framework within which specific policies and measures should be designed to optimize the use of water in order to maximize benefits to the society.

a) **Ownership of water resources:** All water resources in the country should be declared as State property and utilized in compliance with the national water legislation. State authorization is required for all water withdrawals from common resources such as aquifers.

b) **Groundwater sustainability:** Sustainable use of groundwater is essential to ensure sustainable economic development. Thus, groundwater aquifers are to be managed on a long-term sustained yield basis and groundwater mining should be controlled and regulated in such a way that the development of future generations is not affected by the present level of mining.

c) **Stakeholder's participation:** In view of stockholders conflicts arising mainly from water scarcity, the process for water resources management and development should be based on full participation in decision making by water users, communities, planners and policy makers. Raising public awareness about water related issues to mobilize public support for water management policy is must.

d) **The resource management unit:** In view of the fact that Yemen is a country of many hydrological units, the resource management should be exercised on well defined hydro-geographic units.

e) **Allocation and use rights:** The system of water rights should acknowledge traditional and existing rights, provide for clear rules governing appropriation, expropriation and reallocation of allocated rights, and allow for transferability. Consistent with the system of water rights, responsibility of all users should be defined to avoid damage to water quantity and quality, as well as enforcement mechanisms for restitution in the event that allocated water rights are infringed.

f) **The economic value of water:** Considering that water is an economic good, maximizing the value of water use should be a key element of the national water policy. This requires that water should be allocated to its competing uses based on its economic value. The allocation mechanism should ensure that water is transferred without conflict and with fairness from lower value uses to the ones on which society places the highest value.

g) **Water use priorities:** While making inter-sectoral allocation decisions, first priority in the allocation of the nation's water resources should be given to meeting the reasonable needs of the population for human and domestic consumption. Second priority should be given to industry, tourism and other service sectors. Third priority

should be given to the agriculture sector. Sectoral allocation of water and its usage should be governed subject to the enforcement of effective management plans by the public and private entities concerned, as well as proper assessment of social and environmental impacts of water usage.

h) **Quantity and quality considerations:** Since water usage leads to changes in the quality and quantity of water, issues related to water quality and quantity should be treated together within the context of water resources planning and management.

i) **Resource management function vs. delivery of water services:** The Government should recognize the distinction between the management of the resources and the delivery of water services. With respect to planning, management and allocation of water resources, the NWRA should retain full responsibility, adopting approaches to management and regulation that recognize the unitary nature of the resource, the pervasive existence of externalities and the close interaction of quantity and quality issues. In this context, the institutional and technical capabilities of NWRA should be strengthened to enable it to play an effective role in managing the country's scarce water resources. On the other hand, responsibility with respect to provision of water services or for that matter execution of water related projects should remain with the existing public entities. In this regard, however, the policy should decentralize the functions of autonomous public entities to the maximum possible extent to enhance their management efficiency. Also, the private sector should be encourage to invest in large scale municipal water supply networks.

j) **Equitable allocation:** In situations when water management objectives are in conflict with each other (e.g. water conservation vs. maximization of output), the water allocation or transfer decisions should be based on the notion of equity or fairness. The principle of compensation to those surrendering rights should be considered.

k) **Cost recovery:** Both in irrigation and municipal water supply projects, the principle of full recovery of costs should be vigorously pursued. In the case of municipal water supply projects, cost recovery policy can be varied to allow poorer people to pay less, and the better off can pay proportionately more. Similarly, water charges for crops could be adjusted based on either relative profitability of crops or net income per unit of water use.

l) **Integrated planning:** In view of the extensiveness and importance of the role of water in socio-economic development, water planning should be integrated into the macro-economic level of development planning. urban, rural, irrigation and industrial water developments and use should be guided by sectoral strategies / policies.

m) **Appraisals of water projects:** Water projects should be economically and financially appraised on the basis of sound criteria.

ANNEX 6.1

Field visits

From June 26 to July 10 the mission conducted field visits to over 20 villages located in the governorates of Sana'a, Dhamar, Ibb, Taiz, Lahj, and Abyan. The purpose was to see a representative group of water supply systems to observe and evaluate the factors which may be responsible for the sustainability of projects.

The team visited on average two villages a day. The team divided itself up into sub-groups who separately interviewed female users, male users, and the community leaders/system managers. The team held review meetings in the evenings, to compare notes and discuss the sustainability of the systems. Towards the end of the field trip, based on the observations in the villages, the team developed a tentative list of factors promoting sustainability and a list of factors likely to lead to system failure. From these lists an initial set of recommendations were developed for the rural water sector in Yemen. (These are included in the recommendations section of the main report).

Findings from eighteen of the field sites are described in this annex. The team visited two areas which have never been served by improved water systems. The other sites had had one or more projects over the years, eleven of which are currently functioning. At two sites the project systems are not functioning, but improved systems built by private individuals are working and selling water to some community members.

The communities we visited had initiated the request for a project, sending a representative to the government to express their desire for an improved system. In most cases communities paid for their house connections. In a couple of cases the community contributed 30 % of capital costs, in another instance 20 %. Women in several communities provided food for the laborers. A few communities contributed labor and materials, and paid for the transportation of the pump to the village. At every site, the technology was based on a deep well (often the only option for an improved system in Yemen, perhaps explaining why projects had not given villagers a choice of technology). In most sites the community had to pay for house connections, in effect allowing them a choice of service level. Most communities have house connections, and villagers say this is the level of service they prefer. All villages were responsible for O & M, and were making monthly payments. Most villages had metering systems, though in a few places payment had been estimated based on the size of the house or family. Some communities have had outside assistance to help with major repairs or replacements.

Most systems have operators and often a manager and an accountant/cashier. The management or administrative system varies from place to place, and in some villages has changed over time. Some systems have committees formed of the *sheikh* and the village "wise-men". Others are/ have been managed by cooperatives and local councils. Some have no management structure, but are loosely watched over by the *sheikh*. In many areas these administrative systems have successfully managed facilities over a period of years. The system may break down when ten or so years have passed, and major repairs or replacements are needed that the community feels it cannot afford. In other cases,

conflicts between *sheihks* or among users have caused systems to break down, even though the systems may still be fairly young.

Before the improved systems, women and girls would go fetch water from traditional sources: cisterns, springs, and hand dug wells. They might make several trips a day, and these might take up to two to four hours per trip. They would carry the water on their heads or by donkey. They might also get water from agricultural wells. Water from these sources was free. Women often complained about the quantity and quality of water from traditional sources, and of the heavy work involved. The quantity was often low in the dry season, and the quality might be poor due to insects. When improved systems break down, they revert to these sources. They might also buy water from tankers or car vendors, although the poor could not afford these. The women were usually satisfied with their improved water systems, if these were still functioning regularly. Women are not on village committees or management systems, but say they were involved in decision-making about new systems. If systems are not working, they tell their husbands or fathers, who then tell the system managers.

Some houses have pour-flush latrines, which discharge into cess pits. Some of these cess pits overflow to the surface and are uncovered. Members of other households go outside, and throw household waste water onto the ground. Among those who did not have improved systems of sanitation, women often said they would like better systems (although they did not always say that they were willing to pay for these). The women were interested in the convenience and privacy of improved systems. The men often did not want improved systems, and if they did it was to provide privacy for the women.

The field mission provided evidence that communities have been and are able to manage their own water systems over significant periods of time. However, devaluation, inflation and the deteriorating economic climate, along with drastically-reduced income from overseas workers, have severely affected the financial capacities of communities to make major repairs and replacements. Some communities that did so several years ago say that they are not able to today. Some kind of credit mechanism may help communities cope with this situation. Disputes among villagers or between their leaders have also been a major cause of system breakdown. Providing for regular re-election of community management committees provides a way for villagers to remove leaders who are causing problems. If local councils and governorate-level councils are established, perhaps they could provide an institutional mechanism for conflict resolution, giving communities an additional way to resolve disputes.

Al Gabel

Before the Project

Before the project the community had a spring, from which a traditional distribution system had been created. This system was very old. Water was directed from it to the village and the fields. Women would collect water for domestic use from channels running near the houses. Water for household use was free; charges for agricultural use were based on the number of hours water was received from the system. The person who

counted the number of hours was paid by all the land owners. Laborers voluntarily maintained the banks of the system. The women said they used to slaughter a cow and read the Holy Quran every year to ask God for the spring to continue. The women said they like the quality of the water. The spring stopped suddenly; the women said it was because they stopped the custom of slaughtering the cow and reading the Holy Quran.

The Project

The community (mostly men) initiated the project after the spring stopped. The women told us that they were pleased with this initiative. The community paid for everything and made the decisions about technology and level of service. We were told that each family contributed what they could afford. Three wells fed the main reservoir. Two have broken down; only one is functioning. This one is a new, electrical one paid for the by Local Council, which considers its cost a debt the village must repay. In old houses house connections are only a pipe to the house tank and a rubber tube to the house. In new houses, the plumbing system consists of a separate down pipe to every sanitary unit (kitchen, toilet, etc.)

When the project started, the consumption fee was estimated by the elected village council. The council included the educated people in the valley in addition to the three wise men in the village. The three wise men received the household payments which varied according to the size of the house (about 800 YR per month for a big house with 10 persons or 300 - 500 a month for a small house).

Maintenance costs became high and the members of the Council had conflicts that the three wise men of the village could not solve. Some of the women told us that there were conflicts around payment: some people refused to pay for maintenance or for extensions of the system. So the sheiks handed over the project to their Local Council and the Local Council asked GAREW for help. The people now make their payments to a person in the village who uses the money for repairs (if one house fails to pay the bill, the operator cuts the supply to the whole street.) In addition to monthly bills, contributions are collected for major repairs, though the women complained that no receipts are given.

We asked the women to vote on their satisfaction with the system. All voted that the system is "good" (none voted "very good" and none voted "weak"). The reasons they gave were that the pressure is weak, and that water does not reach houses at high levels. The women complained about the quality of the water, saying that the quantity of deposits was large. They showed us a glass of water with salts suspended in it. They also said that the network only covers two thirds of the valley, and that pumping four hours a day is not enough. They said they would contribute to extend the system, but that those already connected to the system should pay less than those being newly connected.

Sanitation

Either several households share a cesspit, or else houses dispose directly onto the ground. The women complained that this system is not healthy, that the cesspits overflow and that the children walk through sewage on their way to school. They would like to have better sanitation and would be willing to contribute to the cost, within their capabilities. The men, however, did not want to pay more for an improved sanitation system.

Sustainability

This system is not financially sustainable at present. Local management failed. Technically the system is not being run and maintained properly. Environmentally, water quality is a problem, as is the current sanitation system.

Asnaf

Before the project

Prior to any projects, the women of Asnaf collected water from hand dug wells. Sometimes donkeys were used to transport the water, and later on some people bought water from tankers.

The Projects

Asnaf has had two projects. Both are now non-functional. One was a well built 18 years ago. It ceased functioning three years ago. Another well was built about eight years ago, and it broke down two years ago. The system included house connections and meters. Strong conflicts between the sheiks of the village have prevented repair of the system. The two sheiks seem to be using the water system as a way to bolster their own political control in the village; neither wants the other to get credit for fixing the system. In the meantime, the women are bringing water from agricultural wells. There are three of these, 270 - 300 meters deep.

The interview team did not stay long in this village, tensions were high, and certain villagers did not want anyone asking about the water situation. A couple of members of the team were able to quickly interview a few community members outside the village.

Wadi Asfan

Before the Project

The people of Wadi Asfan used to obtain their water from several shallow wells fed by rainwater. A few were very close to the village. This water was used both for household and agricultural purposes. Most of the people are farmers; both women and men work in the fields. When rainfall was low, the wells would be dry. The quality of the water was bad (the women mentioned bilharzia, worms, etc.) The villagers said they wanted a new system because of the bad quality, the hard work involved for women collecting from the shallow wells, and inadequate amounts of water when rainfall was low.

The Project

The people of Wadi Asfan initiated the idea for the project, making a request to the Government. The Government then selected the site from its list of priority applications. The women told us that they shared in the decision-making, and that they wanted house connections and meters. The project was financed and implemented by the Japanese 7 years ago, costing US$ 6.5 million. It was designed for the population at that time (today's population is about 3,000). The community did not contribute to the capital

costs of the main system, but most villagers did their own house connections, which have been equipped with meters. The well was drilled during the last quarter of 1988, and the civil works began in December of 1988. The depth of the well is 220 meters. Water for irrigation is now taken from five shallow wells (25 meters deep). The project well affected a couple of the shallow wells close to it.

People pay 25 YR/m3. Payments are collected by two elected members of the community. The money is used for paying the salaries of the operators in addition to O & M costs. Problems have occurred four times during the life of the project. If the operators could not fix the system, repairs were completed by technicians from outside the village. If the money needed for repairs exceeded the amount collected from the monthly bills, households were asked to contribute on a per capita basis to raise the amount needed.

The village wisemen (five men elected by the villagers) check the records kept by the operators. Any member of the community can also see the records. The system is well managed and maintained. Villagers mentioned that water quality was still something of a problem, due to salts in the water. This can also corrode pump parts.

Al Hosn al Abiad

Before the Project

The people used a shallow well (hand dug well with a bucket) and a cistern. Both would become dry if there was no rain. Sometimes insects were found in the water.

The Project

The people initiated the idea of the project, making their request to the Government. The women said they participated in the decision making by passing their opinions through their husbands, fathers, or brothers. The wisemen of the village contributed to the initial cost of the project by paying an amount on behalf of the villagers. The villagers then had to repay the wisemen, each household paying an equal share. Those who failed to pay are considered to be in debt to the wisemen.

The project began in 1985. The technology was chosen by the Government: the plan was to have a reservoir with main pipes and house connections. However, only the well was drilled, by workers from outside the village. The women provided them with food. The people selected the well operator. Each street takes turns paying his monthly salary, which is 800 YR. Since there is no distribution system, those who can afford it have the water transported to their houses by car vendors who charge from 350 - 550 depending on the distance (50 of this amount goes to the well owner for O&M costs). Average consumption is 2 m3 per week transported for 350-500 YR. Others have small tanks right next to the well. They pay 50 YR to fill their tanks, and the women carry water from these tanks to their homes. Major repairs are paid for by collecting contributions from the villagers.

Villagers said there is no community-level organization (council or committee) to work on the water problem. Voting: two of the women voted that the system was very good; two voted good; and 10 voted weak. Those who voted weak said they did so because they do not have house connections, and transporting the water is either expensive or exhausting.

They also said that although the quality of the water is good, the quantity is never enough. They women said they are ready to contribute for house connections, and will convince their husbands if needed. They know that the surrounding villages have house connections and that they are happy with this system. The villagers have asked the Government to complete the project, and they say they are ready to contribute to the cost.

Sanitation

The women told us that about one quarter of the houses have toilets. Those who do not go outside. Houses which have toilets and which are also near the main road have cesspits. Others deposit their waste water directly onto the ground.

Bait Maran

Before the Project

The village had two hand dug wells and a cistern a five minute walk away. The wells were dug by the men in the village. The women and girls would go three to five times a day to the wells to get water which would be carried on their heads or on their animals. These sources were owned by everyone and there was no charge for the water. The quality of the water from their existing shallow wells is good and they drink that water without boiling. Six other villages also used these wells. If the wells are dry, they also get water for 250 YR/ m3 from 5 km away, or for 440 YR/m3 from 15 km away.

If there were any problem with the wells, the men would speak about it at Friday prayers and agree on repairs. The seven villages would take turns paying for the repairs, which were carried out by men. The women told us that sometimes the repairs were undertaken quickly; other times they were not.

Income levels in this area are low. The main income-earning activities are rainfed agriculture and the selling of stones to Sanaa.

The Project

The women said they wanted the project so that they would be relieved of the burden of carrying water. The men elected one person to go to the Government and ask for a system. The Government chose the technology and level of service. If the people had had a choice, they would have chosen house connections.

The Government drilled the well about five years ago and provided pipes to point sources. The project was to have served about 5,500 people. However, the well collapsed when they started operating it because it had no casing. The community's contribution was a 150 m3 tank near the well. After the well collapsed, the community made efforts to follow-up with GAREW or to repair the system themselves. The women said that no one wanted to pay to fix it, nor to pay for regular O & M. The women were not sure if their families could contribute to O & M costs, as they are very poor. Some of the pipes have now been stolen. GAREW has tendered for a new well, although the men hinted at being able to undertake repair. The four women all voted that their current system was weak.

Sanitation

The women said that some houses in their villages have flush toilets or pour flush latrines, but those are only used by the sick and by ladies who have just given birth. The rest go outside to a small stone structure at the corner of their compound. Ladies go at night, while the men go any time. Children are trained to wait as long as possible. The women said they would like an improved sanitation system inside the house, for privacy. They would prefer a Western-style toilet. They said that some households would share in the costs of a new system, while others would not.

Beit al Gabbas

The people of this unserved area (population 500-600) have small holes carved in the rocks which function as rainwater collection systems. Each house has one of these holes and some have two. The water collected this way is usually enough for a month; after that the women walk four hours round trip to reach the nearest deep well (drilled by GAREW). The deep well operator fills two containers (50 litres) for 10 YR. Women carry the water by donkey or on their heads. Women in one family may take turns going, making up to four trips a day. There are some shallow wells a half hour walk away, but these are contaminated by insects. The only other source is a four hour walk away. Sometimes they buy water from those selling water by car, 800 YR for 1 1/2 m3. About half of the families own house tanks.

The interest in a water project was expressed by the whole village, men and women. The women say they have only had promises from the Government, no action. The women say that if a project is approved for their village, they were not sure if they could contribute much to capital costs but they definitely would contribute for operation and maintenance to the best of their abilities. The women said they would like house connections. A tender was announced in the newspaper on June 29, 1996 for 10 wells to be drilled in Arhab. The people here showed us the newspaper, and said they are hoping that one of these wells will be close to their village.

Sanitation

Very few houses have toilets, and those that do use them only for the sick and for women who have just given birth. The women find going outside embarrassing and would like to be able to have an indoor system. They said that cesspits would be difficult, as the land is rocky. They also said that they wanted improved water supplies before improved sanitation services.

Dawran

Before the Project

People used to buy water from car vendors which would take water from the surrounding wells and sell it for about 300 YR. If families did not buy water, the women walked for two hours to an old well to fill their containers and carry them on their heads back to the village.

The Projects

The original water supply system was constructed with Saudi financing prior to the earthquake (probably in the late 1970's). It served the village of Dawran and an adjacent smaller village through a well and pump in the wadi and a large stone reservoir on high ground. Although the reservoir immediately adjacent to the well was damaged by the earthquake (1984) the system continued to function afterwards. We estimated the depth of the well by the "stone drop" method to be about 80 meters.

Following the earthquake the RWA drilled a new well near the asphalt highway which was to serve the new site of the town (about 5 kilometres away from the original site). It was never used and now has been blocked with stones by villagers. Instead a decision was made to serve the new town site from the existing stone reservoir on the old system. However, the villagers refused to accept this system (built with USAID assistance) saying that they wanted their own reservoir. So in 1989 the RWS then constructed another pipeline to a German-supplied steel tank located on high ground in the town. The villagers also refused to accept this system because they did not like the steel reservoir (they said it was not bullet-proof). Then someone told them that the water in the original well had been polluted and thus was not longer safe for consumption. This well is now abandoned, along with the pump and the booster pump to the second system it fed.

People complain that contributions were collected from them several times by the Local Council in Dhamar for Government projects which never materialized. The district office of GAREW was asked by the Government to visit Dawran and to submit a proposal for solving the problem of connecting the private well of Al-Sanaani to the Government reservoir. The proposal was prepared, but no action taken.

In the meantime, eight years ago a rich man call Al-Sanaani dug a well 15 minutes' walk away from the village and wanted to extend pipes to the village but the village representative said no, saying that if he did this the Government would stop giving any aid for the project. The Government pipes were then stolen. We were told that some were used by the wealthy people to connect the Al-Sanaani well to the mosque and to a few points in the existing network laid by the Government. About half to three fourths of the houses now have house connections to this network, and water is pumped every other day. Those who have connections pay 200 -300 YR monthly as a salary for the two operators. The women said the quality of the water was very good. When there is a need for minor repairs, the people share the cost. However, the owner of this well provided a new pump at his own expense. This private system is well run, but little attention is paid to damage from pollution (e.g. the used oil from the diesel lies in a pool around the well).

Those who do not have house connections used to get water either from the well or from their neighbors who were connected. However, the well operators ordered those connected not to give water to others, saying that they would disconnect them for eight days. Those not connected can buy water from cars for 500 - 600 YR (200 YR/m3) or carry it from the mosque. All of the women interviewed (nine) voted that the system was weak, saying that it had been implemented in the wrong way. The connection to the reservoir should have been made so that the whole village could have been served.

Strong conflicts have occurred around the issues of water supply. We were told that seven people had been killed. Some think it was wrong to have connected to the network. The right thing, they say, would have been to connect to the reservoir so that everyone could have been served. The women think that if the connection to the reservoir is done, contributions will be asked only from those not yet connected, and these are mostly the poor.

Sanitation

Kitchen and liquid wastewater from washing is disposed directly onto the land. Houses have pour flush latrines, connected to septic tanks. The women said they wanted a better system, because although there are no major problems now, they are worried about problems in the future if the tanks get filled.

Al-Sayh

A village request for a water supply project resulted in a project supplied by the USAID/TransCentury, who chose the technology. It was built in 1973 and consisted of a well in the wadi which pumped to a stone reservoir on high ground above the village and to a ground level reservoir adjacent to the well. The lower-lying houses were served by a booster pump from the low-level reservoir via public watering points. The total population served was about 6,000. People contributed by supplying house connections, food and Qat for the workers, and by paying for the cost of transporting the pump to the village. Each house paid an O & M fee, based on the size of the house. The cost of minor repairs was shared equally by families.

The pump house burned down in 1983, and no one knew (or would say) who was responsible. Since the sheikh suspected that it was done deliberately, he said he did nothing about it for four years, as a way of punishing those responsible. Then he began petitioning GAREW (or its predecessors) for assistance. (However, in fact he only approached GAREW during the past year). The sheikh said that the private vendors in the area are opposed to repairing the system. An engineer came to make a survey to rehabilitate the old system and extend services to the areas where there were previously public watering points.

In the meantime, the private wells now serve the population of 12,000 for 200 - 400 YR/m3, (depending on the distance). The poor obtain water from agricultural wells or else from three wells in town where they can get it for free. People would like the project to function again, they would like to have house connections, but they want to limit their contributions to installing house connections where needed and to repairing minor damages in the network. There is also a cistern filled by rainwater. This is used for washing.

Sanitation

Ten to twelve houses have flush toilets, and their wastewater goes into cesspits. Those without toilets go outside and dispose of any household wastewater on land. The women said they would like a better system, but that they cannot contribute to this.

Markiz Utmah

Before the Project

Women would carry water by donkey or on their heads from springs an hour or a half hour away. The water was free. The quantity of water depended on the rainfall. When rainfall was low, the women would spend the night at the spring to ensure they would get water in the morning. Arguments would occur when the water supply was low. The women were very dissatisfied with this situation.

The Project

The women complained to the men, asking them to talk to the sheikh about the situation. The men spoke to the sheikh, and asked for a water project with house connections. The pump was installed by the Rural Water Supply Department of the Ministry in 1986. In 1992 the Dutch project added a 25m3 reservoir at the well with a booster pump at the well raising the water to a second reservoir of 50m3, again with a booster pump to raise the water to the highest reservoir, also 50 m3. The villagers paid for the house connections and meters, and provided building materials and salaries and food for the workers.

A committee of one wiseman from each of the sixteen villages served by the system has overseen the project since the beginning of the Dutch intervention. The population of this area is about 3,000. They decided to use meters with the house connections. The committee members ethe chairman and designated two operators (who were trained by GAREW in Sana'a), the cashier and the accountant/financial manager. Originally there were three operators, but one died. His salary is being paid to his widow, to help pay expenses related to his death. The Chairman makes all decisions related to expenditures, after consulting the operations team. Some male users interviewed mentioned that there is no mechanism for re-election of committee members.

There are 267 houses connected to the system with meters. Subscription is 10 YR per month. In 1995 the system's management Board proposed raising the tariff from 25 to 60 YR/m3, but protests forced it to settle for 35 YR/m3. Average monthly use ranges from three to six m3 per connection (higher in the winter than in the summer). In 1994 revenues were YR 354,000 and expenses were YR 295,000. Revenues for the second half of 1995 were YR 320,000. Of the 267 connected houses, only 150 pay on time. After three months, non-payers receive a warning, then they are cut off and a solutions is sought with the sheikh. Ultimately, all pay.

All cash, including the supplementary connection charges (YR 500 - 1,000) are kept in a cash box. The books and cash situation are audited each quarter by an audit team named by the committee. None of the administrative services pay (school, clinics, etc.), nor does the mosque. The system's management did not know how much this group consumes.

The system managers would like to increase the number of house connections and raise the tariff. Some of the unconnected are poor, and will continue to obtain water for free from cisterns and springs. Other houses are so remote that a connection becomes prohibitively expensive. Cross-subsidizing was rejected by the system management, seen as a potential source of trouble.

The women told us that if the cost of repairs cannot be covered by the monthly fees, the sheikh pays the amount required for repairs and then gets reimbursed by the villagers, who share equally (by family). If they notice any problems with the system, the women tell their husbands who then talk to the operator. If he cannot repair it, he tells the sheikh, who then arranges for repair.

If there were a catastrophe (e.g. the well runs dry), they would have to turn to the governorate or return to the Dutch project for help. When the pump failed recently, they called GAREW. Two GAREW technicians were repairing the pump while we were there (the casing had split at the highest stage) and doing maintenance at the same time. They are being paid directly by the users' association. Since the pump stopped one month ago, the women have gone back to the old source. The equipment in the pump house and booster station is clean and well-maintained.

The women all (16) voted that the system was very good, saying that it saves them from a lot of hard work. Some women mentioned that the water contains a lot of salt, but they still said the quality was generally acceptable. They asked for treatment to upgrade the quality of the water. Male consumers interviewed said they were satisfied with the current water system.

Sanitation

The group of leaders interviewed said that about 50 % of the homes have inside toilets, mostly Yemeni. Some also have soak pits. Most just discharge outside the house. Those who do not have toilets go outside. The leaders have notice an increase in the number of mosquitoes since water became more plentiful, but they do not consider it to be a problem. They saw no need to spend money on sanitation.

All the houses have toilets in the lower part of the village where we interviewed the women. Some houses have two. Wastewater is discharged either to cesspits or onto the ground. The cesspits are usually open holes in the ground, sometimes shared by two or more houses. Some cover the pits with corrugated zinc sheets or surround them with thorns. The women said that a deep pit can cost 15 - 20,000 YR. The women were unsatisfied with this method of waste disposal because of the mosquito problems it causes and also the pollution caused by disposing directly on land. They would like a better system and said they would be ready to contribute to its cost.

Sustainability

Generally, the system is functioning well. It is financially sustainable (over the life of the system) for basic O & M and minor repairs, but at the moment not for major repairs. However, as noted above, the management would like to increase the revenues. The project is technically well designed and well managed. They have even been repairing the meters. Administration of the project is very good. The books are well-kept, and the managers are thinking ahead in order to maintain financial viability. As noted above, some male users mentioned that there is currently no method for re-election of the management. The water quality is acceptable to the people, although the women did mention some problem with salt content.

Eryan

Before the Project

Both women and men would get water from rainfed cisterns at walking distances of a quarter or one half an hour away. A shallow well one hour's walk away was also used. Men helped women because women were veiled and could only go to the cisterns at sunset. The quantity of the water was never enough, because many villages depended on these sources. The women said the quality was not good: there were insects in the water.

The Project

Men and women in the villages shared in making the decision about having a water supply project, but the women said they were especially interested because they are the ones who are managing the water in the household. The system came into operation in 1981. The project was implemented by the Government, built by RWSD without any foreign assistance. The technology was not chosen by the people, but the people said they were satisfied because the project met their expectations of having house connections and meters. People contributed to the cost of the project by providing house connections and meters and by giving food to the workers.

Over 30 villages (10,000 out of 14,000 people) are served from a 5-stage system, through 613 connections. Total lift from the well to the 250 m^3 reservoir at the top of the system is nearly 1,000 m. The 50 m3 tanks at each booster level are situated away from any villages and hence cannot serve them. The management recognizes this problem. All the water has to be lifted to the highest point, even though this is not necessary for service. Pumping costs are extreme (4-6 barrels or 800-1200 liters/ day = about 10,000 YR/day). The original well drilled by RWSD collapsed in 1976. It was replaced by RWSD with another nearby in 1986. The system suffers from airlock. GAREW has supplied them with an air release valve but this does not help. The second booster pump is the main problem. It must be repaired at least once very 3 months, and they have replaced it completely 3 times. The managers realize that the problem may be the technical specs of the pump. It costs up to 50,000 YR to repair the access to the booster stations after a storm. They buy a new truck every 2 years, because they have to transport fuel daily over rough terrain. The management is wondering if it would not cost less to have electric-powered pumps.

The operators of the system were chosen by the village men. A monthly subscription fee of YR 75 (before YR 50) and a progressive tariff (YR 75-75-100-125-150 etc.) result in low average consumption (1 to 2 m3/ month). The bills are delivered by one of the operators. Collection of the money is usually on Fridays, at a special place in the market (a small shop).

The difficulty with the system is its high operational costs: diesel, oil, maintenance of roads to booster stations, salaries of 9 staff, project car, repair of under-specified pumps, etc. Financial management is adequate. Over the 14 months up to March '96, YR 1.23 M was collected (of the YR 1.48 M that was obligated) and expenditures were 1.35 M. The latter obviously does not include the incidental repairs that well-connected individuals apparently pay for. At present, GAREW assistance is sought for replacement of the 2nd booster pump and engine (at YR 4 M or so).

House tanks have capacities ranging from 1 - 2 m3. At the beginning of the project water was pumped three times a month. Pumped water was used mainly for drinking and cooking while water from the cisterns was used for other purposes such as watering the household garden and washing. About two years ago, pumping was reduced to two times a month. If the system is not working, people just pay the fixed fee of 75 YR, and many buy water from the car vendors for 1500 YR. The vendors sell small amounts, not enough to fill the house tank, just enough to last about one week. Drinking water is shared with the less-advantaged.

In the last two years damages often occurred in the pumps and the supply of water decreased to once every two to three months. The last stoppage was for four months. No contributions were collected from the people to repair the damage, and there is no local council or village committee to follow the work of the operators who are very slow to repair any damage and to maintain the network.

Voting on satisfaction with the system: 2 women voted very good; 2 good; 3 weak. Those who voted "very good" said that without the project, they would not have any water to drink. Those voting "good" complained of insufficient quantity of water supplied and of the slow action for repairs. They said that maintenance is poor and irregular. Those voting "weak" said that four months is a long time to stay without water from the system, especially for those who have a small house tank. One male user met by the interview team said that if they could not have the water system, he believed the people would leave the higher villages, as there is no economic or other advantage to their being there.

Sanitation

Old houses have dry latrines. All new houses have modern or traditional flush toilets. Wastewater is discharged to covered cesspits or it can be carried by a pipe to the side of the mountain. Water for washing is thrown onto the ground. The women say they are satisfied with this method of sanitation.

Sustainability

The system is financially viable over the life of the system for basic O & M, but no longer for major repairs. Because of devaluation, replacing equipment, etc. is much more expensive than in the first years of the project. Technically the system functions and can continue to do so, but as noted above the system was not well-designed. This has lead to more expensive running and repair costs. The system management/operators have kept the system running, although as stated above some consumers complain about the length of time needed for repairs, and that there is no local council or committee overseeing the operators.

Al- Kanani

Before the Project

The village depended on a nearby spring which filled with rain water and would dry up when there was no rain. When the spring was dry women would walk for three hours (round trip) to bring water from cisterns. No shallow wells existed and agriculture depended on rain. Women used to go twice a day to the water source and bring quantities

of water that were hardly enough. The water was of low quality, with many insects in it, so they would strain it with their scarves. The women complained of head aches and eye strain from carrying the water. There was no fee for the water.

The Project

This village is served by the same improved system as Eryan's. Men's and women's interest in the water project was high. The wise men of the village spoke to an influential village man, who used to be in the military, and asked him to follow up with the authorities. This man, Ahmed al-Sharafi, went to the Government, and in 1981 Kuwait sponsored a project. The project served a big number of villages, mostly in the highlands. It included a five-stage booster pump which pumped water to an overhead reservoir which then distributed water by gravity to the villages. Villagers contributed by paying for house connections and meters and by providing food for the workers. The workers were paid by the project and were from outside the village. The men in the village helped the workers.

Water was available all the time; houses did not have tanks. Meters were shared between several houses in some cases. The number of employees in the project is ten, and the manager lives in Sana'a to follow up the project with GAREW. There is a special car for the project. The manager stated that the fixed monthly expenditures of the project range from 97 -100,000 YR. About ten percent of the houses are not connected with meters. One of the operators sent the bills and collected the fees. The operators changed quite often. Billing rates changes according to the quantity consumed. There was a fixed charge of 75 YR. Then: the first unit was 50 YR, second unit 75 YR, third unit 150 YR, fourth unit 200 YR. More than 4 units cost 200 YR/ unit. The project has 63 metres. The money collected from the bills is used to pay the operators and to buy the diesel to operate the pump. Operators were chosen by the villagers living close to the pumps. The technology was chosen by the project engineers. The women said the villagers approved of the house connections and meters; it is the system they prefer. The complain of the recurrent stoppages of the system due to pump failure, especially during the last two years. During this time the system often has operated for one month and then been out of order for four to 6 months. Villagers have not been asked to contribute to the cost of repairs. When the system is out of order, the people only pay the fixed fee of 75 YR. Water is then collected from the old sources, and they also sometimes buy from car vendors for 1000 - 1200 YR. They share this water, because they have no house tanks to store it in.

The villagers think that the project is of great importance to them and without it they would have left this area. They mentioned that the frequent stoppages of the supply have made their lives very difficult. Voting: 5 women voted very good; 2 good; and none weak. They said they voted this way because the quality of the water from the project is very good.

Sanitation

The quantity of waste water is usually very small and it is disposed either to small cess pits or to a pipe taking it to the mountain edge. Water used for washing is usually brought from the nearby cisterns and is disposed of on the ground. Nearly half of the houses in the village have toilets, the rest go outside.

Sumarah

Before the Project

The women would get water from a spring or cisterns that depended on rain. Car vendors also sold water for 125 YR. The project was initiated by the Government and the sheiks three years ago. The people contributed one third of the capital cost. Women told us that some of them sold their cows in order to contribute the required amount of 20 - 30,000 YR.

The well was drilled and a reservoir and point source were constructed. The project was meant to provide drinking water to 100 villages. House connections were provided by the people. House tanks ranged in size from 1 - 3 m3. At the beginning, the water was pumped three times a month. This was later reduced to twice a month. Bills were estimated by the sheiks. The cost was 100 YR/m3. The project operated for five months, pumping twice a month to three villages. The first failure of the pump occurred after five months and the system was out of operation for one year. Then the sheiks shared the cost of a new pump and then started irrigating their qat from the well. They sold water to the village for 5000 YR every time villagers wanted their tanks filled, and farmers paid 6000 YR to irrigate their qat. The three sheiks had conflicts concerning the irrigation, and the pump failed again one and a half years ago. It has not been functioning since. The women have gone back to collecting water from the spring and to buying from car vendors (400 YR/m). Men interviewed by the team said they felt cheated, having contributed towards construction to a system now taken over by the sheiks. The women were also unhappy with the situation.

Sanitation

Waste water is disposed of into cesspits or into pipes carrying sewage down the mountain.

Al-Sinah

Before the Project

Women would walk for three to four hours (round trip) to the nearest well. They preferred to walk at night to the wells to avoid the crowds there during the day. They would carry candles with them and would sometimes ask men to accompany them with their rifles to protect them from wild animals. The nearest sources of water were two hand dug wells. The first was about ten meters deep and buckets were used to obtain the water. The second was very shallow. In winter, the two wells had very little water, and in many instances women returned with empty containers or with water of low quality (bad odor, bugs, algae). They would strain the water. Agriculture was dependent on rainwater.

The Project

The project was initiated in 1980 by Mr. Abdu Nagi Mugbel and Mr. Mohammed Abdul Aziz who were heading the Local Cooperative Council. The Cooperative covers a sub-district and serves 64 villages and about 10,000 people. It was established several years

before the water project and covers other sectors. Its first project was a health center. Members pay fixed monthly fees. Some make additional, voluntary contributions. Some fines collected by the sub-district also go to the co-op. For example, a special fee is paid by a man when he marries, as well as a fine if he falsely declares the bride price.

For the water project, one of the leaders of the Cooperative went to Saudi Arabia and the Gulf countries to obtain contributions from wealthy villagers who had emigrated. The other remained and supervised implementation. People in the village also gave contributions. In each family, the husband gave 50 YR, wives 50 YR from their household budgets, and children 10 YR. The project was financed by the World Bank, and included two wells, a central reservoir and a distribution system. The community paid the costs of the wells up front, but were reimbursed when construction was completed. The community also contributed about 20 % of the cost of the system in-kind.

The scheme started without meters. Households were charged 20 to 30 YR per month, depending on the size of the household. In 1984 house connections and meters were introduced for those who had toilets in their homes and who could afford to pay for house connections. Those who could not afford house connections were given standpipes with meters. There are a total of 1350 metered connections. The Cooperative administration and the mosque are not charged. Meters were introduced so that more revenue could be raised to pay for the operators' salaries, O & M, vehicles for the project, etc. A few stand posts were allocated to the poor (old, orphans, disabled), free of charge. If they take more than three m3 per month, they must pay. Average consumption is 5 m3 per month. The present tariff structure: there is a fixed fee of 50 YR per month. The first four m3 cost 200 YR. After that, five to ten m3 cost 30 YR each, more than ten m3 costs 80 YR per unit. The management is looking at a change which would eliminate the regressive tariff for the second trench. Instead, the first four m3 would cost 450 YR (including the fixed fee), and all subsequent consumption would be 100 YR/m3.

The level of service was chosen by Mr. Abdu Nagi, who wanted his village to have the best level of service. The men of the village were paid from the project fund for their labor during construction. The women cooked food for the workers.

In 1986 the original wells dried up. Technical advice was sought from GAREW, and a team of engineers investigated the area to advise the community about promising locations for drilling new wells. The Local Cooperative Council bought the land where the wells were to be drilled, and two new wells were drilled and a new reservoir constructed. Within 60 days the new wells were connected to the old distribution system. This was followed by disputes from a nearby village (Al-Suwa) who claimed that they owned the land. The men of Al-Sinah spent the night guarding the wells with their machine guns. It was finally proved that the people of Al-Suwa had no right to the land. In 1989 GAREW provided 2 vertical pumps, and in 1993 GAREW increased the capacity of the system by adding another reservoir and pipeline. They now pump a total of 15 hours a day. All of this is being done by a new pump which the Council just purchased at a cost of $14,000. The other pump has failed. They do not have the funds to replace it. Previous savings kept in the bank have been depleted, used for recent repairs. When the wells were drilled, the water was tested and the quality found to be acceptable. They have not tested it since.

They have bought land as an investment and also to use, if needed, for building wells in the future.

The Cooperative has a total salaried staff of 17, covering all activities (electricity, school construction, etc., not including teachers and nurses). One technician oversees all works, including the water system. Two operators work the system. Other functions (finance, accounting, stores, guards, etc. are shared). Another operator is dedicated to the electricity system.

The Local Cooperative Council chose qualified members of the community to operate and maintain the system, keep the accounts, etc. The tariff changes according to the rate of inflation. The system has suffered from many failures in the last few years, and the quality of the water has deteriorated due to a high salt content. Voting on satisfaction with the system: five women voted very good; none good; none weak. They said they voted this way because the water is available and easily accessible (except during times of breakdown).

The Local Cooperative Council is elected from the General Assembly of the villages, and seven members are elected to be on the Executive Board. Mr. Abdu Nagi has been the head of the Committee for the last eighteen years. Elections are carried out every four years. Only the men vote. Members of the Cooperative have annual meetings where any tariff changes must be approved. The Cooperative has started providing technical assistance to others. As a result, two other systems have been rehabilitated. The women say the system is successful because the people have not had conflicts among themselves. If anyone who has been elected causes problems, they are not elected again. They respect their leadership and feel their leaders' efforts are genuine.

Sanitation

Waste water from houses with toilets is disposed of into cesspits. Those with no toilets dispose on land.

Sustainability

This system is functioning very well. Financially it is sustainable over the short-term, for basic O & M. They do not have funds at the moment for major repairs or replacements, but they could if they raise the tariff as planned. The administration of the system is excellent. Technically the system is well-designed and well-maintained.

Al Nashmah

Before the Project

The women used to bring water from a nearby village called Al-Maki, spending two to three hours round trip. The wells were shallow and water was collected by lowering buckets. The wells were hand-dug a long time ago and water collected from them was free. In dry periods the quality of the water was extremely bad, and they had to buy water from car vendors for 1100 YR/2m3. This amount lasted one week for large families.

The Project

The project was initiated by the people in the village and the men carried the request to the authorities. The project was supposed to provide connections from two wells drilled in 1983/4 (one by RWSD financed by Iraqi aid, one by GAREW) to reservoirs that can distribute water through main pipes to point sources in eleven or more surrounding villages. Ten years passed from when the wells were drilled to when the system was began functioning (1995). GAREW returned to construct the balance of the system, (booster pump to high level reservoir, and distribution system serving about 2/3 of the population). There are 830 connections to date. New connections are still being made, but 470 families cannot be reached without an extension to the distribution system. The reservoirs were built four years ago. The cost of the system was 12 million YR.

Some villagers said that the project was not implemented according to the design and that many villages were not connected. GAREW has said they will extend the scheme to a number of villages not yet served (470 households still depend on dug wells and water vendors who charge 400 to 700 YR/m3) and drill another deep well (as one of the present two only produces water for one hour a day). This is in the 1996 plan for the GAREW Taiz branch. The cost of the project to date is about YR 12 million, all financed by the Iraqi or Yemeni government. The villagers pay for their house connections at a cost of about YR 6,000 each. Villagers said that they had known they would have to pay O & M costs, but had not realized that these would be so high. The women said they are satisfied with the system. They feel that the quality of the water is good. They also said that now they can sleep longer; before they had to go to collect water.

The water was pumped to the village one and a half years ago to a point source from which house connections and meters were installed by people who could afford them. Out of 35 houses in the village where users were interviewed, only four do not have house connections and meters. At the beginning, those with no connections had keys to point sources, but later these keys were taken away from them in order to persuade them to make house connections.

The minimum charge is 180 YR/month for anything up to three m3. From three to ten m3, water costs 70 YR/m3. People pay a YR 500 deposit as well as a one-time contribution of 500 to 2500 YR. Ninety customers are considered poor and are exempted from payment for the first three m3. The revenues from bills are used as salaries for operators, O & M, etc. Revenues are about YR 190,000 monthly in summer, YR 240,000 in winter. Costs are about YR 150,000 in summer, YR 180,000 in winter. The scheme has generated a YR 600,000 surplus over its first year, which is kept in a Taiz bank. The management plans to buy stand-by pumps to supplement the investment by GAREW.

The original two wells are still functioning, but one is running dry and cannot be pumped for more than an hour. The wells pump to two main reservoirs on high ground on the two sides of the wadi. The system is well adapted to the site. They pump for 9 hours a day in winter, 7 in summer (when people use other sources based on rain water collection).

A cooperative initiated and managed the project originally. This was replaced by an LCCD which did not function. Today the system is managed by a nine person Board. his Board deals with all development projects (health units, schools, water points, etc.),

Elections are held every four years, under the supervision of the Ministries of Social Affairs and Local Administration. Board members meet monthly to review costs, establish budgets, etc. The Board chooses the operators and supervises their work.

Sanitation

In the village where users were interviewed, most of the houses have flush toilets. A few old houses do not. Waste water is discharged to cesspits. The women said they are satisfied with this system of sanitation. In the project area as a whole, less than 50 % of the houses have toilets.

Sustainability

The system is functioning, although as noted above it took several years for this to happen. It is financially sustainable at the moment. Technically it is well-designed and well-maintained. The Board is administering the project well.

Hadad /al-Rajaiya

Before the Project

Women used to bring water from a cistern fifteen minutes' walk away or from a spring an hour away. These two sources did not provide enough water and the quality was extremely poor. The women interviewed told us that the water was infected with Bilharzia and insects and was turbid. Animals used to drink from the cistern. During the rainy season in the summer, women would make five to six trips to the cistern. In winter the cistern would be empty, and they would walk to the spring. The cistern is still maintained by the six surrounding villages. They do maintenance (clean it and cement the bottom) in the winter, when it is dry. The sheikh arranges for this. The last time was this past February, and families each contributed 50 YR.

The Projects

Originally there were two project areas, Hadad and Al-Rajaiya. Water projects began in the early 1980's, initiated by local committees. In Al-Rajaiya some problems emerged within the community, and management was handed over to the Local Council, which successfully managed the project for several years. In 1991 the people decided to combine into one project area. There are six deep wells, two drilled by the villagers, two by GAREW, and two by the Southern Highlands project. Villagers contributed two reservoirs, one 500m3 and the other 250 m3. Thirty-eight villages are covered. The villagers and their committees jointly decided to have meters. The total number of houses with connections is: 1,500. The total population 18,100.

All the villages have been divided into three parts, and each part receives water three to five time a week. The unit price for the first two units is 90 YR. There is a minimum charge of 180 YR. After two units, the price is 30 YR per unit. Average consumption is 2.25 m3; the percentage of those consuming more than the minimum of two m3 is very small. The mosque receives water free of charge. About 400 houses have not connected to the project. They still receive water from springs and hand dug wells.

There are ten people working in the project now. The running costs are from 135,000 to 140,000 YR (per month), not including maintenance costs. Monthly income ranges between 180,000 and 300,000 YR. The high level of iron in the water damages the pipes and pumps, resulting in heavy maintenance tasks and frequent replacement of equipment. This problem and the unwillingness of the people to pay more for water has led to a deficit in the project's budget. To date, this has been covered by the head of the project committee, who paid 600,000 YR recently.

Some of the women we met with did not have a clear idea about when the project started. The houses in the area of the village we were in were new, and these women seemed to have returned after the Gulf War. So perhaps they were not in the village when the project started. Some old women said that the project was initiated by an educated son of one of the strong sheiks of the village, Mr. Mohammed Ali Al-Haj, who was the first to approach the Government for education and water projects for the village. Wells were drilled, the reservoir constructed, and the main pipes laid. The villagers were asked to provide house connections and meters. The technology and level of service were chosen by Mr. Mohammed Ali Al-Haj who also chose the project manager, Mr. Kasem Seif. The manager employs the operators and meter readers and receives the payments from the villagers.

The women did not know who fixed the rates. Village men usually go to the manager when there are problems in the water supply system. These have been more frequent since 1990. The villagers are not asked to contribute any extras for repairs. Small repairs are made within ten to fourteen days, while bigger ones can take from three to four months. When the system is down, the women collect water from the old sources or from car vendors (four barrels for 600 YR). Women were satisfied with the water quality, and were not aware that the water contained high levels of iron (reaching 3 mg/l). Voting: six women voted very good, none voted good or weak. They said they voted this way because the project saves them a lot of time and effort and provides them with clean water.

Sanitation

All houses have flush toilets. Some houses (those on the edge of the village) dispose of the waste water into pipes which carry it to the side of the mountain. Houses in the middle of the village cannot do this, and they build cesspits. Some houses cannot do this however, as their land is too rocky. Some of those with cesspits complained that theirs overflowed. Those who cannot build cess pits said they would like to have a better system of sanitation, but were concerned about the cost as only a few houses have this problem, and so there would not be many to share in the costs of an improved system.

Sustainability

This system is functioning. According to the project's administration, it is not financially sustainable (they have a budget deficit and villagers have been unwilling to pay more for water). Technically the system has problems because of the high iron content (the iron damaging the pipes and pumps). This has also lead to higher O & M costs. The administration and maintenance of the system has been good. What is needed is a redesign of the wells and treatment for the water.

Bani-Afif

The village is in an area of four villages unserved by an improved water supply system (population approximately 5,000). The only source of water is several shallow wells that have water in the summer (during the rainy season) but are dry or almost dry in the winter. The women estimated that the number of houses in each village is 15 and that more than one family lived in the same house. Some of the surrounding villages have been involved in water projects, but these four villages were not included.

In the winter the women walk for three hours round trip to buy water from the owner of a tank who sells a jerrycan of water for 5 YR or they can have all the water in the tank for 600 YR. The owner of that tank fills his tank for 100 Yr from car vessels or from shallow wells and the quality of that water is also very poor.

Many poor people in the village get their water in winter from wadis, and in summer the water from the shallow wells is provided free by the private owners. Some of the villagers have dug shallow wells in their land, but the water is available in the summer only and the quality is very poor. The majority, however, do not have their own shallow wells. Because of the shortage of water in winter, they take baths only once a month.

When asked about the level of service they would choose for a water system, they said they would have chosen house connections. But they then said they could not contribute in the cost of the project if it was high, because they are very poor. They said the sheik lives very far away and is not able to do anything to help them. They are all farmers, and the level of education is low. The most educated are the school teachers.

Sanitation

Some houses have flush toilets and the rest go outside. Waste water is discharged outside of the homes. The women said they were not satisfied with this method of sanitation because it causes problems of mosquitoes, flies and other insects. They would like to have a better system of sanitation, but the women said they could not afford it. The women said they have no local council or cooperative which could help them obtain a project for their village.

Agan-Al-Shureija

Before the Project

Women used to bring water from the nearby wadi in which water never stopped even during the winter months. It would take half an hour to collect water from the wadi. The water was free but of poor quality (turbid and with insects). The women would strain the water using their scarves. On the few occasions when the wadi did not have enough water, the women would dig small holes in the wadi to find water. The people of the village never bought water.

The Project

The project started in 1971. It was initiated by one of the villagers who was a member of the former Socialist Party. It was implemented by the Chinese. The well was drilled and a

pipe placed to the reservoir. A monthly fee of one dinar (approx. 25 YR) was collected from every house. The women would go to the reservoir to fill their containers. The well pumped water from the reservoir from morning until noon. The women told us that engineers from Al-Musaimmer used to come regularly to clean the reservoir and add some chemicals (disinfectants). Before the 1994 war, a project had planned to connect four other villages to the system, but the pipes were stolen during the war.

During the 1994 war, the villagers fled to another location. On their return, they continued to pay the 20 YR monthly fee for about five months. They were then asked to pay a monthly fee of 100 YR to cover the costs of the diesel. The amount collected often does not cover the diesel for the whole month. When this happens collect water from the wadi until diesel is bought for the next month.

The villagers choose the well operator by consensus. They have had a series of operators. The current one was chosen last year. Contributions of 100 YR were collected from each family last year to help pay for repairs. About 15 - 17 houses were exempted from these payments because they are poor. The operator decides who should be exempt. Project staff are on the payroll of the Highway authority. The nearby military camp has also contributed to repairs (the last one cost YR 15,000). The Highway authority truck occasionally brings water to surrounding, unserved villages. The system's main pipe and reservoir are in bad condition. Both the Highway Authority and the military camp use water from the system.

There are about 80 houses in the village (population approximately 800). They do not have any kind of committee to organize them. Their sheik, the women told us, does not help them solve their problems, but sometimes complicates them.

Voting on satisfaction with the system: the women all voted weak (13 votes). They said that this was because the water from the reservoir is dirty; they even have dead lizards in it. They also complained that since the 1994 war the reservoir is not cleaned and chemicals are not added as they were before. The villagers gave the operator contributions of 10 YR per family to hire someone to clean the reservoir, but the person hired failed to do the job properly. The women asked to have the reservoir cleaned regularly and disinfected or else to be able to use the new reservoir build in 1982. The male consumers interviewed asked that GAREW come regularly to treat the reservoir. The villagers have failed to organize themselves even for providing a cover for their reservoir.

Sanitation

The houses have no toilets; villagers go outside to defecate. Women said they find this very embarrassing and told us they would be ready to give contributions for a better sanitation system.

Al-Ruga'a

Before the Project

The women and girls used a shallow well that was dug 40 years ago (the depth of the well is 13.5 meters). Depending on where one lived in the village, the trip to the well was from

ten minutes to half an hour round trip. The women and girls would make three to four trips a day. Some young women drowned while trying to collect water from the well, which was 75 feet deep. The quality of the water was very poor. They did not pay for the water when they collected it, but the villagers would collect contributions if the well needed repairs. Contributions varied according to the financial capability of the villagers. Laborers were hired from outside. The well was also used by some nomads, who also collected water free of charge.

The Project

The village has two leaders who are the sons of old sheiks. The population is approximately 2,000 people, 180 households. The project was initiated by the village men and women, who took their request to the Government. The Government provided a pump in 1980 - 81, and the villagers contributed by providing a tank to store the water and to be used as a point source. The villagers charged about 20 YR to cover the cost of diesel and repairs. This amount was enough at that time, the villagers said, as everything was cheap then. The salary of the operators was paid by the Government.

As the village expanded, the tank could not provide the villagers with enough water to meet their demands. Women used to fight for water at the tank. Two and a half years ago, a family descended from the sheiks donated one of their agricultural wells to be used as a source of water for the village. The men of the village made a request to the Governor, and a donor provided a pump for this well. The family who owns the well donated two reservoirs and the Governor provided the main pipes. The Local Council helped construct a third reservoir and pipes were laid (2/3 by Government, 1/3 by community). The villagers contributed labor. Another donor provided the stand posts. The monthly fee for water is 120 YR and the fee for electricity is 300 YR. The water fee is used for buying diesel and for paying the operators' salaries. An attempt to raise the tariff failed.

The women told us that the village has a council agreed upon by the village men. The monthly payment for water is given to the council, which pays the operators, and pays for the fuel, keeping the rest for maintenance. The two operators were chosen by the people. One of them is stationed by the pump, while the other looks after the reservoir and pipes. So far all repairs have been paid for out of the monthly fee. Sometimes there is not enough diesel to last for the month, and then pumping stops, but only for a few days. The wealthy of the village also help with costs. The shiekh said that he would like to turn the management of the system over to a government authority.

The system has not yet had a major failure, but the women said if it did, they would not be able to cover the repair costs but would go to the Governor asking for help.

The Governor attended the opening ceremony for the system and mentioned that what was implemented was only the first stage of the project. He promised a second stage, which would involve house connections. He did not say who would pay for them. The women said that if they were asked to pay for house connections, only a few people would be able to afford it. The rest would just continue to collect water from the point sources. Those who do get house connections would have to use water sparingly, the women said, as the village is poor and people cannot afford to pay much for water. Some male users

said they would be willing to pay for meters (YR 5000), if the Government would provide the pipes for house connections. Voting: six women voted very good, four good, and none weak. Those who voted very good said that the project saved them a lot of time and effort and provided them with a safe source of good quality water with adequate quantity. Those who voted good said they wanted house connections. They also mentioned that they wanted more electricity to be provided (they currently have it from 6 pm to 12 pm).

Sanitation

All houses have areas for bathing, but only ten have flush toilets. The rest of the village defecates on land. There is a part of the village (on the outskirts) designated for women, and another part set aside for men. Women go to this place in the daytime. However, sometimes the men go to the women's area by mistake, causing embarrassment for the women. The houses having flush toilets discharge of their waste water on the land. Those who do not have flush toilets said they could not afford to install them. The women said that they are not satisfied with this sanitation system and would like an improved one, but that the obstacle is financial.

Sustainability

The system is not financially sustainable. The villagers said they would not be able to pay for major repairs, but would refer to the authorities. Currently, the monthly fees to not always permit the purchase of enough diesel for continuous monthly operation. The system was not technically well-designed, although it does function. It is not well-protected in case of floods in the wadi. The administration cannot be called sustainable, as the sheikh said that he wanted to turn management over to the authorities. Environmentally the system has problems, as there is pollution from animals in the wadi.

ANNEX 6.2

The General Authority For Rural Electricity And Water
Department of Bilateral Projects
List of Donor-Assisted Projects

No.	Name of Donor	Project Title	Cost of the Project	Type of Assistance	Project Period	Population Served
1	Qatar Gov	60 pumps	$585,269	Grant	1974-1975	25,000
2	Abu Dabi	300 pumps	$2,630,425	Grant	1975-1976	100,000
3	Iraq Gov	80 water projects	$5,480,502	Grant	1977-1980	70,000
4	Japan Gov	38 water projects	$14,341,298	Loan	1978-1980	133,800
5	Japan Gov	3 water projects	$2,192,021	Grant No. 1	1982-1983	10,000
6	Japan Gov	2 water projects	$2,192,021	Grant No. 2	1984-1985	7,000
7	Japan Gov	5 water projects	$3,288,031	Grant No. 3	1985-1986	15,000
8	Japan Gov	4 water projects	$2,300,000	Grant No. 4 Phase 1	1987-1988	17,000
9	Japan Gov	4 well drilling	$2,300,000	Grant No. 4, Phase 2	1988-1989	35,000
10	Japan Gov	2 water projects	$7,118, 518	Grant No. 4 Phase 3	1989-1990	---
11	Japan Gov	2 water projects	$4,500,000	Grant No. 5 Phase 1	1991-1992	10,000
12	Japan Gov	1 water project	$4,500,000	Grant No. 5 Phase 2	1993-1994	80,000
13	Japan Gov.	2 water projects	$5,100,000	Grant No. 5 Phase 3	1995-1996	9,000
14	Dutch Gov.	31 water projects	11,800,000 Dutch Guilders	Grant Nos. 1&2	1983-1989	50,000
15	Dutch Gov.	20 water projects	8,000,000 Guilders	Grant No. 3	1988-1990	30,000

ANNEX 6.2 (cont.)

No.	Name of Donor	Project Title	Cost of the Project	Type of Assistance	Project Period	Population Served
16	Dutch Gov.	34 water projects	13,250,000 Guilders	Grant No. 4	1991-1996	47,000
17	Dutch Gov.	50 water projects	14,980,000 Guilders	Grant No. 5	1996-2000	48,000
18	USAID	158 water projects	$28,231,039	Grant Nos. 1&2	1980-1988	130,382
19	USAID	46 water projects	35,000,000 YR	Grant (PL 480)	1992-1997	68,000
20	Saudi Arabia	36 water projects	68,940,000 YR	Grant No. 1	1979-1981	75,000
21	Saudi Arabia	Drilling of 50 wells	---	Grant No. 2	1983-1986	---
22	Saudi Arabia	17 water projects	22,000,000 YR	Grant No. 2, Phase 1	1987-1988	34,850
23	Saudi Arabia	19 water projects	146,000,000 YR	Grant No. 2 Phase 2	1989-1993	60,000
24	Arab Fund	13 water projects	$2, 746, 602	Loan	1983-1990	32,000
25	UNICEF (PHC)	14 water projects	$3,043,840	Grant/ Equip.	1985-1988	11,800
26	UNICEF	100 water projects	$3,300,000	Grant/ Equip.	1994-1998	150,000
27	Switzerland	6 water projects	$785,401	Grant	1983-1984	6,500
28	Germany	44 water projects	21,147,348 YR	Grant/ Equip.	1984-1988	72,168
29	Germany	18 sites, well drilling	8,000,000 DM	Grant	1993-1994	90,000
30	UNCDF	48 water projects	---	Grant/ Equip.	1980-1989	141,896

This information has been provided by Mr. Fawzi Al-Khirbash, GAREW

ANNEX 7.1

EXTRACT FROM EL SHAMSY REPORT ON ESTABLISHMENT OF GAREW JANUARY, 1993

4. INSTITUTIONAL ARRANGEMENTS

4.1 Institutional Set-up

4.1.1 Agencies Involved in Rural Water

In principle, the Directorate General of the Rural Water Supply (RWSD) had the primary responsibility of extending water supply in the rural areas of the country to population conglomerations of up to 20 0000 persons. However, agencies such as the powerful Ministry of Local Administration (Directorate General of General Services) was authorized to respond to requests by the Local Development Councils (LDC's), agencies of local rural communities, for water projects. The Department of Rural Water of the National Water and Sewerage Authority (NWSA) was also involved in rural water supplies and through the Directorate General of Engineering of the branch office of NWSA

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in Aden Governorate. Other agencies were also involved such as the Department of rural Electrification of the General Authority for Electricity, and the Directorates General of the Governorates which had similar activities. Furthermore, some local communities implement their own water supply projects with their own resources without reference to any of the previously mentioned government agencies.

4.1.2 Legislation For Rural Water Supply

On 10 November 1992 Presidential Decree No (230) was issued (see summary translation in Annex 15) establishing a new General Authority for Rural Electricity and Water (GAREW), and abolishing the RWSD and all above rural water activities by other government agencies. the Authority for Development of rural Areas, under the tutelage of the Ministry of Agriculture and Water Resources is the only government agency exempt under the provisions of the Decree. the reasons for this exemption are not clear.

The importance of this Decree is twofold: it streamlined rural water activities under one Authority rather than diffusing them under so many government agencies; and it strengthened the modest capabilities of the old RWSD under a new strong and viable agency with better managerial and administrative abilities and easier access to national planners and decision makers

It is redundant to go into detail of activities of agencies now defunct under Decree No (230). Functions of the new water sector of GAREW and defined in the same Decree under Article (4), the second part. It is to be noted that the definition of rural now means population conglomerations of up to 30 0000 persons. The overall responsibilities of the new Authority encompass the following:

1) Water exploration, abstraction and storage for drinking and domestic purposes
2) Studies, technical designs and implementation of rural water supply projects either directly or by the private or the cooperative sector
3) Monitoring and protecting rural water sources
4) Carrying out necessary water installations
5) Guarding against environmental pollution and preserving public health through proper controls and systems.
6) Training and rehabilitating those working in the water sector in rural areas with regard to operation and maintenance.
7) Providing technical opinion and advise to private and cooperative sectors and to the rural population in charge of implementing, operating and maintaining their own projects.

4.1.3 Present Constraints

In 1976, the total number of RWSD staff was less than 10 including one hydrogeologist. Sixteen years later (1992), the number has swelled to over 190 including 38 professional engineers of various disciplines. Despite this large infusion of staff, there remained managerial, administrative, organizational and financial constraints which have been plaguing the Department's performance for many years. The following is a summary of these constraints:

1) There is no clear organization of the RWSD. Any organization chart that exists is the personal effort of some individuals.

2) Job descriptions do not exist. It is assumed that the title of a staff member (such as a "Hydrogeologist") is sufficient to define what he is supposed to do.

3) Obligations, responsibilities, authorities, and accountabilities of staff members are not in any way elucidated. They are literally "lost". Few even choose not to come to the office, and they are not missed.

4) Management is generally detached from first line and lower staff members Communications between them hardly exist. In other words, effective direction and briefing on policies, targets, objectives, strategies and other necessary information are lacking.

5) Approved budget figures, by national planners, are determined without consideration for RWSD real impelling needs. The approved yearly budget is simply estimated on the basis of the previous year's budget plus perhaps a maximum of 10%. In real terms and considering high inflation, the yearly budgets may be actually declining with a continuous demand for increased work load To illustrate, the yearly budgets were: 90 Million.YR for each of the years 1988, 1989, 1990 and 1991, then was raised to 158 Million Y.R. in 1992 noting the continuous increase in inflation.

6) Despite an approved budget, when funds are needed for normal activities, RWSD has to make a request each time to its Ministry of Electricity and Water, then to the Ministry of Planning, Ministry of Finance (for approval), then to the Yemeni Central Bank and the approval is then sent back to the Ministry of Electricity and Water informing them of the availability of requested funds. This tortuous routine is depriving the Director General of any authority and is delaying necessary payments for a very long time. For example, staff members who have to travel may not receive their travel allowances (in arrears) for as long as sometimes one year with a negative effect on morale and performance.

7) In some cases, the right man is not put in the right job. Few may be under qualified For example, decisions on selection of pumps offered in tenders may be made by persons not qualified or technical and often against the technical opinion of those who know Secrecy of tenders is flounted and details of offers are known to outside suppliers who may raise their prices (if theirs are relatively low) for improper profit. Offers are sometimes accepted even if they are not according to specifications. Some sections are understaffed; others may have staff members sitting idle.

8) Information action is collected in a primitive way Although there is an old computer, it is obsolete with a very limited capacity. There exists no proper data bank and no system analysis has been carried out to determine information needs of the RWSD.

9) Salary levels are continuously being eroded by high inflation and steep rise in cost of living. Employees of the same professional level in some other government agencies are receiving more than twice the salaries of their equals in RWSD. This, also is having a demoralizing effect.

10) There exist regulations, but are not enforced to control indiscriminate drilling and abuse of water extraction all over the country with very serious consequences of fast dwindling groundwater resources. Wells are gradually drying up. In the coastal areas, wells as far as 30 km from the coast are becoming saline. It is estimated that abstraction is roughly twice recharge rates. The groundwater level in the Sanaa basin has receded from about 60 m in 1976 to more than 400 m in 1992.

11) Offices are extremely overcrowded and not conducive to work. People (employes or rural visitors) loiter around growing from one office to the other without purpose causing continuous disturbance. The office building was built without any regard to its functionality or appropriateness for those who have to use it.

12) With the exception of two 24-seat buses for employees, there is one solitary vehicle for the use of field visits for the whole Department. Staff who are obliged to go to the field depend entirely on the benevolence of contractors; a situation which may compromise their professional integrity.

13) There is total lack of stationary and office equipment.

14) There are 4 photocopiers all of which are out of commission. No various efforts are made to repair them on the basis that no funds are available. When necessary, use is made of the services of an enterprising individual who set up a photocopying service just outside the Department at 3 YR per page, usually paid by the employees themselves.

15) The Department's workshop, which was previously very useful and active, was permanently closed 6 years ago. It was stated that its management was poor. It is currently used as a store. All repairs to vehicles or diesel engines (sometimes simply discarded) are now done outside at a very high cost. Sixteen out of the original 24 workshop employees are still on the Department's payroll.

16) Pumps for rural projects are installed by outside contractors at a cost of 25-30,000 Riyals per unit. Qualified Department's technical staff could perform the same function in some situations (not all) for probably less than half the cost.

17) Some of the many drilling companies which sprung up in the last 15 years or so may not have the required skilled personnel or know-how necessary for the task. This is causing many problems for the Department when drilling does not produce water or is faulty.

18) There is lack of equipment and aerial photographs, or geologic or hydrogeologic maps which enable locating suitable drilling sites. There is a need for initiating comprehensive hydrogeological studies to cover all Yemen. What is available are preliminary studies of numerous basins but they are not of sufficient detail.

19) There are no regular training and rehabilitation programmes for existing staff, either technical, administrative of financial to upgrade their job skills.

20) Other constraints also exist and pertain to difficulties which confront the RWSD in drilling operations vis-a-vis the rural communities when no water could be found. Drilling rigs may be confiscated until a solution is found by the Department.

4.1.4 Proposed New Organization of the Authority

Under the new Authority, there are two Vice Chairmen, one for electricity; the other for the rural water sector. The Vice Chairman for water will now be managing a renovated (previous) Rural Water Supply Department with an elevated status (6 Directorate Generals in lieu of one) and expanded responsibilities. The Finance & Administration for the whole authority will be under the direct supervision of the Chairman with functional lines to the two Vice Chairmen. The proposed organization is shown in Figure 1. However, the final set-up may be slightly modified.

The following is a summary of the proposed new organization:

a) A new Research unit is planned to be attached to the Vice Chairman to oversee technology development, appropriate technology, alternative methods, standards and all matters related to the improvement of the technical and financial performance of the Authority.

b) Drilling unit: will carry out field surveys, project preparation (for drilling contractors), supervision of drilling and testing operations and follow up. IN addition, there is a small laboratory for chemical analysis of water expected to be expanded to also include bacteriological analysis of water and of soil and radioactivity. A new function is added to this unit, namely, environmental health to ensure that the quality of water delivered to rural consumers will be safe and that environmental health considerations will be taken into account. Presently, the unit consists of 33 employees including 3 hydrogelogists, 13 geologists, 2 hydrologists, 1 geophysicist, 7 drilling technicians and few laboratory technicians.

c) Government project unit: carries out complete survey, design and supervision of construction of rural water projects financed by the government. There are currently 29 employees of this unit including 12 civil engineers, 8 surveyors, 3 pipe fitters and one electrician.

d) Bilateral cooperation unit: this important unit coordinates all rural water supply projects implemented by bilateral agencies including, but not limited to Dutch, German Saudi, Japanese, USAID, and UNICEF. Thee are 8 employees including 1 hydrologist and 4 civil engineers.

e) The Mechanical unit: Supervises installation of pumping units and maintenance work and the workshops. A new responsibility is added to this unit, namely occupational safety, especially for those working in the field under difficult conditions Training programmes for the operators of rural water supplies were trained by this unit, but this activity may now be shifted to the new Training and Rehabilitation unit (see item g below). There are 37 employees in this unit mostly mechanics, electricians and pipe fitters.

Proposed rganization of GAREW (Water S(:or)

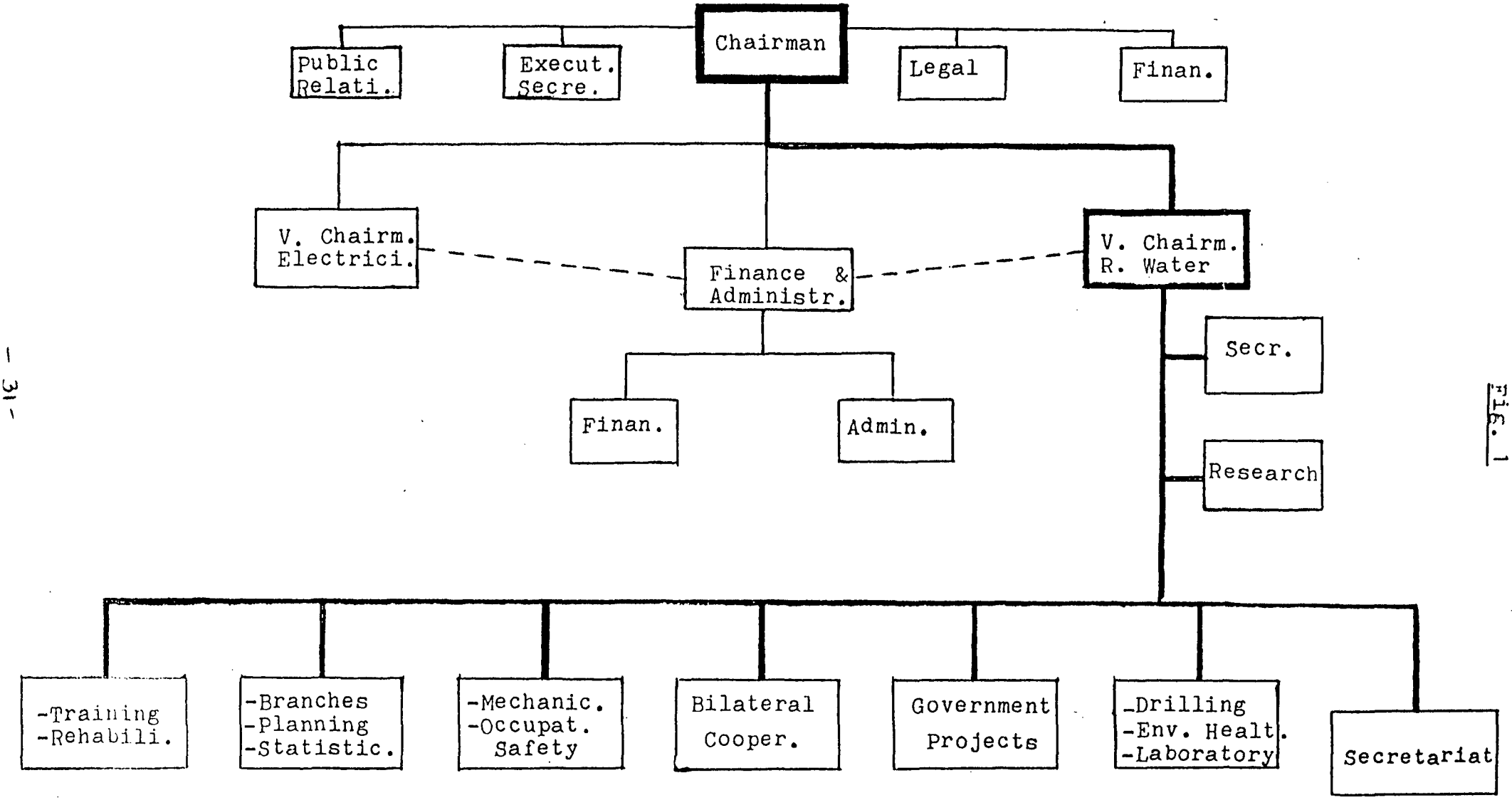

Fig. 1

f) Branches, Planning and Statistics unit: is a new unit that will essentially supervise branch offices when they are established (there is only one in Dhamar to coordinate with the Dutch project). This unit will also be responsible for data collection and for planning and reporting regularly on rural water activities.

g) Training unit: This is also a new unit which will be devoted entirely for manpower development on a planned and continuous basis.

4.2 Manpower Development Requirements

4.2.1 Inventory of existing staff

Annex 16 is an inventory of the complete staff, the total number of which is reported to be 194, classified, in general, as follows:

39 Technical staff, university graduates including 14 civil engineers; 16 geologists, hydrologist, hydrogeologist, geophysicist and 3 science (for the laboratory).

11 University graduates in other disciplines such as commence, law and art

61 Technicians: mechanics, surveyors, well-drillers. pipe fitters, workshop technicians, electrical and laboratory technicians

83 Administrative , finance, stories, secretariat, public relations and general staff

Out of the above, one has retired, another is deceased, and the third moved to the Aden Water Corporation.

More specific distribution oft the technical staff was shown in Section 4.1.4

4.2.2 Representative Staff Profiles

Detailed staff profiles do not exist. However, the following are limited profiles for some selected staff members:

1) The type two (the Vice-Chairman and the Adviser to the Chairman) are reported to be (no data available) secondary school graduates with very long practical experience. Three decades ago, there were no university graduates, and a secondary school certificate was the highest one can get.

2) Mr Abdallah Badr: Director General, Drilling Dept. Masters Degree in Hydrogeology (1976) from Yugoslavia, appointed in 1977.

3) All geologists were stated to have a Bachelor's Degree in Science (University of graduation not mentioned). graduated between 1978 (Director General of Bilateral Cooperation Dept.)and 1990 and appointed the same year of graduation or a year later.

g) Laboratory Technician
h) Director of Finance
i) Research Engineer
j) Training Officer
k) Economist/Financial Analyst

The job descriptions of those 11 posts are shown in Annexes 17-A to K. They were selected for one or more of the following reasons:

1) They generally cover many of the existing similar posts either directly (the person in charge), or by extension to those immediately below him in the same department but the job description need only slight modification.

2) They include new added functions as a result of GAREW's mandate such as the Research Engineer, the Training officer, and added functions to the Drilling, Environmental Health and Laboratory, and the Mechanical and Occupational Safety.

3) They demonstrate differences between some of the existing and the desired qualifications for that post.

It is understandable that in the late fifties and early sixties, a secondary school certificate was the highest that could be obtained then. It cannot be denied, either, that 25 to 30 years of experience can often be valuable and relevant to GAREW's functions. Rehabilitation programmes could enhance their skills until replaced by attrition or retirement.

A review of the list of existing staff (Annex 16) would reveal those posts that qualifications of whose occupiers may not fit what is desired. For many years, to obtain any university degree meant a guaranteed promotion to the level of university graduates in the bureaucratic hierarchy without regard to whether this university degree is relevant degree in Law but appointed as the Deputy Director General of the Mechanical Department. Over the years, some attempts were made to offset this drawback by providing additional courses and fellowships to those persons in the fields of their present posts. It is roughly estimated that 22% of all posts are occupied by persons who may, in some cases, have practical experience, but do not have the academic qualifications commensurate with their jobs.

4.2.5 Manpower Needs, Year By Year, For All Categories

To assess manpower needs, the following is assumed:

a) One branch office will be established first in Sanaa in 1993, and three more in 1994. The primary function of each branch office is to carry out design of rural water supply schemes in its specified region and reduce the load on HQ by decentralizing this function, currently carried out by the head office. The proposed initial structure of each branch is shown in the center of Fig. 2. Additional three branch offices may be further established in 1994 and their manpower needs are included in the 1994 projections, In addition to the original 4 branch offices, three more are proposed for 1994 (See Fig 3).

b) If the proposed 4 Maintenance Centers and the 4 Training Centers are to be established, they could be integrated with four branch offices. In this case, the complete set up is as fully shown in Fig 2. Their manpower needs are included in 1993/1994 (Fig 3).

c) Future conditions may require expansion of the branch offices to meet increasing work load This possible expansion is difficult to predict precisely at this stage, but allowance is made for it in 1995 and 1998.

d) When branch offices are established, some of the existing excess staff members at the main office would be relocated to fill required posts in the branches. This is taken into account in estimating manpower needs (Fig 3).

e) If GAREW decides to increase the number of branch offices to more than 7, staff will have to be increased accordingly.

f) Allowance is made to increase slightly branch office staff in1996 and beyond for those posts whose work load is expected to increase.

4.2.6 Existing In-Country Training Facilities

At present, Yemen offers a maltitude of training possibilities in a wide range of fields including management, administration, finance, environmental health, maintenance and repair (motor car engines), computer skills, professional engineering and science, and others

The tables shown in Annex 22 for in-country training facilities have been extracted from Reference 19 which, in turn, obtained this information from the following two references:

a) Agro Vision Holland/DHV/Euroconsult. Inventory of Training Institutes in the Republic of Yemen. Rada Water Supply and Sanitation Project and the Dhamar Health Improvement and Waste Disposal Project. Agro Vision: Sanaa, Yemen, 1990. (numbered 13 on the list of references in the above Ref. No 19)

b) Haskoning Royal Dutch Consulting Engineers and Architects. Education, Training and Applied Research on the Environment: Universities of Sanaa and Aden: Haskoning: Sanaa, Yemen, May 1992 (numbered 14 on the list of references in the above Ref. No 19)

Although titled "Solid Waste Management Training Opportunities in the Republic of Yemen, the information presented applies to other fields as well.

Proposed Organization of a Branch Office

(Only for four Branches. For others, delete Maintenance and Training Centres, as necessary)

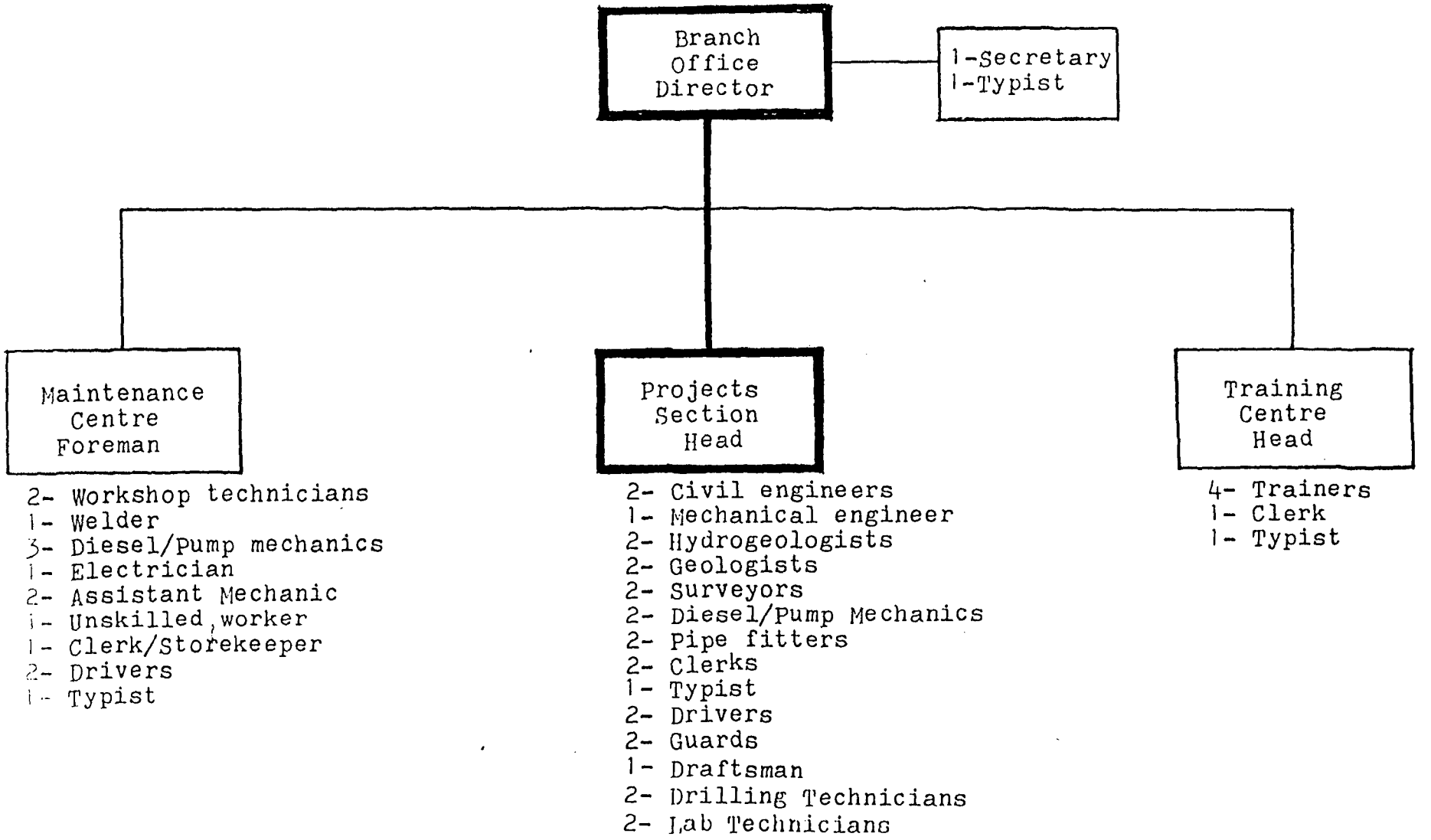

Fig. 2

Fig. 3

Manpower Needs

	Category	Exist. 93 HQ	93 a+c	94 b+c	95 d	96	97	Total New in 5 years	Remarks
1	Hydrogeologist	3	(2)	6	6	7	-	19	
2	Geologist	16	(2)	(6)	(6)	-	-	-	
3	Hydrologist	3	(1)	-	-	-	-	-	
4	Geophysicist	1	-	-	-	-	-	-	
5	Drilling Technic.	7	(2)	(5)+1	6	7	-	14	
6	Lab. Technician.	3	(3)	6	6	-	-	12	
7	Civil/San. Eng.	14	(2)	(6)	(6)	7	-	7	
8	Mech. Engineer	1	1	3	3	-	-	7	
9	Surveyor	8	(2)	(6)	6	7	-	13	
10	Draftsman	1	(1)	3	3	-	-	6	
11	Diesel/Pump Mech.	29	(5)	(15)	(6)	(3)+4	-	4	
12	Assist. Mechanic	-	2	6	4	-	-	12	For mainter
13	Electrician	3	(1)	(2)+1	-	4	-	5	
14	Pipe fitter	3	(2)	(1)+5	6	7	-	18	
15	Workshop Technic.	9	(6)	-	-	-	-	-	For Mainten.
16	Welder	1	(1)	3	-	-	-	3	
17	Unskilled Labour	-	1	3	-	-	-	4	
18	Clerk	13	(4)	12	3	7	-	22	
19	Typist	2	3	9	3	7		22	
20	Research Engineer	-	1	-	-	-	-	1	
21	Training Officer	-	1	1	-	-	-	2	
22	Economist/Fin. An.	-	1	-	-	-	-	1	
23	Secretary	4	1	3	3	-	-	7	
24	Trainer	-	4	12	-	-	-	16	
25	Driver	12	(4)	(4)+8	6	7	-	21	

Explanatory Notes:

(1) Numbers in paranthesis are staff members to be relocated from HQ
(2) The following assumptions were made:
    a = Sana'a branch office to be established in 1993
    b = Three additional branches to be established in 1994
    c = The four maintenance centres and the four proposed training centres would be attached to the above 4 branch offices
    d = Another 3 new branch offices to be established in 1995
(3) If the time schedule for establishment of branch offices is changed, or if more branch offices are to be established, the numbers or timing on the above list of manpower needs should, accordingly, be changed
(4) Personnel, finance, public relations and general staff are not included in the above list as they need thorough review and analysis.
(5) Manpower needs shown on the list may be modified according to GAREW's actual needs when the new organization is finalized.
(6) Some minor inaccuracies might appear on the list as the information provided was not fully clear with regard to some posts
(7) No allowance is made for attrition as it is assumed that replacements could be easily done.

Fig.3 (Cont'd)

Manpower Needs

	Category	98	99	2000	01	02	Total New in 10 Years	Remarks
1	Hydrogeologist	7	-	7	-	-	33	
2	Geologist	-	-	-	-	-	-	
3	Hydrologist	-	-	-	-	-	-	
4	Geophysicist	-	-	-	-	-	-	
5	Drilling Technic.	7	-	-	-	-	21	
6	Lab. Technician	-	7	-	-	-	19	
7	Civil/San. Eng.	7	-	-	-	-	14	
8	Mech. Engineer	7	-	-	-	-	14	
9	Surveyor	7	-	7	-	-	27	
10	Draftsman	-	-	-	-	-	6	
11	Diesel/Pump Mech.	-	7	-	-	-	11	
12	Assist. Mechanic	7	-	-	-	-	19	For Mainten.
13	Electrician	-	7	-	7	-	19	Increased Electrifi.
14	Pipe fitter	7	-	-	-	-	25	
15	Workshop Technic.	6	-	-	-	-	6	
16	Welder	3	-	-	-	-	6	
17	Unskilled Labour	3	-	-	-	-	7	
18	Clerk	-	-	-	-	-	22	
19	Typist	-	-	-	-	-	22	
20	Research Engineer	-	-	-	-	-	1	
21	Training Officer	-	-	-	-	-	2	
22	Economist/Fin. An.	-	-	-	-	-	1	
23	Secretary	-	-	-	-	-	7	
24	Trainer	-	-	-	-	-	16	
25	Driver	-	7	-	-	-	28	

4.2.7 Future Manpower Training Needs

An examination of manpower training needs must be viewed in the context of a comprehensive human resources development (HRD) policy and plan; HRD being defined to include the supervision and skill developed of every level of staff serving the rural water supply sector. GAREW should plan for its long-term sectoral manpower needs, but should also take immediate steps to meet current priorities, including allocation of funds for more staff and better training.

Every level of staff means: managerial, administrative, secretarial and clerical, financial as well as all technical disciplines whose appropriate skills are indispensable to the efficient and smooth operation of the agency's activities.

It is difficult at this stage of transformation from RWSD to GAREW to detail every training need. However, it is possible to outline, in broad terms, the areas which need development and strengthening. The new training officer to be appointed by GAREW soon could develop a comprehensive training plan based on the following outline proposal.

1) Management: There is an urgent need to improve management skills including: problem identification, monitoring, evaluation, planning, budgeting, etc.

Candidates	Directors and Deputy Directors or higher whose age is not more than 55 years.
Course	1 year course at the National Institute for Administration Science, or a shorter and more intensive course elsewhere.
Qualifications	At least a university degree in Business Administration, accounting, engineering or economics.

2) Administration & Finance: Organization, personnel, office administration, accounting, stores, secretarial and clerical skills, statistics, bookkeeping, etc.

Candidates	Secondary school graduates from administration and finance whose age is not more than 55 years.
Course	9 months or longer at the National Institute for Administration Science in Sanaa or the Institute for Administrative Science in Aden.

Qualifications — Secondary school graduates

3) Computer skills: Word processing (English and Arabic), spreadsheet and data base, word perfect, etc.

Candidates — Engineers, personnel and finance staff, and those who will operate GAREW's information system.

Course — 3 to 11 weeks at

a) Sanaa International School, or
b) Computer World, Sanaa (in conjunction with Sanaa International School
c) Yemen Computer Company Ltd, Sanaa
d) Other suitable institutions

Qualifications — English and Arabic speaking

4) Sanitary Engineering GAREW should strengthen its sanitary engineering aspects as it is required to take necessary measures to protect water sources and prevent pollution. A limited number of staff ought to be trained in sanitary engineering.

Candidates — Civil engineers and other similar disciplines

Course — 11 months post-graduate course or a 10 weeks course at Delft University, or similar courses at the High Institute of Public Health, Alexandria, or in any other suitable institution in the region.

Qualifications — University degree in an engineering discipline. Good knowledge of English if Delft University is considered.

5) Diesel Engines/Pump Technology: If trainers are to be developed in this field, an in-country training should be provided to upgrade existing skills.

Candidates — Existing diesel and pump mechanics who have a good record

Course — At least a 4-week in-country extensive course carefully prepared by engine and pump manufacturers who would provide teachers and develop the course to produce trainers.

Qualifications — A diploma from a recognized vocational or technical institute. At least 5 year practical experience. A working knowledge of English is desirable.

6) Occupational Safety: This is another area that concerns GAREW's new activities.

Candidates	To be selected from mechanical engineers, drilling technicians, diesel/pump mechanics, workshop technicians
Course	A 3-months course or shorter, if available, in-country or in region
Qualifications	Persons involved in work with occupational hazards.

7) GAREW's staff should attend in-country training seminars, workshops, meetings which are sponsored by the Environmental Protection Council, Ministry of Housing and Urban Planning or other national agencies if they are of interest to GAREW's activities and functions.

8) Some on-the-job training in design of projects was provided by WHO's Project YEM/CWS/001.

4.3 Operation and Maintenance

4.3.1 Existing Situation and Present Problems

Once a rural water supply project is completed, it is handed over to the local community which becomes responsible for its operation and maintenance. In turn, the community selects someone to operate the project who normally lacks adequate knowledge of proper operation and maintenance of his diesel-pumping unit. This had resulted in many unfortunate cases of engine breakdowns for simple reasons that could have been easily averted had the operators had basic knowledge of proper maintenance. Once an engine breaks down, usually in less than a year of operation, it is discarded, and a new engine is purchased at a substantial capital cost.

Recognizing that such failures not only involve large capital losses, but may also force many communities to revert to the use of their old distant and polluted water sources, the previous Rural Water Supply Department (now GAREW) initiated in 1978, with support from the then UNDP/WHO project, a training programme for the operators of rural water supply schemes. The intention was to develop a 3-class programme where Class A would be a basic course, then Class B and Class C would be progressively more advanced to upgrade trainees skills who would be recalled for further training.

Due to financial constraints, the programme was halted in 1983 by which time 162 rural water supply operators had undergone Class A training. The programme was resumed in 1985 with USAID assistance, and a further 220 operators were trained by 1987. (Ref 14) The RWSD supported the continuation of training of these

operators, and up to 612 have so far been trained. The total number of completed schemes is at present about 2100. This means that only 30% of the operators have been trained. With increasing construction of rural water schemes, the existing huge backlog is even expected to increase if the rate of training continues at its present average level of about 50 operators per year.

4.3.2 Current Training Programme

As indicated above, an average number of 50 rural water supply operators are being trained each year by the department. The trainees undergo a 3-week basic training course based on the original 1978 course. However, the department simply does not have the capacity either to increase the number of trainees or to retrain those operators to upgrade their skills as originally intended.

Instruction is primarily carried out by the Mechanical Department but this arrangement is severely restricting development of a proper training programme capable of handling expanding training needs, because of the Departments occupation with its heavy load. WHO's Project YEM/CWS/001 was providing technical support for the current training programme.

The Department has a good training center specially equipped for instruction and demonstration of diesel engines and pumps. Instruction material for the basic course is available in Arabic, but not in sufficient quantities. Necessary tool for dismantling and assembly of the equipment are not available. Field visits necessary for practical training are difficult to make as there is a severe shortage of department vehicles. Furthermore, there are financial constraints with respect to per diem payments to trainees, amounting to 150 YR per person per day.

4.3.3. Desired Training Programme and Needs

A good training framework must include the following important elements:

a) A permanent experienced manpower development officer devoting his total time to assessing the continuous training needs, and for developing and monitoring training programmes suited to functional present and future needs. This slot is now available under GAREW's new institutional structure.

b) In the area of operation and maintenance, training sufficient trainers to be entirely devoted to the training of the operators of rural water supply schemes on an all-year round basis.

c) Sufficient training centers conceniently demographically located in the country and adequately equipped to provide satisfactory training facilities

d) Instruction material carefully designed and prepared to suit local conditions in Yemen.

e) Logistical support to provide required means of transportation for trainees local movement including necessary field visits.

f) Firm commitment and adequate financial resources and institutional support for a long-term human resources development programme.

Translating the above into specific actions, the following is proposed:

a) Appointment by GAREW of a qualified training officer (TO) as soon as possible. This person should be, among other things, familiar with engineering work related to water supplies. He will immediately set about assessing and prepared comprehensive training programmes for GARW's staff (water sector). This would include a programme for the training of the operators of rural water supply schemes, and it will include the following actions.

b) Training of Trainers: It is essential to establish a qualified cadre of trainers who will be involved on a full time basis in the training programme for the operators of rural water supply projects. Money spent on this training programme will be well spent as operation and maintenance of these schemes improve and financial losses due to inefficient operation are significantly reduced.

It is assumed that four training centers, including the existing one in Sana'a will be established and available. Each will be initially staffed with 4 fully qualified trainers. Thus, the total number of required trainers will be 16.

Each potential trainer will be carefully selected to fulfil the following requirements:

- He will be a graduate of a recognized vocational or an equivalent technical institute in diesel mechanics

- He will have had at least 5 years practical experience on diesel engines.

- He will also have a good working knowledge of pumps, especially deep well and horizontal pumps, and the installation of deep well pumping units and small diesel generating sets.

The selected to-be trainers will undergo a 4-week intensive training course to make them qualified trainers. The course will review Class A, Class B, and Class C contents (or the equivalent) in detail, and will include a lecture on training methods and techniques. During this course, each candidate will be required to act as a trainer.

The teachers of this course should include one or two foreign expert technicians of equipment predominantly used in Yemen.

They will be invited to lecture on specialized subjects such as: complete overhauling of diesel engines, dismantling and assembly of deep well and horizontal pumps, diagnosing equipment problems and how to correct them, and proper ways of record keeping of operation and maintenance activities. Subjects will also include the use of tools, precision gauges and advanced instruments.

3) It was previously proposed to the TWSD, and it is again supported, that there is a need to establish four permanent training/maintenance centers in the country strategically located. There is already one training center in the vicinity of GAREW which needs to be upgraded For training purposes, each of these centers should be equipped with at least the following:

a) A cross section model of a small diesel engine
b) A small diesel engine, 20 to 40 HP, which can be operated for training (the exhaust pipe should be led to the outside of the building)
c) A cross section of a vertical turbine pump similar to a deep well pump commonly used in Yemen
d) Model of a submersible motor
e) Individual part of an engine and a pump
f) Illustrative wall charts, drawings, cross sections, etc.
g) A complete set of tools, gauges and necessary instruments for maintenance and repair work.

4) Development of complete instruction material, in Arabic, to cover the three A,B, and C courses (or their equivalent) from the basic course to the most advanced. The courses should be carefully designed and prepared to suit conditions in Yemen.

5) From above Section 4.3.1, it was estimated that about 1500 operators still need to be given basic training in addition to an annual new schemes of between 50 and 80. This large backlog could be almost eliminated if, starting from 1984, the four training centers are ready and the 16 trainers are in place The situation would then be as follows:

- Assume 2 trainers for each 4-week course
- 11 months training each year; i.e. 11-4 week courses
- Number of manageable trainees per course: average 12

Total number of trainees per each training center per year = 11x 12 = 132
Total number of trainees for the 4 training centers would then be = 4 x 132 -= 528 say 500

If the above conditions are fulfilled, the backlog could be cleared in less than 4 years. It would, obviously, take longer if less training facilities are available. After clearing the backlog, the total number of trainees per year would decrease to perhaps less than 100. In this case, some of those already trained could be recalled for advanced training.

6) It is essential that at least one medium size bus of a capacity of 20 persons be made available, on a continuous basis, to each training center

4.3.2 Maintenance Requirements

In the absence of adequate and reliable repair and maintenance facilities for the rural water supply schemes, it is cost-effective for GAREW to set up its own maintenance programme as follows:

a) A stationary well equipped workshop would be attached to each of the 4 training centers A good maintenance workshop had existed in Sanaa, also in the vicinity of the training center, but was closed down 6 years ago for no apparent reason. It could be easily re-activated, and the existing workshop personnel re-assigned to it, and those who had left be replaced.

b) Each stationary maintenance workshop would essentially include at least: a center lathe, a radial drill (1 inch), an electric welding machine, an oxy-acetylene welding machine, an overhead crane of suitable capacity, a-one ton fork lift, and a complete set of tools, gauges and necessary instruments. All heavy and major maintenance work would be carried out by these central workshops.

c) Minor, on-site repairs would be performed by mobile units, one per center, consisting of a 4-wheel drive vehicle with 5-ton crane and a complete set of tools. Two persons would go out on these assignments, a qualified technician and assistant, or two technicians as the situation may require.

d) Rural communities would be charged a reasonable fee for repairs estimated on a capital and operational costs recovery basis. The communities would most likely accept this arrangement rather than seek a more expensive alternative; resort to the supplier in the city for assistance, or replace an engine, for example.

e) Manpower needs for these 4 central maintenance centers (to which mobile staff would be attached) are as follows, but could be expanded as necessary: For each center (see section 4.2.5 for a modified set-up)

1 Director of the training and maintenance center
1 Foreman for maintenance
2 Workshop technicians (for lathe, drill, etc.)
1 Welder
3 Diesel/pump mechanics (one always in center)
1 Electrician
2 Assistant mechanics
1 Unskilled worker
1 Administrative clerk/store keeper
2 Drivers
2 Guards
1 Typist

4.4 Logistic Support

4.4.1 Existing Situation

Since the implementation of rural water supply projects had been totally entrusted to local contractors, the agency is no longer involved in storing and transporting major equipment and material for its projects. At present, the main stores in Sanaa have only few pumps, spare parts for drilling rigs and piping left from previous operations when the Department was implementing its own rural water schemes. In view of the soaring costs of these projects now carried out by contractors, GAREW may consider procuring directly from outside suppliers such components as pumping units, piping and other accessories, thus reducing costs considerably since the agency is exempt from custom duties. Contractors would use GAREW's equipment and supply local material to implement the projects. In this case, the central stores would play an important part in he supply of major project components.

GAREW has no vehicles for field work or local errands and its staff are forced to depend on the benevolence of the contractors or the villagers for transportation with associated ethical problems. There is also a pronounced lack of engineering equipment, material, stationary and office equipment necessary for GAREW's office and field operations.

4.4.2 Further Logistic Support Needs

The following is considered to be equipment that should be made available for proper logistic support:

a) At least four, 4-wheel drive suitable vehicles with drivers for the main office, and two of the same type of vehicles, also with drivers, for each branch office that will be established.

b) Hydrogeological equipment as follows:

1- One - well testing unit with total heads of 450 and 300 ,
2- Four - water levels (measuring tapes)
3- Eight - altimeters
4- Eight - compasses (Broundy)
5- Six - EC Meters (Electric Conductivity)
6- Eight - geological hammers
7- Five - binoculars
8- Three - stereoscopes
9- Eight - hand-lenses, geologic
10 One-geophysical equipment including:
   (a) Well logging
   (b) Surface resistivity
11 Necessary aerial photographs, geologic and hydrogeologic maps to enable locating suitable drilling sites.

(c) The following office equipment is included in logistic support because it is painfully lacking

1. There are 4 photocopiers which have been out of order for a long time. They should be repaired as soon as possible.

2. Necessary stationary and office equipment for design and drafting work.

ANNEX 7.2

GAREW POLICIES (DISCUSSION PAPER)

- Responsibilities of GAREW and those of other interveners in rural water supply

GAREW is the only Government institution responsible for rural water supply (and sanitation).
This does not mean that GAREW alone is responsible for rural water supply (and sanitation).
In the GAREW's Policy, the responsibilities in this sector are divided between the Government (GAREW) and the benefitting Communities.
Tasks and Costs of rural water supply construction, operation and maintenance are divided between GAREW and the communities as follows:

Tasks of GAREW:

- Planning of the country-wide construction programme of new water supply systems; this includes selection of project areas.
- Assist communities to determine its needs concerning of water supply and sanitation
  Hydrological survey and selection of water source or drilling site if no source is available
- Preparation of tender documents for drilling
- Select the drilling contractor
- Supervise drilling.
- Do survey / topographical survey and selection of location of project components and lay out of the system. This includes estimation of the population to be met in the community.
  - Design of the system: Pumping main, tank(s), break-pressure tank(s), distribution pipes, standposts and specification of required pump, engine(s) and generator(s)
  - Give directions to the community about necessary measures in the field of waste and waste water disposal.
  - Preparation of tender documents for the construction of the system including pump(s), engine(s) and generator(s).
- Selection of contractor(s)
- Supervision of construction of the system
- Supervision of installation of mechanical equipment
- Hand over the completed system to the community
- Training of community water supply operators (in regional training centres to be established)
- Provide assistance to communities in maintenance and repair of systems through regional workshops (to be established)

Tasks of communities:

- Assess their needs concerning water supply and sanitation
- Choose representative(s) who will represent the community towards the government (GAREW)
- Agree to the proposed plan of a water supply and sanitation project
  Collect a part of the estimated amount of money the project will cost
- Agree the land needed for the project as community property
- Give GAREW specific preferences concerning lay-out of the project and location of project components
- Construct simple pit latrines and waste water disposal systems under guidance of GAREW

- Select operation and maintenance personnel to be trained by GAREW
  Take responsibility for operation and maintenance of the water supply system when construction of it is completed
  Technical supervision and maintenance of the system by a technician
- Administrative management based on a financial plan where water fees paid by the community members cover operation and maintenance costs (fuel, spare parts, salaries of operators) and depreciation costs

3 Selection of new project areas

In selecting new project areas, priority will be given to :

- Areas where the water is available at a relatively large distance
- Areas where the available water is of low/unacceptable quality
- Governorates/Districts with a relatively low water supply coverage
- Areas where the communities are willing to accept responsibility for the tasks mentioned under (1) and are willing to pay a part of the capital cost

4 Link between Water and Sanitation

Although GAPEW does not have the means to implement sanitation systems, it considers safe disposal of waste and waste water essential from health point of view, but also from the point of view of protection of water sources.
The role of GAPEW in the field of sanitation is much more limited than in water supply.
GAPEW will give directions to the communities which types of waste and waste water disposal systems are most appropriate, but construction of these systems is the responsibility of the communities themselves.
Construction of waste and waste water disposal systems could be a precondition to construction of water supply systems.

5 Sharing of capital construction costs of water supply systems between Government and Communities

* See duscussion paper on this subject

The percentage of capital costs to be paid by the communities will vary between 20 and 50, depending on several factors as financial potential of community, population etc.

ANNEX 7.3

GAREW FIRST FIVE YEAR PLAN FOR THE WATER SECTOR (1996 - 2000)

Ministry of Electricity and Water

General Authority for Rural Electricity and Water Supply
(GAREWS)

Water Sector

First Five-year Plan

(1996 - 2000)

1) General Strategy of the Plan

The rural population of Yemen comprise 84% of the country's total population. Until 1995, the Authority has covered about 54% of them. The rest get water either through tankers or from the private sector (probably means through private networks ?).

It is estimated that the average per capita rate is 30 - 35 l/d. Through the five-year plan, GAREWS would seek to achieve a set of goals, the most important is the delivery of clean drinking water to the maximum possible number of the rural population. This will be attained by implementing (3,070) projects whose total cost is estimated at 43 Billion YR. This will increase the percent served of the rural community to 64% of the rural population, i.e., an increase of 2.5 million person during the plan's years.

The Authority also aims to introduce a new policy in the implementation of rural water supply projects. That is: to make the beneficiaries contribute to the construction of these projects. GAREWS will also seek to upgrade its administrative and technical capacity, and improve the level of performance with respect to carrying-out studies, field surveys and engineering designs.

The policies to achieve these objectives are:

1) finish the current projects (which are underway) as scheduled, by making available sufficient resources to fulfill outstanding financial obligations,
2) take all measures to protect the environment against pollution caused by inadequate use of water, and to safe-guard public health in rural areas,
3) rationalize water consumption is rural areas and abate uncontrolled drilling,
4) train rural operators to enable them to operate and maintain the systems,
5) encourage the private and cooperative sectors to invest in water supply projects.

2) Relative Distribution of the Rural Population at the Governorate Level

Table (1) shows the distribution of the rural population in the various governorates:

Governorate	Rural population	% Rural population relative to total rural population	Governorate	Rural population	% Rural population relative to total rural population
Sana'a	1.7	13.8	Sa'adah	0.34	2.7
Taiz	1.87	15.2	Marib	0.14	1.1
Ibb	1.67	13.6	Jawf	0.10	0.8
Hudayda	1.47	12	Aden	0.09	0.7
Dhamar	0.86	7	Lahj	0.43	3.5
Bayda	0.46	3.7	Abyan	0.46	3.7
Mehweet	0.39	3.2	Shabwah	0.24	2
Hadramout	0.54	4.4	Mahara	0.07	0.6

Projects were allocated to various governorates and on the 5 years of the plan according to the following criteria:

1) distribution among the Governorates on the basis of total rural population and geographic distribution,
2) pay more attention to districts' capitals,

3) settlements containing large populations,

4) remote areas which are deprived of basic services,

5) amount of contribution by local population.

Table (2): Project Distribution during the 5 years of the plan.

No.	Governorate	# of projects	Years of the plan				
			1996	97	98	99	2000
1	Sana'a	464	139	116	93	70	46
2	Taiz	481	144	120	97	72	48
3	Hudayda	78	23	20	16	11	8
4	Dhamar	230	69	57	46	35	23
5	Ibb	247	74	62	49	37	25
6	Bayda	280	84	70	56	42	28
7	Haja	157	47	70	56	42	28
8	Sa'adah	93	28	23	19	14	9
9	Marib	70	21	18	14	10	2
10	Mehweet	143	43	36	28	21	15
11	Jawf	23	7	6	4	3	3
12	Aden	8	2	2	2	1	1
13	Hadramout	243	73	61	49	36	24
14	Shabwah	63	19	16	12	9	7
15	Lahj	33	10	8	7	5	3
16	Abyan	57	17	14	11	9	6
17	Mahara	13	4	3	3	2	1
	Bilateral projects	279	84	70	55	42	28
	Rural water supplies	108	32	27	22	16	11
	Grand Total	-	920	768	615	459	308

General Indicators used in Plan

a) Growth of rural population during the period 1990-2000 is shown in (Table 3) below.

Table (3): Growth of the rural population and Coverage.

Parameter	1990	1995	2000
Total pop. (millions)	10.79	12.25	13.93
Required coverage (%)	46	54	64
Number of beneficiaries (millions)	4.97	6.561	9.018
Required quantity of water (MCM/ year)	47.6	72.6	105.4

b) Thus, during the 5 years of the plan the situation will be as shown in Table (4).

Year	Total population (M)	% Coverage	Number of beneficiaries (M)	Incremental pop. served (M)	# of projects (assuming 800 persons/ project)
95	12.25	54	6.561	-	-
96	12.51	60	7.297	0.736	920
97	12.89	61.3	7.912	0.615	768
98	13.28	62.3	8.404	0.492	615
99	13.68	63.3	8.771	0.367	459
2000	13.93	64	9.018	0.247	308

1) The total incremented population to be served by the end of the plan is 2.457 M. By the year 2000, GAREWS would have covered 64% of the rural population with clean water (i.e., 9.018 M people).
2) Population growth rate is 2.8% till 1999, then 2.7% till 2000 (doesn't seem right ?).
3) Average population served per project is 800.
4) Number of required projects is 3,070...serving 2.457 M or 64% of the rural population.
5) The incremental increase in the % rural population served by clean water (the 10%, from 54% to 64%) will require provision of the necessary financial resources.

Table (5): Rural population growth.

Governorate	Year		According to 1994 census	Year 2000
	1990	1995		
Sana'a	1.58	1.70	1.74	2.28
Taiz	1.69	1.87	1.65	1.98
Ibb	1.47	1.67	1.54	1.85
Hudayda	1.19	1.47	1.02	?
Hajja	1.65	1.42	1.13	1.77
Dhamar	0.8	0.9	0.88	0.9
Bayda	0.38	0.046	0.38	0.65
Mahweet	0.34	0.39	0.35	0.54
Saada	0.33	0.34	0.425	0.45
Marib	0.13	0.14	0.16	0.16
Jawf	0.09	0.10	0.14	0.11
Aden	0.9	0.9	0.638	1.0
Lahj	0.41	0.43	0.56	0.46
Abyan	0.43	0.46	0.31	0.49
Hadramout	0.53	0.54	0.48	0.59
Mahra	0.06	0.07	0.04	0.08
Shabwa	0.23	0.24	0.32	0.25
Total	10.79	12.25	11.16	13.93

4) Required Human Resources

A five year plan was devised. The estimated cost of additional staff is 59.02 million YR, covering a total of (686) new jobs as follows:

264 University Graduates
276 Technicians and clerks
58 Experienced crafts men and typist, etc.
88 Supporting services

Of the total cost of new jobs, 34.36 M YR are for staff at GAREWS branches (Table 6) and 24.66 M for staff at HQ (Table 7).

Table (6): New jobs at the branches during the five year of the plan.

Category	Sub Category	Qualifications	Required number
2 (univ. degree)	C	Electrical Eng.	30
2	C	Civil Eng.	15
2	C	Mech. Eng.	30
2	C	Geology & hydrogeology	28

Table (6): cont.

Category	Sub Category	Qualifications	Required number
2	C	Accounting	15
2	C	Administration	15
2	C	Arts	
2	C	Law	15
3	B	drilling/ mech. /elect. technicians	66
3	C	High school grads.	30
3	C	Assist. tech. (equipment)	66
4	A	Preparatory school (typist)	15
4	A	Primary school	15
5	B	Experience (supporting serrvices)	56
Total			396

Table (7): New jobs at the HQ during the five years of the plan.

Category	Sub Category	Qualifications	Required number
2	C	Electrical Eng.	20
2	C	Civil Eng.	12
2	C	Mech. Eng.	8
2	C	Geology & hydrogeology	10
2	C	Geologist	2
2	C	Accounting	57
2	C	Administration	5
2	C	Law	1
Total			115

The Training Centre (TC)

GAREWS TC requires support in order to enable it to receive trainees from rural areas to be trained on O & M and sustainability of rural water supply projects, sanitary awareness, and water conservation. Table (9) shows the required support.

Table (9): Required support for the Training Centre.

Type	Qty	Est. Cost ('000 YR)
Chairs for lecture rooms	200	200
Audio-visual equipment * 8 mm film-replay	1	30
* Video	1	30
* TV	1	60
White board with accessories	1	15
Mechanical tools	10 sets	200
Electrical tools	10 sets	200
Industrial protection (safety) equip.	1 set	100
Maintenance of the lecturing/ training room	-	400
Building a workshop	-	300
Training of 8 trainers		?
Engines to be used for training	for 2 months	240
Total		1,980
Categories at 20%		397
		2,382

Table (8): Allocation of the new jobs among the HQ and various branches of GAREWS.

No.	Branch	CE	Geo-lgoy	Hydro.	Geo-physics	EE	ME	Acct.	Adm.	Law	Arts	High Diplo ma	Tech. high educ.	High school	Prep. school + typist	Certific. of Ex-perience	Prelim. school	w/out cert.	Total
1	HQ	12	2	8	2	20	8	57	5	1	1	57	25	32	17	12	11	20	290
2	Aden	1	-	1	-	2	2	1	1	1	-	2	2	2	1	1	1	2	2-
3	Taiz	1	-	1	-	2	2	1	1	1	-	2	2	2	1	1	1	2	20
4	Dhamar	1	1	1	-	2	2	1	1	1	-	2	2	2	1	1	1	1	20
5	Hodayda	1	1	1	-	2	2	1	1	1	-	5	5	2	1	1	1	3	28
6	Mehweet	1	1	1	-	2	2	1	1	1	-	5	5	2	1	1	1	3	28
7	Ibb	1	1	1	-	2	2	1	1	1	-	5	5	2	1	1	1	3	28
8	Marib	1	1	1	-	2	2	1	1	1	-	5	5	2	1	1	1	3	28
9	Hadramout	1	1	1	-	2	2	1	1	1	-	5	5	2	1	1	1	3	28
10	Abyan	1	1	1	-	2	2	1	1	1	-	5	5	2	1	1	1	3	28
11	Mahra	1	1	1	-	2	2	1	1	1	-	5	5	2	1	1	1	3	28
12	Haja	1	1	1	-	2	2	1	1	1	-	5	5	2	1	1	1	3	28
13	Sadah	1	1	1	-	2	2	1	1	1	-	5	5	2	1	1	1	3	28
14	Jawf	1	1	1	-	2	2	1	1	1	-	5	5	2	1	1	1	3	28
15	Bayda	1	1	1	-	2	2	1	1	1	-	5	5	2	1	1	1	3	28
16	Shabwah	1	1	1	-	2	2	1	1	1	-	5	5	2	1	1	1	3	28
	Total	27	15	23	2	50	38	72	20	169	1	123	91	92	32	22	21	61	686

Training Costs

1. Training Program in Management/Administration Field:

Field	Totals by Year 2000			Place of Training		Est. cost ('000 YR)	
	# of candidate	Repeat times	Duration	In-country	Abroad	96	97-2000
English lang.	58	11	3 mo.			32	128
Computer skills (1)	96	10	1 mo.			120	480
Computer skills (2)	100	10	1 mo.			120	480
Administ. Organization	16	8	3 weeks			80	320
Office secretary	10	5	1 mo.			30	120
Public administ.	210	8	1 mo.			6	24
Business adminst.	17	8	1 yr.			6	24
Mechanical skills	22	11	1 mo.			30	120
Typing (A/E)	22	9	3 mo.			12	48
Accounting	50	15	1-2 yrs			120	480
Review of contract invoices	10	5	1 mo.			556	1824
Total	611	100				1112	4048
Contingencies 40%						445	1619
GRAND TOTAL						7,224	

2. In-country Technical Training:

Field	Totals by Year 2000			Est. cost ('000 YR)		Remarks
	# of candidat.	Repeat times	Duration	'96	'97-2000	
O & M of WS and sanitary projects in rural areas	30	15	1 mo.	1050	4200	for system operators
Sustainability of WS & sanitation proj. + water conservation	30	15	4 d	222	2664	funded by WHO
Lectures & seminars	30	12	2 h	60	240	for engineers& techn. (1/ mo.)
Electrical works	26	8	3 mo.	126	2772	
Mech. works	10	15	3 mo.	63	252	
Operation of rural electri-city stations & networks						not relevant to water
Water lab., sanitary lab., etc.	30	10	21 mo.	480	3840	2 per year
Total				2190	16,992	
Total + Contingencies 20%					23.018	

3. Training Abroad (in US$)

Field	Totals by Year 2000			Est. cost (US$)		Remarks
	# of candidat	Repeat times	Duration	'96	'97-2000	
Hydrogeology, geology & geophysics	17 Eng. 27 tech.	10 10	1 mo. 3 mo.	32	128	
Well drilling & design	10 Eng. 10 tech.	5 5	3 mo.	36	144	
Geophys. exploration & maint. of geophys. equip.	10 Eng.	5	2 mo.	?	?	
Surveying	10 Eng.	10	1 mo.	20	320	
Visits manufacturing plants of pumps, engines,	14 Eng. 16 tech.	15	1 mo.	4	56	co-ordinated w/ local agents
Total				92	648	
Contingencies 50%				46	324	

6) Requirements for Implementation

a) Managerial & technical requirements:

- establishing the governorate branches,
- establishing a department for environmental health,
- establishing a computer department,
- support from other entities so as to enable GAREWS to re-organize,
- strengthening the lab,
- strengthening the workshop (electrical & mechanical equipment).

b) Public participation

- Study means & ways to enlace public participation.

c) Financial resources

Given the number of people to be served each year ('96-2000) and that the average cost per person (using '94 & '95 average data) is 8,800 YR/person, then the total financial resources to implement the plan are as shown below.

Year	Number of population to be served	Required funds (billion YR)
96	0.444	3.91
97	0.471	4.14
98	0.492	4.34
99	0.514	4.52
2000	0.536	4.72
Total	2.457	30.62

Summary of the 5-Year Plan

No.	Governorate	# of projects	Total cost (to the nearest MYR)
1	Sana'a	464	7,365
2	Taiz	481	6,791
3	Hudayda	78	1,644
4	Dhamar	230	2,331
5	Ibb	247	5,182
6	Bayda	280	2,666
7	Haja	157	2,604
8	Sa'adah	93	835
9	Marib	70	700
10	Mehweet	143	2,844
11	Jawf	23	1,110
12	Aden	8	211
13	Hadramout	243	2,895
14	Shabwah	63	521
15	Lahj	33	1,106
16	Abyan	57	1,073
17	Mahara	13	323
	Bilateral projects	279	1,840
	Rural W. Supplies (???)	108	783
	Human resources	-	25
	Field survey	-	28
	Training	-	25
	Total	3070	43

ANNEX 7.4

PRIME MINISTER'S RESOLUTION 36/1996 ON THE EXECUTION OF THE PUBLIC BUDGET (FISCAL YEAR 1996)

Acronyms

MOF	Ministry of Finance
PB	Public Budget
PB=FY'96	Public Budge of the Fiscal Year '96
CLE	(Central Level Entities) = all ministries, authorities and central organizations at the central level (HQ's)
GLE	(Governorate Level Entities) = offices of the CLE in the various governorates and it the City of Sana'a.

Prime Minister's Resolution 36/1996

Dealing with The Instructions on Execution of the Public Budget, Fiscal Year 1996

The Prime Minister

...

and after approval by the Cabinet, it is decided that

Article (1) : All financial transactions, collection of the pre-estimated revenues and disbursements from allocations ... pursuant to the law of PB-FY'96 shall be subject to the Finance Law No. 8/ 90 and its by-laws as well as the valid laws, regulations and by laws (of relevance).

Article (2): All central and governorate level entities shall adhere to the provisions of the laws of PB-FY'96 and the Finance Law and its by laws, as well as the instructions and procedures issued by the MOF (aiming) to balance the flow of revenues with the limits of expenditures.

Article (3): The decisions and orders by the cabinet concerning the first and second phases of the economic, financial and administrative reforms shall be closely observed. Especially those relating to the enhancement of revenues and rationalization of expenditures.

Article (4): The special remarks shown in the PB-tables shall form a complementary part of the law of PB-FY'96 and they shall be in force and be implements.

Article (5): Effective from the beginning of the fiscal year, all central level entities which are included in the PB, as well as their offices at the governorate level shall be authorized (each within it respective scope of responsibilities) to use their respective allocations for their designated purposes.

Article (6): The MOF shall notify the various entities at the central and governorate levels of their remaining allocations as per the law of PB-FY'96. These various entities shall adhere to the following:

a) not to recruit new civil servents before 1st Feb. or after 30 Sept. of the fiscal year. Further, any new recruitment should be within the approved staff budget and provided that the financial allocations for each entity or office permits such recruitment.

b) all settlements (of salaries), and transfers from an entity to the other shall be done only during the period 1 Feb. - 30 Sept. of the fiscal year; and provided that all conditions and legal procedures and financial allocations are met.

c) the various salary toppings (allowances) shall not be disbursed except in accordance with the resolutions regulating the rules and provisions of disbursement, and after the toppings approval by the cabinet, and provided that budget allocations are available.

Article (7): The ministers, chairman of authorities and central organizations, and the governors are hereby given the authority of the MOF, as depicted: Finance Law # 8/90 and its by laws, ... to: re-allocate funds among the various sub-chapters of Chapter (1) (Salaries, wages and the like), Chapter (2) (Expenditures on goods and services), Chapter (3) (Recurrent transferable expenditures) and Chapter (5) (Investment expenditures) ... provided that such re-allocation is agreed upon with the Minister of Civil Services (for Chapter 1), the Minister of P&D (for Chapter 5). No re-allocations are allowed between the sub-chapters shown in Articles (14) and (15) of this resolution. A copy of the re-allocation decree should be submitted to the MOF. This article doesn't apply to transfers from one entity to another.

Article (8): The Ministry of Civil Service shall have full authority in regard to the implementation of Chapter (1) (Salaries, wages and the like), within allocated amounts and provided that each vacancy is announced so as to give equal opportunities.

Article (9): The MOP and D shall have full authority is regard to the implementation of Chapter (5) allocations (Investment budget), within allocated amounts and projects of each entity (ministry and governorate).

Article (10): The governors are hereby fully authorized to implement the service projects, within allocations and as per the projects outlined in the investment budget.

Article (11): The powers of the high tender committee are hereby authorized to the ministers and the local (governorate) committees established prime minister resolution 37/95, within a sum not to exceed 100 M YR for ministers and 50M YR for governors.

Article (12): Funds allocated for the implementation of investment projects which have an externally funded foreign component shall not be made available until the funding agreement with the funding agency becomes effective and constitutionally approved. Disbursements from the local component and within the allocated amounts in the budget.

Article (13): It shall be forbidden to pay (out of Chapter (5) allocations) for salaries or wages staff who are paid from Chapter (1).

Article (14): It shall be forbidden to make any re-allocations from the following sub-chapters and types to other sub-chapters or types:

Chapter (1): Salaries, wages and the like.
Sub-chapter (1): Basic salaries.

Chapter (2): Expenditures on goods and services.
Sub-chapter (3): Type (1): Medicine, Medical supplies, etc.
Type (2): Food stuffs and clothes.
Sub-chapter (4): Rents (re-allocation among types are allowed).

Sub-chapter (5): Water, electricity and communication (" " " " " ")
Sub-chapter (6): Maintenance costs (" " " " " ")
Sub-chapter (7): Type (3): Travel allowances (Abroad).
Sub-chapter (8): Type (8): Scholarships and training abroad.

Chapter (3): Recurrent transferred expenditures and investment public debt.
Sub-chapter (1): Subscrip. in Arab, regional & international organizations.
Sub-chapter (4): Social security and pension to non-employed.
Sub-chapter (5): Type (1): General assistance.
Type (2): Assistance to cover recurrent/budget shortages.
Sub-chapter (6): Type (1): Government installment in installments.
Type (2): Insurance installments.

Chapter (4): Capital and transferred-capital expenditures.
Sub-chapter (1): Type (1) Budding and construction.
Type (2): Lands and real-estate.

Article (15): It is prohibited to re-allocate funds into the following sub-chapters & types:

Chapter (1): Salaries, wages and the like.
Sub-chapter (2): Contracted and temporary wages (through re-allocation among the two types allowed).
Sub-chapter (3): Overtime wages and bonuses (through re-allocation among the two types allowed).

Chapter (2): Expenditures on goods and services.
Sub-chapter (7): Type (2): Internal travel.
Sub-chapter (9): Type (2): Expenditures of special nature.

Chapter (3): Recurrent transferred expenditures and interest on public debit.
Sub-chapter (3): Compensations, fines and contingencies.
Sub-chapter (5): Type (1): General assistance.

Chapter (4): Capital and transferred-capital expenditures.
Sub-chapter (1): Type (2): Supplies and furniture.
Sub-chapter (2): Type (4): Vehicles.

Chapter (5): Investment expenditures.
Sub-chapter (5): Supplies and furniture.
Sub-chapter (6): Vehicles.
Sub-chapter (7): Project's salaries and wages.
Sub-chapter (8): Project's general expenditures.

Article (16): All CLEs and their offices at the governorates (i.e. GLE) shall promptly (and in accordance with supporting documents) pay their bills for electricity, water, telecom, airline, rents and other debits.

Article (17): Priority shall be given to back payments which are due from the previous fiscal year. These should be paid and deducted from their respective chapters, sub-chapters and types in 96 budget. Back-payments from fiscal years prior to '96, shall only be paid after approval of Minister of Finance or whenever the Minister authorizes to.

Article (18): It is prohibited (except by set-aside revenues of any sort, or part there-of, cash or in kind, and to keep these revenues away from budgeting revenues. It is also prohibited to use a specific revenue to face a specific expenditure, except by law. Violators will be held responsible.

Article (19): Central and governorate level entities shall work not only to achieve (collection of) their estimated revenues, in accordance with their respective laws establishing those entities, but also to develop and increase these revenues. Revenues in kind should also be deposited in accordance with the law on tenders, actions and gov. warehouses and the by-laws there-of.

Article (20): All revenues should be promptly forwarded to the Central Bank. It shall be forbidden to deposit a revenue of any sort in any other bank except if so authorized by the Central Bank.

Article (21): All production and service sectors' authorities, corporations and companies; which are expected to make surplus over their current activity, should deposit (25%) of the governorates share of this surplus by the end of each quarter. The amount shall be determined according to the end-of-quarter financial statement. If no such statement is submitted, the government's share shall be 25% of the estimated sum shown in the annual budget.

Article (22): All government officials at all ranks shall be held responsible to adhere, during their implementation of the 1996 public budget, to the constitutional provisions, finance law and its by-laws, and the law of government tenders, Auctions and Warehouses and its by-laws, and the cabinet resolutions concerning the first and second phases of economic reform, ...

Article (23): All central and local entities should provide the MOF, M of Civil Service, the Central Audit and Accounting Organization, with monthly and quarterly reports shown the progress of budget implementation... These reports should reach the three entities by the 10^{th} day of each month.

Article (24): The Ministers of P & D and Civil Service, each in his respective field, should issue the necessary resolutions to regulate the implementation of this resolution, without violating the 1996 PB-law and the provisions of the Finance Law. They should also issue authorizations to the governors to implement the recurring budget, investment budget and employment budget.

Article (25): All provisions which apply to the PB-96 shall also apply to the budget of the Ministry of religious trust.

Article (26): Thus resolution shall be effective for its date of issue and shall be published in the official bulletin.

Prime Minister **Minister of Finance**

ANNEX 8.1
Unit Prices Paid for Water

governorate	district	village	source	unit price [YR/m3][1]	alternative sources and other remarks	year paid
Sanaa	Arhab	Bait Maran	vendor	250-440	shallow wells/cisterns	1996
		Bait al Gabbas	deep well (@ 4 km)	200	by women	1996
			deep well (@ 4 km)	700	by tanker	1996
	Khawlan	W. Asfan	house connection	25		1996
		Maza'am	vendor	400		
		Bait as Shuhtrah	deep wells (@ 1 km)	100		1996
Al Mahwit	Ar Rujum	Ar Rujum	house connection	15		1989
		Bait al Jaradi	house connection	20		1991
			vendor	130		1991
Dhamar	Ans	Dawran	house connection	50	private network	1996
		As Sayh	vendor	200		1996
		Bani Obeid	spring			
	Utmah	Sama	house connection	40	springs	1996
		Marks	house connection	40	springs	1996
Ibb	Yarim	Eryan	house connection	130	cisterns/springs, progressive tariff, av. use = 1.5 m3	1996
			vendor	400		1996
		Sumarah	vendor	400		1996
			house tank	100		1994
	Dhi Sufal	Dhi Sufal	vendor	214	average	1996
Taiz	Al Mawasit	As Sinah	near-house connection	60	min. YR 250 (< 4 m3), av. use = 4 m3	1996
		Nashamah	near-house connection	60	min. YR 180 (< 3 m3), av. use = 4 m3	1996
			vendor	400-700		1996
		Hadad al Rijiah	house connection	80	cisterns, min. YR 180 (< 2 m3), av. use = 2.5 m3	1996
			vendor	750		1996
		Bani Afif	vendor	500-600	shallow wells	
	At Taiziyah	Al Xums	vendor	375		1995
	At Taiziyah	Miqbaaba	vendor	150		1995
	At Taziyah	Ar Riwaas	vendor	400		1995
	Al Muwasit	Al Malika	vendor	300		1995

[1] These are averages, taking into account subscription charges and average monthly use.

ANNEX 8.1 (cont.)

governorate	district	village	source	unit price [YR/m3][2]	alternative sources and other remarks	year
	Sharab	Al Adan	house connection	40		1995
	Sharab	Al Jahaaza	house connection	20		1995
	Sharab	Al Anjud	house connection	20		1995
	Dimnat Khadir	Al Rahayba	house connection	5		1995
	average	average	vendor	550		1995
Lahj	?	Aqqan	standpipe	50	use = 2 m3	1996
	Tawr al Bahah	Rijah	system	30	use = 4 m3	1996
		Tawr al Bahah	system	7	NWSA tariff	1996
Aden	Lawdar	Amnagdah	system	35	NWSA-managed	1996
Shabwah	As Said	Ataq	house connection	61	use = 6 m3	1995
			vendor	125	idem	1995
	Nisab	Nisab	house connection	63	use = 6 m3, idem	1995
			vendor	140	idem	1995
	Bayhan	Bayhan	house connection	54	use = 6 m3, idem	1995
			vendor	125	idem	1995
	Armah	Wadi Jirdan	vendor	280	idem	1995

[2] These are averages, taking into account subscription charges and average monthly use.

ANNEX 10.1
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