JAPAN INTERNATIONAL COOPERATION AGENCY
GENERAL AUTHORITY FOR RURAL ELECTRICITY AND WATER
MINISTRY OF ELECTRICITY AND WATER
THE REPUBLIC OF YEMEN

BASIC DESIGN STUDY REPORT ON THE PROJECT FOR RURAL WATER SUPPLY IN THE SOUTHERN AND EASTERN GOVERNORATES OF THE REPUBLIC OF YEMEN

APRIL, 1994

JAPAN TECHNO CO., LTD.

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PREFACE

In response to a request from the Government of the Republic of Yemen, the Government of Japan decided to conduct a basic design study on the Project for Rural Water Supply in the Southern and Eastern Governorates of the Republic of Yemen and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Yemen a study team headed by Dr. Yuji Maruo, Senior Development Officer, JICA and constituted by members of Japan Techno Co., Ltd., from November 20 to December 26, 1993.

The team held discussions with the officials concerned of the Government of Yemen, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Yemen in order to discuss a draft report, and as this result, the present report was finalized.

I hope that the report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Yemen for their close cooperation extended to the teams.

April, 1994

Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency

April, 1994

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Rural Water Supply in the Southern and Eastern Governorates of the Republic of Yemen.

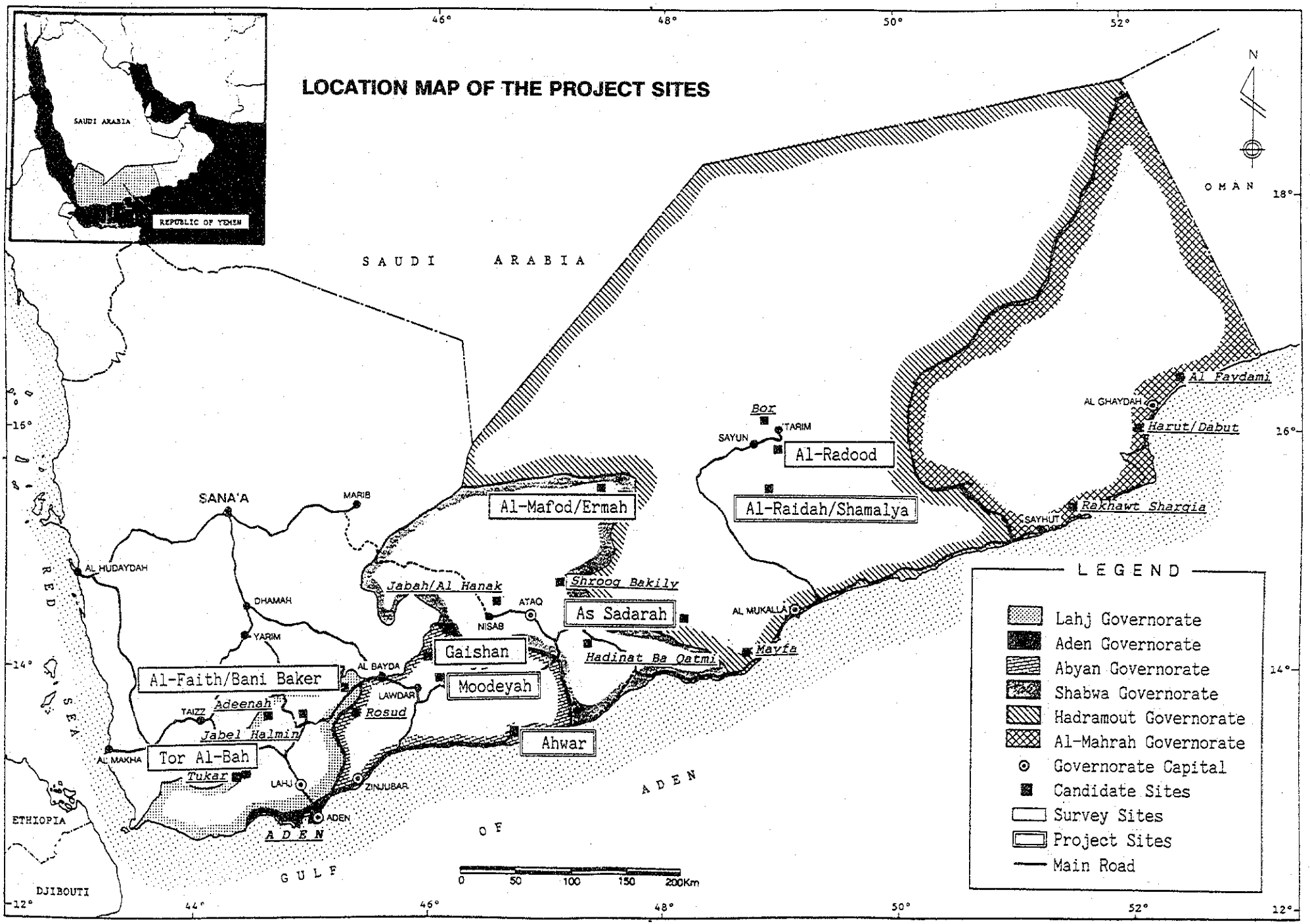
This study was conducted by Japan Techno Co., Ltd, under a contract to JICA, during the period from November 16, 1993 to April 28, 1994. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Yemen, and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, the Ministry of Foreign Affairs and the Ministry of Health and Welfare. We would also like to express our gratitude to the officials concerned of the Ministry of Planning and Development, the General Authority for Rural Electricity and Water, the Ministry of Electricity and Water, the Embassy of Japan in Yemen for their cooperation and assistance throughout our field survey.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Tetsuji Niwano
Project Manager,
Basic design study team on
the Project for Rural Water Supply
in the Southern and Eastern
Governorates of
the Republic of Yemen,
Japan Techno Co., Ltd.


LOCATION MAP OF THE PROJECT SITES
SAUDI ARABIA
REPUBLIC OF YEMEN
SAUDI ARABIA
OMAN
ETHIOPIA
DJIBOUTI
RED SEA
GULF OF ADEN
SANA'A
MARIB
AL HUDAYDAH
DHAMAH
YARIM
TAIZZ
AL MAKHA
LAHJ
ADEN
ZINJUBAR
AL BAYDA
LAWDAR
NISAB
ATAQ
SAYUN
TARIM
BOR
AL GHAYDAH
SAYHUT
AL MUKALLA
Al-Mafod/Ermah
Al-Radood
Al-Raidah/Shamalya
Jabah/Al Hanak
Shroog Bakily
As Sadarah
Gaishan
Moodeyah
Ahwar
Al-Faith/Bani Baker
Tor Al-Bah
Adeenah
Jabel Halmin
Rosud
Tukar
Hadinat Ba Qatmi
Mayfa
Al Faydami
Harut/Dabut
Rakhawt Sharqia
0 50 100 150 200Km
LEGEND
Lahj Governorate
Aden Governorate
Abyan Governorate
Shabwa Governorate
Hadramout Governorate
Al-Mahrah Governorate
Governorate Capital
Candidate Sites
Survey Sites
Project Sites
Main Road

SUMMARY

The Republic of Yemen is located in the southwestern part of the Arabian peninsula, with an area of about 530,000 km^2 (1.4 times that of Japan) in which an estimated population of 14,000 thousand lives (1993). While accounting for only one fifth of the entire population, the former South Yemen occupies a land of 330,000 km^2 comprised of 6 governorates, with its middle and eastern governorates particularly stretching vast barren land where the oil exploration and development have been booming in recent years. Surrounded by harsh natural environment with the yearly rainfall short of 100 mm, the people in the southern and eastern parts traditionally have been migrating in waves to Saudi Arabia and other Gulf countries. The former South's population census reports these non-residents occupy more than 10% of the total population in the area. Shortly after the unification of North and South in 1990, the country was forced to confront the Gulf crisis/war in 1990/91, in which assistance from the Gulf countries was abruptly halted and some 800 thousand workers were forced to return home. The resultant increase of unemployed and progressive inflation have since been straining the country's economy.

In its first announcement of the nation's economic agenda, the united government underscored the necessity of effectively and efficiently promoting the agricultural sector and rural development, which had concentratedly been driven under its previous 5-year National Plans, referring to its decision to take steps for the conservation of groundwater resources apparently on the verge of depletion as well as executing the improvement of rural infrastructure, particularly the provision of water supply systems to remote, sparsely populated areas. In an attempt to boost the rural water supply sector, the government instituted in 1992 the General Authority for Rural Electricity and Water in the Ministry of Electricity and Water to entrust the task of developing the national rural water supply scheme. The government took a further step in 1993 to set up its Aden branch to centralize the rural water sector.

The rural water coverage across the nation at present is reportedly hovering around 40 percent, although the government has a target to boost it to a level of 80 percent by the year 2010. Such a low range of the present coverage might be attributed in part to the difficulty of acquiring appropriate water

sources under harsh natural environment and in part to the shortfall of funds due to the government's tight financial situation. There has currently been no choice for the residents in the hard-hit areas but to rely upon unsanitary sources such as shallow hand-dug wells and cisterns (structures storing surface runoff during storms). As a result, digestive organ disorder and water-borne disease are sweeping across the rural communities, taking their toll mainly among infants and small children and leading to a low life expectancy short of 50 years. In recent years the government committed to addressing the problem by adopting the Action Plan during the National Population Conference in 1992, in which the necessity of urgently promoting the rural water supply was stressed as one of the measures to protect the lives of mothers and children.

With such a situation as a backdrop, the government of Yemen formulated a plan to provide water supply facilities to 20 rural communities, 4 each from 5 governorates of the southern and eastern governorates, which have been left less developed, and requested the government of Japan to execute the project with grant aid, taking into account its past contribution in this sector for the northern part. Meanwhile the Japan International Cooperation Agency (JICA) sent to Yemen a project formulation survey team from January 15 to February 13, 1993 (30 days), which carried out the examination of the viability of the project including the organizational setup for the project implementation on the Yemeni side, urgency of each project site and conditions of water sources. Based upon the results of the mission, the government of Japan decided to carry out the basic design study, and JICA dispatched a basic design study team from November 20, 1993 to December 26, 1993. The team held discussions with the concerned authorities of the Yemeni government and conducted the collection of data and information as well as the field survey of the candidate sites including the examination of their natural environments, water use practices and water sources conditions and topographic surveying. Further studies were made at home, and a mission was sent to Yemen for consultation on the draft report from March 30 to April 7, 1994. The project plan formulated as a result of the process of these studies is described as follows:

The project sites for the basic design study are four (4) sites in two (2) governorates that can be judged to ensure stable and sanitary water sources, out of twenty (20) sites in 5 governorates of the southern and eastern parts of the country requested by the government of Yemen. The selection of these

sites were made, based upon the following criteria: (1) The site has a safe and stable water source(s) to be relied upon for the project; (2) The site ranks higher in priority as to urgency of water supply facilities; (3) The site has a higher score in cost-effectiveness (a lesser construction cost per beneficiary); (4) The site poses no critical problems in the implementation of construction work including access; (5) The site has a good prospect to run sustained operation and maintenance. These elements were analyzed with each site, along with reference to the results of the former project formulation survey and the collected data. The proposals made by the Yemeni side during the discussions were paid respect to. This initial process led to the selection of nine (9) project candidate sites, where the field survey was carried out. Through the evaluation of the results of this survey, the following four (4) sites have finally been assigned for the project sites for the basic design study :

	Name of Site	Governorate	Current Population (1993)	Planned Population (2008)
1.	Ahwar	Abyan	13,900	20,400
2.	Moodeyah	Abyan	22,900	32,000
3.	Al-Raidah/Shamalya	Hadramout	9,400	12,700
4.	As-Sadarah	Hadramout	11,000	14,000
	Total:		57,200	80,000

Although the initial list included other sites with the urgency and necessity of water facilities comparable with those of the selected project sites, they had to be canceled because of their highly adverse environment hindering to secure viable water sources. Such results of the technical field survey reflect the more rigorous characteristics of natural conditions in the southern part than those in the north.

The features of the four project sites thus selected are described as follows:

(1) Ahwar (Abyan governorate)

The Ahwar site is constituted of the Ahwar subdistrict capital and surrounding villages. The ongoing water service in the capital area has long been strained by the decreased quantity and inferior quality of served water, with management of the water office in charge being

left in bad shape. This project plans to improve this situation, focusing on the Ahwar service area in particular due to its high priority, by ensuring reliable water sources, though limited in the available yield. This measure is expected to help the Ahwar water office revamp its current situation.

(2) Moodeyah (Abyan governorate)

A similarly degraded water service as in Ahwar has long been continuing in the Moodeyah district capital and the surrounding areas due to the lack of good water sources, crippling management of the Moodeyah water office. Although a regional water supply plan is required for the whole area requested by the water office, this project plans to concentrate on the Moodeyah service area, which has the highest priority in the area, due to the limitation in the viable water sources. The improved water service is expected to help to restore the management of the water office.

(3) Al-Raidah/Shamalya (Hadramout governorate)

This site is composed of a cluster of large villages scattered over the highland platform. The water supply plan for the site has recently been made possible for the first time through the success of a very deep drilled well over 400 m in this area. At present, however, all the villages except the one nearby the well depend upon costly water vending nearly all the year round. This project plans a regional water system covering all the constituent villages, based upon the existing well and an additional new well.

(4) As-Sadarah (Hadramout governorate)

Water environment in this site is completely different from the other three sites. Since they can utilize special water resources such as hot springs and a surface stream, the residents so far have not installed any water facilities. As-Sadarah, however, is now a developing subdistrict capital, and the shallow water sources within the crowded residential areas have been exposed to artificial contamination raising growing concern among the residents. The water supply system to be installed for the first time in this area is, therefore, planned to employ the safest and the most stable of the region's sources, a stream flow away from the community zone.

The range and components of the respective water facilities have been determined, based upon the conditions of existing facilities and the characteristics of the sites: in Ahwar where house connections already exist, the basic concept for the design is to provide facilities from the water sources to distribution mains; Moodeyah, though in a similar situation as Ahwar, has its distribution network in place in far better conditions, and the replacement of distribution line is not required; in the other two sites where no substantial facilities have yet been installed, complete systems from water sources via distribution main to public standpipes have been designed. The distribution branch lines and house connections thereafter are planned to be undertaken by the Yemeni side, which has proved to have adequate experience and expertise for this line of work, with support under this project through a supply of some portion of piping materials.

This project will be implemented with the General Authority for Rural Electricity and Water as the executing agency, whereas the management/ operation and maintenance of completed facilities are to be undertaken by the water offices acting under the hierarchy of the local governments. After completion of the construction work, the role of the Authority is reduced to offering technical support and advice to the water offices for their operation/maintenance and repair of the facilities and equipment. All the existing water supply systems for the rural population over the country are working under this system. In this project, the water offices are required to recruit the staff vital for the routine operation of the completed facilities, to manage the water service through the collection of water fees from the beneficiaries covering all the expenses for operation and maintenance such as payroll and fuel. As a result of the calculation in this report, the recommended water rates for the four sites range from YR 8.0/m^3 to YR 10.0, which correspond to a level below 5 percent of an average household income of YR 3,000, meeting a vast majority of the residents' willingness to pay confirmed during the field survey. These rates could be reduced, if the government would provide support for their expenditures like wages of employees. Since the ongoing tariff collection is a flat-rate system, the initial operations in the four sites are expected to follow this pattern of billing. To achieve a fair distribution of limited volume of served water in these sites, however, the current method is recommended to gradually switch to the metered-rate method. The project is based upon a planning period of 15 years; a population growth rate of 2.0 to 2.6 percent, conforming to the

criteria of the Public Water Corporation which formerly was responsible for the rural water scheme in South Yemen; a daily per capita service rate of 40 lcd for Moodeyah and 50 lcd for other three sites due to the available production volumes of water in the respective sites.

In view of the total workload and the implementation period controlled under the rules of Japan's grant aid system, it is relevant to divide the execution of the project comprised of four (4) sites into two (2) phases, based upon the priority, locations and work components, as presented in the following table:

Phase	Site Name	Facilities	Specifications
1st Phase	1. Ahwar	Water sources	Existing well x 2 Nos.
		Pumps	Submersible pump x 2 Nos. Booster pump x 2 Nos.
		Pump houses	3 Nos.
		Water tanks	250 & 100 m^3 x 2 Nos.
		Pipelines	ϕ3" - 8" x 12,049 m
2nd Phase	2. Moodeyah	Water sources	Existing well x 3 Nos. New well x 1 No.
		Pumps	Submersible pump x 4 Nos. Booster pump x 2 Nos.
		Pump houses	4 Nos.
		Water tanks	300 & 100 m^3 x 2 Nos.
		Pipelines	ϕ2-1/2" - 8" x 15,235 m
	3. Al-Raidah/ Shamalya	Water sources	Existing well x 1 No. New well x 1 No.
		Pumps	New Submersible pump x 1 No. Exist. Submersible pump x 1 No. Booster pump x 2 Nos.
		Pump houses	5 Nos.
		Water tanks	750 & 100 m^3 x 2 Nos.
		Pipelines	ϕ2" - 6" x 22,130 m
	4. As Sadarah	Water sources	Infiltration Gallery x 1 No.
		Pumps	Intake pump x 2 Nos. Booster pump x 4 Nos.
		Pump houses	3 Nos.
		Water tanks	300 & 50 m^3 x 2 Nos.
		Pipelines	ϕ2" - 6" x 18,822 m

The project is planned to serve safe and stable drinking water to a total population of 80,000 in the four sites at a daily per capita supply rate of 40 lcd (for Moodeyah) to 50 lcd (other three sites). The residents in these

sites are to be released from dependence on unsanitary, contaminated sources such as open wells, cisterns and even water vending. The environment of the communities are anticipated to acceleratedly improve, leading to the conspicuous decrease of rampant infectious disease and digestive organ disorder. In the widespread reliance on water vending at the project sites, the residents purchasing 20 lcd at most have been forced to pay a share of more than 10 percent from their income. With the execution of the project, their heavy burden will be relieved, while enjoying the supply rate more than double the current rate of consumption.

The project has a direct benefit to meet one of the basic human needs of the residents in the project sites, and is anticipated to improve and stabilize their rural life, eventually contributing to one of the government's top-priority policies to promote the rural development. In this view, the project is judged to be viable to be implemented under Japan's grant aid system.

The following points are recommended to be taken into consideration for sustained operation and maintenance of the facilities completed under the project:

1) Establishment of proper water tariff system and improvement of water fee billing/collecting methods.
2) Arrangements for minimizing water leakage in the existing distribution networks
3) Recruitment and training of management/operation staff members adequate for meeting the requirements of the completed systems
4) Institutional arrangement to reinforce the action and function of the local governments in terms of management/operation and maintenance of water systems for the rural population

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LIST OF ABBREVIATIONS

DAC	Development Assistance Committee
DANIDA	Danish International Development Agency
GAREW	General Authority for Rural Electricity and Water
GDLG	General Directorate for Local Government
HWC	High Water Council
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
IMF	International Monetary Fund
JICA	Japan International Cooperation Agency
KFW	Kreditanstalt für Wiederaufbau
LCCD	Local Cooperatives for Cooperation and Development
LDA	Local Development Associations
LPC	Local People's Councils
MAWR	Ministry of Agriculture and Water Resources
MEW	Ministry of Electricity and Water
MLG	Ministry of Local Government
MOH	Ministry of Health

MPD	Ministry of Planning and Development
NWSA	National Water and Sanitation Authority
NWC	National Water Committee
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation And Development
OECF	Overseas Economic Cooperation Fund
PWC	Public Water Corporation
RWSD	Rural Water Supply Department
UAE	United Arab Emirates
UNCDF	United Nations Capital Development Fund
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

CHAPTER I

INTRODUCTION

CHAPTER 1 INTRODUCTION

The Republic of Yemen, located in the southwestern part of the Arabian Peninsula, took shape on May 22, 1990 through the unification of the Yemen Arab Republic and the People's Democratic Republic of Yemen. The united government has since been making hard efforts to achieve true unity of the former two nations through the measures to promote development in effective and efficient manners. Among its strategies, the government has growingly been stressing priority focused on the improvement of infrastructure for the rural population. As one of the measures for supporting its drive, a rural water supply project was formulated, aimed at relieving hardships caused by acute lack of domestic water in twenty (20) rural communities of the southern and eastern governorates of the country where a vast, sparsely-populated area stretches, and the request has been forwarded to the government of Japan for its implementation under Japan's grant aid program. Meanwhile, the Japan International Cooperation Agency (JICA) sent to Yemen a project formulation mission from January 15 to February 13, 1993 (30 days) which carried out the examination of the viablity of the project including the Yemeni side's setup for the project implementation, urgency of each project site and conditions of water sources. Based upon the results of this mission, the government of Japan decided to carry out the basic design study, and JICA dispatched to Yemen a basic design study team headed by Dr. Yuji Maruo, its Senior Development Officer in groundwater development, from November 20, 1993 to December 26, 1993. The team held discussions with the concerned authorities of the Yemeni government and carried out the field survey in order to confirm the background of the request, the objectives and details of planning and the effects and viability of the project, and finally concluded the minutes of discussions with the representatives of the General Authority for Rural Electricity and Water as the executing agency of the project.

This report for the basic design study on the project has been prepared in Japan, through further studies after a mission for the consultation on the draft report, headed by Mr. Kiyoto Kurokawa, First Basic Design Study Division, Grant Aid Study and Design Department, Japan International Cooperation Agency, was sent to Yemen from March 30 to April 7, 1994. It covers the viability of the project, the details of planning, the implementation program, the estimate of the project cost and the operation and maintenance scheme, along with the recommendations. The minutes of discussions, the itinerary of the survey, the member list of the team, the list of personnel interviewed, and other records are attached to Appendix to this report.

CHAPTER II

BACKGROUND OF THE PROJECT

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2.1 Overview of the Republic of Yemen

2.1.1 General

The Republic of Yemen emerged in May 1990 through the unity of the Yemen Arab Republic (commonly referred to as North Yemen) and the People's Democratic Republic of Yemen (commonly referred to as South Yemen). It is located in the southwestern part of the Arabian peninsula, with its capital in Sana'a, the former capital of North Yemen nestled in a central mountainous basin at an altitude of 2,300 meters. Aden, the former capital of South Yemen, has been planned to be transformed into a free port, and a project is currently underway to rebuild it into a nation's central commercial zone. The unification has expanded Yemen's territory to an area of 530,000 km^2 (approximately 1.4 times the size of Japan), having an estimated total population of approximately 14 million (1993). Through these changes, Yemen has grown a significant country on the Arabian peninsula.

The current basis of Yemen's politics is a multiparty system, with constitutional government and president as its head of state. The first democratic elections to elect a parliament (301 seats) were held in April 1993, and subsequently, a three-party coalition government, including the socialist party, has been instated.

Through their former 5-Year plans, both North Yemen and South Yemen made efforts through the development of agriculture to improve the living standards of their rural inhabitants accounting for approximately 80% of the entire populations. In line with this policy to promote rural development in the 5-Year Plan at the time, the development of large volumes of groundwater resources by machine-drilled deepwells began in North Yemen late in 1970s. With the heavy use of groundwater, however, the sharp fall of groundwater level soon became conspicuous in many parts of the country, and depletion of the water resources has currently been of great national concern, and although the government advocates resource conservation, little effect is seen.

In the former South Yemen, Aden had continuously been the focus of development in South Yemen. Except for especially fertile areas, such as the Wadi Hadramout basin, agricultural development has not been successful in the vast barren lands to the east, which remained as underpopulated Bedouin areas until the success of the recent oil explorations.

Prior to unification both governments relied on foreign assistance for infrastructure development, such as water supply facilities for rural inhabitants. Mainly because of the harsh natural environment and tight financial conditions, however, the public water supply scheme has not yet been improved much, even in large cities such as the capitals of Sana'a and Aden: in Sana'a the water service has long been restricted because of shortages of groundwater resources; for Aden, securing sources of good quality water has been a challenge. The circumstances surrounding the water supply for rural citizens have further been straining.

According to the General Authority for Rural Electricity and Water, which is responsible for the rural water supply projects throughout the nation, growth in the rural water supply is approximately 40%. (Yet there are no reliable statistics available.) However, as the statistics related to disease illustrate, along with diseases of the digestive organs, the water-born disease such as bilharzia is spreading through the use of unsanitary water, with the victims tending to be concentrated among infants and children. (The infant mortality rate was 131/1,000 in 1990.) As a result, life expectancy hovers around the mid 40s. This project targets people suffering from the shortfalls of clean and stable water in the less developed southern and eastern governorates of the republic, with its main objective aimed at urgently providing them with the appropriate water supply facilities.

One of the major issues for the present central government is to promote harmony between the peoples of the former North Yemen and South Yemen. Various strategies to promote development in South Yemen were committed by the government, including the provision of water facilities to remote, sparsely populated areas. However, the national economy was seriously damaged by the repatriation of nearly one million workers as a result of the 1990-1991 Gulf crisis/war, which occurred immediately after unification. Lingering inflation also continues to

hinder the progress of the government's development program. The government, therefore, has been under pressure to stabilize the nation both socially and economically.

2.1.2 Population and Administrative Division

The only available census currently in Yemen is the one conducted in the 1980s respectively in the former two countries. The latest Statistics Yearbook (1992), published by the Ministry of Planning and Development, shows only the results of the surveys in the former census: the 1986 census for North Yemen and the 1988 census for South Yemen. Based on the Statistics Yearbook, the combined population of both countries in 1992 is 11,448,031 people. The population for North Yemen is listed as 9,371,692 and South Yemen as 2,076,339 people (figures include expatriate workers). As these figures show, the population of North Yemen overwhelms that of South Yemen, contrary to the sizes of their respective areas, demonstrating the sparseness of the population in the latter.

Under these circumstances the united government has been preparing since last year for its first census, which will take place during 1994. However, because of the significant number of expatriate workers and non-residents in North Yemen and South Yemen, and the need to conduct a careful analysis of census finding, the results will probably not be available for some time. In the previous census for both countries, non-residents represents 1/8 of the total population, and it was impossible to determine whether or not they were permanent or temporary residents. According to the aforementioned Statistics Yearbook, 731,800 workers were repatriated to Yemen during the 1990-1991 Gulf crisis/war (October 1991 survey).

From several surveys conducted by various international agencies in regard to population growth, Yemen's population growth is estimated between 2.0% - 3.6%. However, a 2.5% increase, based upon the survey by the United Nations, is generally accepted as an average figure nationwide. The total population in 1993 is expected to be approximately 14,000,000. Population statistics from both former countries, based on governorate are shown in Appendix 2-b.

Meanwhile the standards for the classification of Yemen's urban and

rural populations are not clear because of the various types and conditions of settlements. Nevertheless, the calculation of the census in both countries defines the urban population at 37.8%.

The highest institution for local administration is the Ministry of Local Government. Six governorates from the South and 11 governorates from the North operate under this ministry. The most important aspects of local administration, such as the levy and collection of taxes and the police, are the responsibilities of the general director of the District Office (Mudirya) under the governor. The "village" (Qariya) is the smallest administrative unit and "subdistricts" (Uzlah in the North, and Markaz in the South) are under the supervision of the District Office. Each governorate consists of 4 to 5 districts, and each district in the South consists of three subdistricts. A re-examination of these administrative units was initiated after unification, but the results have not yet been compiled.

The request for this project targets water supply facility development in 20 rural settlements in five governorates in the South. The half of these are regional water supply projects to cover a broad area whose center is either the district or the subdistrict capital. This may suggest that rural development in the South has been less active even in the core areas.

2.1.3 Economy, Finance, and Industry

According to the World Bank, the country's GNP per capita for 1990 and 1991 after unification was US $540. During the late 1980s, North Yemen and South Yemen were both successful in oil exploration, and economic growth in the North showed a rapid increase as its oil was immediately exported. In the wake of the Gulf war, however, economic assistance to Yemen was suspended and massive numbers of migrant workers were repatriated from the Gulf countries. The coalition government, attempting to restore the economy, was plagued by intense inflation as a result of the sudden decrease in foreign capital and the sudden increase in the number of unemployed. These effects continue to be felt today.

The economy of Yemen had been dependent on assistance from the Gulf

countries and remittances from expatriate workers, at least until the recent successes in oil exploration in both North and South Yemen. Although the North and South have tried hard to develop agriculture since their independence in the 1960s, in what can be considered a relatively good farming environment for the Arabian peninsula, productivity has never been conspicuously improved. This is due mainly to the characteristics of agriculture which mainly depend on precipitation because of shortages of water resources, and a farm system based on the division of land into small lots. Domestic production, in therefore, continues to lag far behind the demand and consequently food products, mainly grains, occupy the top rank among imported items. In terms of exports, petroleum occupies approximately 90% of the country's revenues. (Present daily volume is 200,000 barrel; 320,000 barrels if the new development of South Hadramout is included.) As oil prices has been sluggish in international market, Yemen's position vis-a-vis the acquisition of foreign capital is not improving. With the creation of a new government system with the elections in April 1993, economic rehabilitation has become the most important issue among others. (Appendix shows the recent major economic indices for Yemen.)

2.2 Present Situation of the Water Sector

2.2.1 Water Resource Environment

North Yemen and South Yemen are dominated by a dry climate, and water resources are difficult to secure. Quite naturally, water resource development and conservation plans are always listed among the priority policies in the national development plan. There are few rivers in both regions where water flows year-round; water resources in this country is directly linked with groundwater resources. The conventional approach to water resources in the North, however, is slightly different from the South.

As a result of the large-scale groundwater developments conducted by government and the private sector in the late 1970s in line with the strategy of the national development plan, and the subsequent heavy use of groundwater, the sharp fall of groundwater level has grown conspicuous in many parts of Yemen, and depletion of the water resources is currently of great concern. The government created the "High Water Council" (hereafter HWC), at the Ministry of Electricity and Water, to resolve this problem. Early decisions taken by the HWC were anything but effective, and an organizational reform was initiated in 1986 by the chairman, and a secretarial bureau was established to act as the executing agency in an attempt to strengthen the organization. The council's organization was strengthened again in 1988 by assistance from the UNDP. It is the goal of the council to create a data base for the water resources throughout nation as well as propose and enact groundwater regulation laws.

While groundwater development (deepwell drilling) became active in the market economy of the North, drilling in the South was exclusively conducted by the "Public Drilling Corporation". Because of a social system which recognized exclusive drilling rights, the supervision of groundwater resources was far easier in the South than in the North, and drilling for a public water supply plan was given a top priority among others. This type of control was enforced by the Water Resources Division of the Irrigation Bureau, which was the former Ministry of Agriculture and Agrarian Reform in charge of water resource control throughout the former South Yemen, and the National Water Committee, which was the highest water agency in that part. After unification,

however, drilling companies in the North, having an eye on a potential market, began operations in the South, and the conditions surrounding drilling operations there are now beginning to change.

The control of groundwater resources which are limited in quantity and scattered in locations is extremely difficult. Yet this is one of the most significant elements for the country's sustainable development in the future to be addressed in serious manner. The government strongly requests that each sector offer cooperation to the HWC, in particular the agricultural and water sectors. This is an unavoidably important issue for the future of Yemen.

2.2.2 Water Administration

The government took steps to unify the institutions for water projects nationwide, and by the presidential decree the system was revamped. Through such measures, major related agencies are now under the supervision of the Ministry of Electricity and Water (hereafter the MEW) of the national government. The following is a chronological outline of the process that resulted in this system.

1) The "Public Water Corporation" (hereafter the PWC) supervised water projects in South Yemen, and was incorporated into the MEW in 1990.

2) The "Rural Water Supply Department" (hereafter the RWSD) supervised rural water projects in North Yemen, which became the executing agency for rural water supply projects nationwide in 1990, including the entire South.

3) The PWC became in 1992 the Aden branch of the "National Water and Sanitation Authority (hereafter the NWSA), which supervised urban water projects in North Yemen.

4) The RWSD was restructured into the "General Authority for Rural Electricity and Water" (hereafter the GAREW) in 1992.

5) The GAREW Aden branch was founded in 1993 for supervising projects in the southern part, with its main staff transferred from the NWSA Aden branch, including the manager.

Prior to unification urban water projects in North Yemen were implemented by the NWSA, which supervised the water projects in six major cities in the northern part, while the RWSD was the executing agency for the rural water supply projects. On the other hand, the PWC in South Yemen was in a position to exert its influence over both urban and rural water projects, entrusted with combined functions of its northern counterparts across the entire region of the southern part. However, as a result of government changes after unification, a system has been created in which the NWSA is responsible for the nation's urban water supply, while the GAREW (established in 1992) is responsible for the rural water supply.

The major roles of the above agencies consist of project planning, surveying, design, and construction. The operation of completed water supply facilities in urban cities is directly managed by the NWSA or its Aden branch. In contrast, the respective local governments which benefit from the supply of rural water must assume responsibility for its operation and maintenance. At the present time, all offices of the governorates belong to the "Ministry of Local Government" (hereafter the MLG), and the district offices, which function as minor governorate institutions, are in direct charge of rural water supply. In the South, the operation and maintenance of water resources and the development of rural water supply facilities are still undertaken mainly by such institutions of the governorates, and the national government encourages local governments to independently develop water supply facilities, even if on a small scale. In the North, the governors have no direct function with rural water supply projects, except for administrative steps such as acting as a mediator in conflicts. The main role in this sector in the North is taken over by the local development promotion agencies, "Local Councils for Cooperation and Development" (hereafter the LCCDs), belonging to the MLG, which were established in each district to play a central role for rural development. However, the realities confronting the local governments and agencies in each region are quite different, and they do not always function well or follow the regulations stipulated by the government. For example, in locations far from the central administrative area, there are many independently operated and managed community water supply facilities.

The objective of this project is to develop water supply facilities

which target rural communities in the former South Yemen. This project is to be implemented under the present organization and conditions, and the agencies directly involved are roughly divided into two groups: the GAREW and local governments. Local governments are defined as district offices (if the project area is a district) or district branch offices (subdistrict) or settlement communities. The following is an outline of the agencies related to this project.

(1) General Authority for Rural Electricity and Water (GAREW)

The GAREW was established by a presidential decree to promote rural electrification and water supply projects throughout nation. Its original body was the RWSD which was established in 1972 as part of the Ministry of Public Works in North Yemen (currently the Ministry of Construction). The RWSD was transferred to the MEW in 1988 in line with the government's policy to integrate water administration. After unification, the GAREW was established to improve the rural social capital through the rural water supply planning, together with the rural electrification policy which had been supervised by the "Yemen General Electric Corporation", organized under the MEW. This was a timely reorganization. While the water supply sector continues to operate their longstanding policies, the electrification division remains yet to launch its regular activities as it is just recently established.

The GAREW, by the presidential decree, established the following functions and responsibilities.

a. Through cooperation with related agencies, the GAREW implements water resource development to ensure drinking water for other living purposes in rural communities. The GAREW is also involved in water intake and water storage plans.

b. The GAREW implements the designs, planning, and construction for single water supply projects which target populations less than 30,000.

c. The GAREW implements the necessary measures for water

resources conservation and pollution countermeasures through cooperation with related agencies.

d. The GAREW implements the necessary measures to prevent health and sanitation problems caused by inappropriate water usage in rural settlements.

e. The GAREW provides technical support and instruction related to the operation and maintenance of water supply facilities in rural communities.

As stated clearly in the decree for the establishment, the major responsibilities of the GAREW are the planning, design, and construction of rural water supply projects with populations less than 30,000. In regard to the operation and management of water supply facilities, the GAREW's responsibilities are limited to technical support and training for rural settlements involved in the actual operation of these water supply facilities. Including the era of the RWSD, the GAREW has been the executing agency until the Phase IX of the rural water projects with Japanese grant-aid for North Yemen. Although the GAREW is also to play the same role for this project, the actual operation of the facility upon completion will be transferred to the beneficiary local governments. The GAREW's major role thereafter will be technical support for rural communities, including operation instruction, inspection of malfunctions, and advise for repairing.

The total number of the GAREW's employees currently are approximately 250. Although only temporary as yet, the organization of the GAREW is shown is Fig.-2.1.

The investment plan of the GAREW in fiscal 1993 appropriates 300 million rials (Yemen currency) as opposed to RWSD's 219 million rial plan proposed in 1991 just after unification. The government budget for this plan is not announced and the exact figures are unknown. The GAREW must anyhow to address to implement the water supply project in the South in the future with limited financial resources as well as those in the North. It is therefore expected that they will depend more on

development assistance.

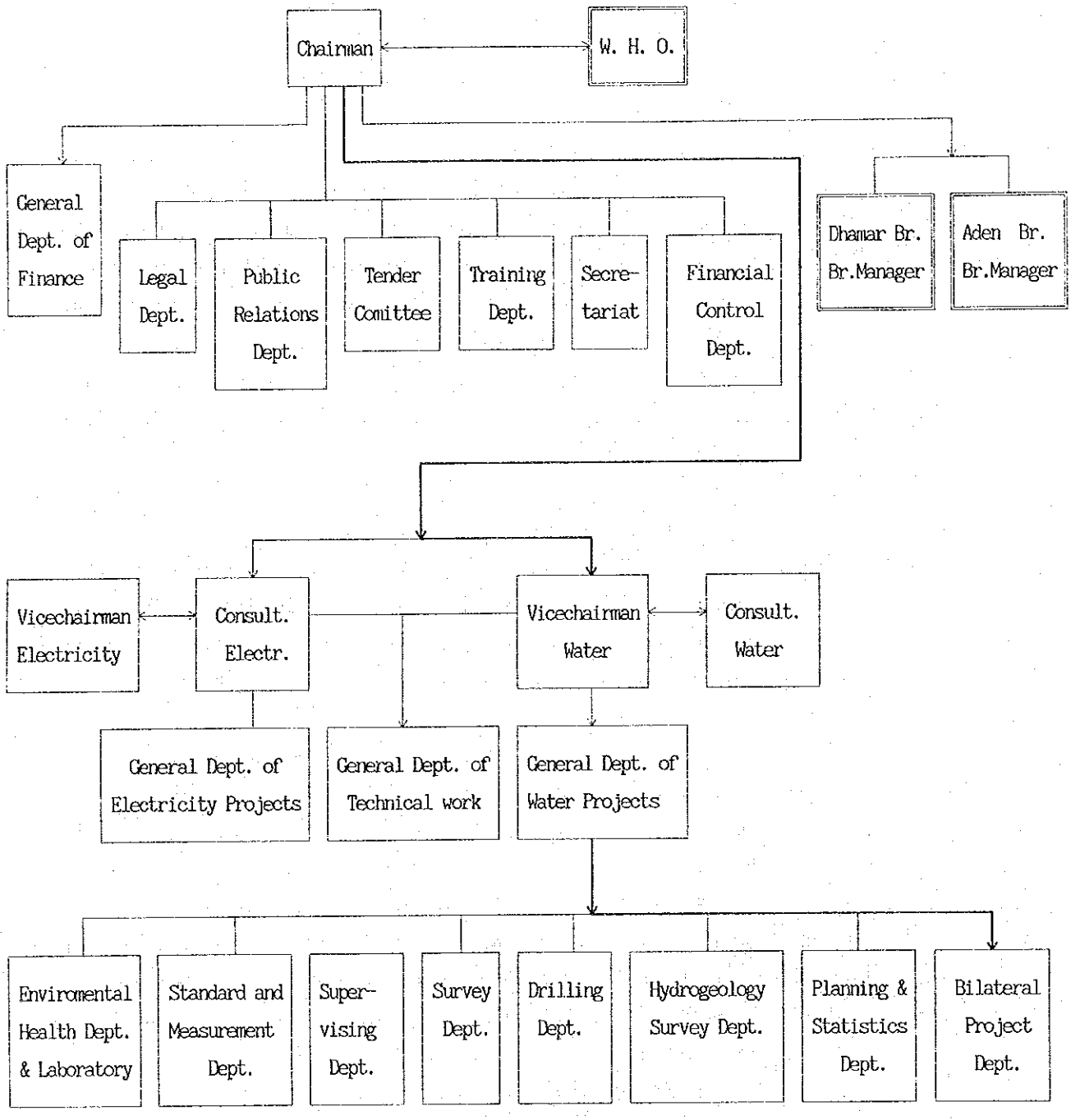
(2) National Water and Sanitation Authority (NWSA)

The NWSA was established by assistance from the World Bank (IDA) in 1973 as the executing agency for the water supply project for the North Yemen's capital of Sana'a. Initially organized as one wing of the MEW in North Yemen, the NWSA has now grown a massive national agency in the water sector, including not only the former PWC as its Aden branch but also other branches of the PWC located in the core cities in the southern part. However, the head office and branch offices continue the operations in the original area, functioning nearly as before, and actual activities of the respective offices are not much different from the conventional ones.

The headquarters in Sana'a supervises six major cities in the northern part. These include: Sana'a, Taizz, Hodeidah, Ibb, Dhamar, and Hajjah. The city water in these areas was all developed through assistance from international agencies and Western countries, and is managed by the NWSA branches in each area.

The PWC in South Yemen was established in 1970. The organization was enhanced through assistance from the IDA in 1978. The subsequent assistance from the IDA was extended to the water projects in Aden, in Al-Mukalla which is the second largest city in the southern part as the capital of Hadramout governorate, and in Sayun, another major city in the southern part, located deep inland along the Wadi Hadramout. The former PWC branches in the two cities in Hadramout, Al-Mukalla and Sayun, are now NWSA branches engaged in regional water management.

Fig.-2.1 Organizational Set-up of GAREW (1993)



Although its initial function and major role were thus the management of urban water system in South Yemen, the PWC also played an active role in the development of rural water supply. It supplied pumps and other materials/equipment to rural communities as the executing agency for the rural water supply scheme through the government's special budget (US $1.5 million) in 1986. As well, it continued to make efforts to technically support the establishment of local governments' water supply plans. (Twenty projects involved in the request from the Yemeni government for this project have been selected from those which had these days been surveyed and planned by the PWC, based upon the consultation between the PWC and the local governments.)

The PWC's efforts in the rural water sector further involved the establishment of local offices in the four important bases in two governorates adjacent to Aden, namely Lahj and Abyan, and these local offices have since been engaged in promoting the water supply and operating the water supply facilities in the base areas. (The Tor Al-Bah branch in Lahj governorate, mentioned in Chapter 3, is one of these local offices.) The national government established the GAREW Aden branches in 1993; its employees consist of former PWC employees in consideration of the rural water supply conditions in the South.

(3) Local Governments

Prior to unification, the central organizations to supervise the local administrations were the MLG located in North Yemen and the "General Directorate for Local Governments" (hereafter the GDLG) located in South Yemen. The MLG absorbed the GDLG after 1990. The ministry implements the government's rural social development plans and is responsible for the enhancement of core areas in each region as well as the supervision of projects.

In North and South Yemen, from the 1970s to the early 1980s soon after independence, each local government agency began to develop small-scale water supply facilities for villages, mainly drilling deepwells to secure water sources. Along with the development of the water agencies of the national government, activities in the construction field by local governments were phased out, especially in North Yemen and the focus was shifted to the

operation and maintenance of facilities constructed by the agencies of the central governments. In the rural communities in the North, where the influence of tribal society is still strong, all of the facility operation costs, including employee salaries, were commonly managed through an independent profit system for each facility, and no subsidies were provided from the government.

On the other hand, local government activities in the South in the water sector has relatively been active because of the presence of water offices established within the district offices and the development of rural water supply facilities through the cooperation with the former PWC. In particular, in the remote areas such as the governorates of Shabwa and Al-Mahara, the water supply departments of the governorate offices is functioning as the central agency for the promotion of regional water supply as there are no local PWC offices.

In the South, "water offices" have been established in the district offices under the control of the governments of the governorates, and they operate their facilities. The position of the organization of the water offices is different in each area, and water offices are not always incorporated in the formal administrative organization (in places operated as a private enterprise for water service responsible for the district director), and their positions are not always the same. Salaries for water office employees are paid in two ways. One is paid by the government of the governorate and the other is paid by through the independent-profit system, as is prevailing in the North. As a general rule, those who benefit pay for the fuel and repair costs for all facilities.

The facilities to be constructed through this project will be operated and managed by these water offices. It is necessary to create a plan for sustainable water supply, under close attention and technical support from the GAREW, which now controls the nationwide rural water supply under the unified government.

2.3 Outline of the National Development Plan

National development plans for North and South Yemen began in the 1970s. Unification of the country occurred during the final year of the third national development plan. The previous plans were formulated with assistance from the World Bank in the North and the former Soviet Union in the South. Investment plans and results significantly depended on bilateral or multilateral assistance for both countries. Although the final third plan showed a trend to shift its emphasis to industrial development by the efforts of the private sector in a background of the oil exploration success during the plan, rural and agricultural development had constantly been the primary focus, and a significant weight had been given to the development of water sources and the rural water supply related to rural development. The performances of the agricultural sector through these plans, however, could not live up to expectations, always lagging far behind in terms of targeted goals.

A new development plan was expected to emerge soon after the unification. The united government set the period of 30 months after unification as the "transitional period" (until December 1992) to move to actual integration of both nations. Although a one year investment plan was established during this period, the prospects for the emergence of a new plan still lingered. The elections of the members for a new parliament, which was to be carried out during the transitional period, also did not come. During this period, however, various steps were taken by the government to establish a new program. It is suggested that the unexpected events such as Gulf Crisis/War and the paralyzed economy are partially responsible.

Under such situation, the final development plan has not yet been announced, although the government did announce a major policy for economic development in June 1990 soon after unification. The National Reform Program was approved by the temporary government in 1992, and the direction for development is now being discussed. The objectives of this program are (1) improving the national living standard, (2) meeting the various needs of the nation, (3) establishing sound government finances, and (4) increasing productivity and investment in each sector.

The following approaches are underscored in this Program.

1) Improvement of development plans based on the actual social and economic conditions and a population policy; and an improvement in the methods to control natural resources.

2) Increased reliability and efficiency in public service

3) Promotion of a market economy environment

4) Development for human resources and social services

5) Sustainable use of natural resources, especially water

Among these approaches the population plan is a new feature. The objective of this plan is to restrict the growth in population, while decreasing infant mortality and prolonging life expectancy, based on the Action Plan adopted by the "National Population Policy Conference" in October 1991. In order to achieve these objectives, growth in the rate of the safe and stable water supply is to be increased to 80% among the total population. As well, the crisis in the water resources in recent years was emphasized, and the establishment of a rule to effectively share limited resources based on sectors is advocated. The development of infrastructure in remote areas is especially targeted in regard to water supply.

2.4 Trend of Development Assistance for the Water Supply Sector

The major portion of bilateral assistance to the rural water sector has been provided by Germany, Holland, America and Japan (refer to Table-2.1 in regard to total amount of assistance to the GAREW up to 1993; the list of loans and grant aid projects from Japan are shown in Appendix 2-d). The following is a comparison of assistance provided by those countries.

(1) Germany

Germany has assisted in environmental development, targeting wide-range rural water supply and middle-scale cities through KFW. Germany developed the city water supply in Ibb and Hajjah,

which are now operated by the NWSA. Germany installed an activated sludge treatment plant which is not common in Yemen, and this has attracted much attention.

Germany initiated a regional water supply plan for the Arhab District in Sana'a governorate (approximately 50 km north of the capital, Sana'a). In the first half of the plan, together with the social and economic surveys, Germany surveyed a entire area of the district for confirming the possibility of groundwater development in the broad limestone platform where groundwater occurrence is complex and difficult to probe into, and Germany began a drilling project for 15 deepwells in 1993. An UAE's multinational company was selected as the contractor through a international tender. If this drilling project succeeds, a regional water supply will be designed for approximately 130 villages within the district. The GAREW is the executing agency for this project.

Germany formerly undertook a regional development plan in the district capital of Al-Mahabisha, which is a core city in the central mountainous zone in North Yemen. (The major objective of this project is regional electrification, and the Yemen General Electric Corporation was the executing agency.) However, water source development did not succeed due to the poor performance of a local drilling contractor. Therefore, Germany is now very cautious in its groundwater development. Germany's projects are large scale and implemented over the long term, and operate with the goal of comprehensive rural development.

(2) Holland

The rural water supply project by Holland began in relation to its support for agricultural development in Yemen; the core of the development is central Dhamar (100km south of Sana'a), which is the granary in North Yemen. As well, US $26 million has been earmarked for a water and sewage development project in Radah City in Dhamar, which began in 1987.

The Dutch rural water supply projects have targeted middle and small-scale settlements since 1979, with the purpose of assisting rural water supply projects of the RWSD. However, Holland failed

in water source development from the very beginning of the project, and its rural water supply projects have since been undertaken for other facilities than water sources such as pumps and distribution networks for the communities where the RWSD has successfully installed deepwells for water sources under its own projects. The Dutch projects are similar to those of Japan in terms of site, scale, and details, except for the following three points:

a. Excludes drilling
b. Limits the project area and target communities in the govenorates related to its agricultural development projects.
c. Tender is conducted locally and the contractors are all Yemeni companies.

The Fourth Water Supply Program to support the GAREW has been implemented since 1991 at a cost of 13.25 million guilders.

In the water resource field, a million dollars in technical support to the "Ministry of Oil and Natural Resources/Water Resources Department" has been spent every year for the past 12 years for the purpose of preparing a nationwide water resource data base. Holland will provide approximately 10 million dollars in assistance between 1988 and 1995 for the development of alternative water sources to deal with the water crisis in the capital, Sana'a, where the threat of water resources depletion is reportedly imminent. Furthermore, Holland's positive assistance activity covers two million dollars for the "Higher Water Council" Strengthening Program by the UNDP, for establishing water resource conservation program beginning in 1994.

After unification Holland began a regional environmental development project (mainly water supply and sewage treatment) in Ataq, the capital of Shabwa governorate in the southern part, and a survey is now being conducted. Holland is providing the largest amounts and the widest range of assistance in the water sector.

(3) Japan

Saudi Arabia first launched rural water supply projects in Yemen,

constructing deepwells and supply facilities in 38 areas starting in 1973. Following Saudi Arabia, Japan's OECF mission was dispatched to Yemen, and Japanese assistance began with a loan project. This project was implemented between 1979 and 1983, and targeted 42 areas scattered throughout North Yemen, targeting approximately 150,000 people.

A grant-aid project followed the loan project in 1981 and currently the Phase-9 Project is being implemented. Until the late 1970s when Japan followed Saudi Arabia for assistance in the water sector, there had hardly been any deepwells in Yemen. Japanese groundwater development technology, the most advanced at the time, was the focus of attention. However, companies from the Gulf countries began operations using drilling rigs, and assisted by the policies of the National Development Plan encouraging groundwater development, a drilling boom came in Yemen. The number of deepwells increased dramatically, and the construction of water supply facilities including distribution networks then called "improved type" became the mainstay. The grant-aid projects, over a period of nine terms, targeted a service population of approximately 100,000 people. One of the characteristics of the Japanese project is that the project areas are scattered throughout the North.

Assistance for the RWSD and later for the GAREW from these Western countries is summarized in Table 2-1. America, which began assistance in the rural water sector at the same time as Japan and provided continued assistance to RWSD, shifted its focus of assistance to different field in 1988.

America has provided 35 million rials in assistance based on a preferential product loan for grain purchase in 1993, and with this fund the GAREW is now implementing water supply projects which targets 46 areas.

In regard to urban water supply, both North and South Yemen have depended on assistance mainly from international agencies. As discussed in section 2.3, water supply systems were developed by the World Bank/IDA in the capital of Sana'a and in the former capital,

Aden, in the South. Along with the establishment of the NWSA in the North and the PWC in the South, the diverse measures to expand and reinforce these organizations were implemented by various international agencies. Agencies of the United Nations also provides assistance in the North and the South. As the South hardly received any assistance from Western countries, the activities of these agencies were remarkable. The following is an outline of the assistance provided by these agencies in the water supply sector, mainly in the South.

(1) World Bank/IDA

Water facilities in the capital of Sana'a and the port city of Hodeidah in North Yemen were developed through a joint loan from the World Bank/IDA and the Arab Fund. Water supply system in the former capital of South Yemen, Aden, has continually received assistance from the World Bank/IDA. The loan reached a total of US $130 million, offered mainly from international agencies to major city water developments in the South. IDA has contributed US $41 million of this amount. The following lists the major forms of assistance.

a. 1980 Aden water improvement project (US $13.2 million)
b. 1981 Al-Mukalla water improvement project (2.9 million SDR)
c. 1983 Sayun water improvement project (6.5 million SDR)
d. 1986 Second Aden water improvement project (5.3 million SDR)

Table 2.1 List of Projects with Bilateral and International Assistance to Former RWSD and GAREW

COUNTRY (ORGANIZATION)	PHASE	YEAR	TYPE		AMOUNT(F/C)	AMOUNT(YR)
ABDHABI		1974	GRANT	EQUIPMENT/MATERIALS SUPPLY	$2,533,191	12,000,000
STATE OF QATAR		1975	GRANT	E/M SUPPLY	$568,085	2,670,000
UNCDF		1981	GRANT	E/M SUPPLY + TECHNICAL COOPERATION	$5,531,914	24,870,000
WHO			GRANT	TECHNICAL COOPERATION		10,000,000
JAPAN	1	1974-87	GRANT	CONSTRUCTION	¥500,000,000	215,803,000
	2	1982	GRANT	CONSTRUCTION	¥500,000,000	
	3	1983	GRANT	CONSTRUCTION	¥600,000,000	
	4	1986	GRANT	CONSTRUCTION	¥319,000,000	
	5	1987	GRANT	CONSTRUCTION	¥915,000,000	
	6	1988	GRANT	CONSTRUCTION	¥961,000,000	
	7	1991	GRANT	CONSTRUCTION	¥587,000,000	
	8	1992	GRANT	CONSTRUCTION	¥531,000,000	
	9	1993-94	GRANT	CONSTRUCTION	¥542,000,000	
GERMAN	1	1984	GRANT	E/M SUPPLY CONSTRUCTION	DM5,000,000	13,016,000
	2	1987	GRANT	CONSTRUCTION	DM5,000,000	37,500,000
	3	1993	GRANT	CONSTRUCTION	DM8,000,000	
KINGDOM OF SAUDI ARABIA	1	1973	GRANT	CONSTRUCTION	SR100,000,000	236,940,000
	2	1983	GRANT	CONSTRUCTION		
	3	1991-94	GRANT	CONSTRUCTION		146,000,000
KINGDOM OF THE NETHERLANDS	1	1976	GRANT	CONSTRUCTION	DG4,450,000	92,528,000
	2	1984	GRANT	CONSTRUCTION	DG7,350,000	
	3	1986	GRANT	CONSTRUCTION	DG10,000,000	
	4	1991-94	GRANT	CONSTRUCTION	DG13,250,000	
UNITED STATES OF AMERICA	1	1980	GRANT	CONSTRUCTION	$6,600,000	49,500,000
	2	1984-89	GRANT	CONSTRUCTION	$12,500,000	90,500,000
	3	1993-	GRANT	CONSTRUCTION		35,000,000
UNICEF(PHC)	1		GRANT	E/M SUPPLY CONSTRUCTION		26,000,000
	2					
	3	1994-	GRANT	E/M SUPPLY CONSTRUCTION	33,000,000	
SWISS		1984	GRANT	CONSTRUCTION	$4,950,000	3,583,000
JAPAN		1978-83	LOAN	CONSTRUCTION	¥3,880,000,000	65,425,000
REPUBLIC OF IRAQ		1977	GRANT	CONSTRUCTION	$5,320,000	25,000,000
ARAB FUND		1984	LOAN	E/M SUPPLY	KD700,000	12,530,000

These projects were implemented through a joint loan from DANIDA (US $22.5 million), the Arab Fund (US $8 million) and the Kuwait Fund. The total amount by 1995 will reach US $54.7 million.

e. 1988 Al-Mukalla water project (8.7 million SDR)

f. 1990 Tarim regional water supply project (under appraisal)

Together with facility construction, the World Bank/IDA reconstructed and enhanced the operation, structure, and system of the former PWC in Aden, and implemented water facility development in the second largest city, Al-Mukalla, and the ancient capital of Seiyun, both located in the South. PWC branches were established in the two locations and assisted in the continuous operation of constructed facilities. The branches in each area operated and maintained their own facilities as well as played an important role in promoting rural water supply plans as a central organization to supervise rural water supply sectors before unification. After unification these branches became NWSA branches, and the direct relationship and responsibilities for rural water were legally transferred to the GAREW. Therefore, these branches are now engaged in city water management in Al-Mukalla and Sayun as their major responsibility.

Among the project areas, Aden and Al-Mukalla are modern port cities along the Gulf of Aden. Sayun and Tarim are historical cities located in the Wadi Hadramout, where there is an abundance of groundwater resources, and reflect the atmosphere of rural cities. The regional water supply plan, targeting 30 settlements and 75,000 people, mainly in the Sayun district capital, is now completed. This system is operated by the NWSA Wadi Hadramout branch, which was established through this project. The project will begin in Tarim, which is located 30 km from Sayun, and targets the water supply over a broad area, including the Tarim subdistrict capital of the Sayun district and surrounding villages. The facility is scheduled to be operated by the NWSA branch, as in Sayun. (Another regional water supply project targeting a local city and surrounding settlements are being implemented for Al-Abous district in Lahj governorate and surrounding villages, targeting a rural population of 50,000. This project received capital assistance from Arab agencies, such as the Arab Fund, Kuwait Fund, and OPEC. The NWSA Aden branch is

the executing agency for this project.)

(2) United Nations' Agencies

While the World Bank mainly provides assistance for city water, United Nations' agencies such as UNDP, UNICEF, UNCDE, and WHO have been providing assistance mainly in rural water supply areas in North and South Yemen. These agencies assist in reinforcing a structure for government executing agencies and in improving their technical levels through technical cooperation. As well, they have continued to develop and improve water supply facilities by means of providing materials/equipment. The following is an outline of each agency's activities.

1) UNDP

The assistance from UNDP to the water supply sector in South Yemen was mainly technical cooperation related to the "Bedouin Development Program" by the General Directorate for Local Government, which was promoting rural water supply (especially to secure water sources) from early 1970s. (Between 1973 and 1981 the UNDP offered approximately US $5 million in assistance to enhance the General Directorate for Local Government's organization and to provide drilling rigs. UNDP continually supported this project until the late 1980s.) After unification the UNDP promoted a plan of the "Strengthening of the HWC", which aims at nationwide water resource conservation control, as mentioned in section 2.1.1. Their preparation phase is over and UNDP will begin to create a data bank and to establish regulatory laws which target control of groundwater development for agriculture, which has been left without any regulations. This will be conducted through a joint investment with Holland between 1994 and 1998.

2) UNICEF

UNICEF dispatched experts and provided materials/equipment to the rural water supply sectors in North and South Yemen. The following is a record of their activities.

1981-1988 North Yemen rural water supply/health plan:

dispatched experts and provided equipment.

1986-1990 South Yemen rural water supply/health and sanitation plan: dispatched experts. This project was conducted mainly through a South Yemen government fund as well as assistance from DANIDA and AGFUND. At a cost of US $11 million, water supply development was implemented in 70 rural communities in six governorates in the South. The executing agency was the PWC.

1994-1998 Rural water supply development plan: the major objective is the rehabilitation of existing facilities in 25 areas for each of four governorates nationwide. The executing agency for this project is the GAREW, and the total cost is US $3.3 million.

Among these activities the rural water supply projects from 1986 regularly dealt with the rural water supply in the South. The PWC consolidated its own position in the rural water sector, which had been handled by the General Directorate for Local Government.

Along with these activities, Arab agencies have also played an important role in the rural water supply development in South Yemen. A regional water supply project now underway in Al-Abous, discussed earlier, is one of the forms of assistance from an Arab agency. For 26 sites among the large district capitals and subdistrict capitals nationwide, a water supply project was implemented by the Arab Fund starting in 1984. For this project, the Arab Fund covered the foreign currency and the government fund, mainly construction costs. The water supply systems in Tor Al-Bah (in Lahj), which were also one of the targets for this project, and in the surrounding communities, were constructed at the time through an investment of approximately 800,000 Yemen dinars (21 million rial). (The government paid 65% of the investment cost.)

2.5 Background and Contents of the Request

In line with one of its major policies to promote the rural development, the government of the Republic of Yemen formulated a rural water supply plan and requested to the government of Japan to execute it with grant aid. The project targets 20 areas in five governorates of the southern part of the country where urgent development of water supply facility is necessary due to serious shortages of domestic water. The executing agency is the General Authority for Rural Electricity, which after unification, exclusively handles the rural water supply projects throughout the nation.

A greater part of the requested 20 rural communities are centers for local administration, which are already in possession of diverse water supply facilities. However, acute water shortages, compounded by deteriorating water quality, prevent basic water services to their residents. They depend on expensive water vending and are forced to suffer heavy economic burdens. The current water practice of using unsanitary water cannot cease due to widespread water shortages, and prompts the increase of waterborne disease and digestive organ disorder in rural communities throughout nation.

The request from the Republic of Yemen is summarized as follows:

(1) Contents of the Request

The project sites with high priority are selected from the twenty(20) target areas in five(5) governorates in the territory of the former South Yemen for the rehabilitation of existing water sources, the development of new water sources, the installation of pumps, and the construction of water tanks, pipelines, and standpipes.

(2) Project Area

The project sites with an outline of their present situation are listed in Table-2.2.

The objective of this basic design study is to examine the contents of the request and the present situation in the project sites with reference to the results of the "project formulation study"; to formulate the most appropriate plan to implement the project; and to

carry out the basic design study for the scope and details of facilities and materials/equipment required for the implementation.

Table 2.2 Current Situation of the Sites under the Request

No.	Site Name	Gaver-norate	Existing water source	Project water source	Popu-lation	No. of Villages	Geomorphology	Project drawings
1	Al-Faith /Bani Baker	Lahj	Open Well* Old network	Open Well under construction	15,650	2	Mountainous	Not avail
2	Ahwar	Abyan	Deep Well	2 Deep Wells	15,367	12	Plain	Not avail
3	Hadinat Ba Qatmi	Shabwa	Open Well Water carried by Donkeys	2 Deep Wells	4,815	19	Pain/Desert	Available
4	Al-Raidah /Shamalya	Hadramout	Deep Well	2 Deep Wells	12,135	27	Plain	Available
5	Hoof/Gader	Al Mahara	Open Well	2 Deep Wells	2,217	2	Plain	Not avail
6	Jabel Halmin	Lahj	Open Well Spring	2 Deep Wells	6,575	8	Mountainous	Preliminary survey
7	Moodeyah	Abyan	Deep Well	2 Deep Wells	7,250	17	Plain	Not avail
8	Shrrog Bakily	Shabwa	Spring	Collecting of water from spring	1,000	11	Hilly/Desert	Available
9	Al-Radood	Hadramout	Open Well	2 Deep Wells	6,014	7	Plain	Available
10	Harut/Dabut	Al Mahara	Open Well /Salty Water extracted by bucket	2 Deep Wells	2,385	2	Plain	Under design

11	Tukar	Lahj	Open Well Water carried by women	2 Open Wells	2,422	27	Plain	Available
12	Rosud	Abyan	Open Well	2 Deep Wells	2,635	21	Plain	Not avail
13	Al-Mafod /Ermah	Shabwa	Collecting water from digging holes	2 Open Wells	2,735	18	Plain	Available
14	As Sadarah	Hadramout	Spring water	2 Deep Wells	4,500	18	Plain	Not avail
15	Badeyat Al Zeyad	Al Mahara	Open Well	2 Deep Wells	2,700	3	Plain	Not avail
16	Adeenah	Lahj	Open Well Water carried by women	2 Open Wells	1,332	6	Mountainous	Available
17	Gaishan	Abyan	Open Well + Surface water	2 Open Wells	5,085	28	Plain	Available
18	Jaba /Al Hanak	Shabwa	Open Well	2 Deep Wells	1,917	6	Plain	Not avail
19	U-One	Hadramout	Open Well	2 Deep Wells	1,716	3	Plain	Not avail
20	Rekhoot	Al Mahara	Open Well	2 Deep Wells	3,200	3	Plain	Not avail

Note: Open wells are hand-dug shallow wells, usually 2-4 m wide and 10 to 30 m deep, with or without stone or brick wall, while deep wells involve every boreholes drilled by the machines with or without steel casing, regardless of its drilled depth.

CHAPTER III

FEATURES OF THE PROJECT SITES

CHAPTER III FEATURES OF THE PROJECT SITES

3.1 Outline of the Project Sites

3.1.1 Candidate Sites Requested by the Government of Yemen

Based upon the decision by the government of Japan in response to the request by the government of Yemen for grant aid for a water supply project involving 20 rural communities in the southern and eastern governorates, the Japan International Cooperation Agency (JICA) dispatched the "Project Formulation Survey Mission" to Yemen in January 1993. The purpose of the mission was to examine an appropriate framework of the project based on the examination of various conditions related to the implementation of the project. These conditions included (1) the intensity of urgency in each project site, (2) the possibility of securing safe and stable water sources, and (3) the accessibility of the sites. The mission revealed that among the 20 sites in the request, there were the areas where projects had already been completed or underway by the Yemeni side. Therefore, through the discussions with the Yemeni side, the following 20 sites were agreed to be designated as the candidate sites for the project (including the substitutes for the completed sites).

Table-3.1 List of the Candidate Sites for the Project (Jan.1993)

Number	Site Name	Governorate
1.	Al-Faith/Bani Baker	Lahj
2.	Jabel Halmin	Lahj
3.	Tukar	Lahj
4.	Adeenah	Lahj
5.	Ahwar	Abyan
6.	Moodeyah	Abyan
7.	Rosud	Abyan
8.	Gaishan	Abyan
9.	Hadinat Ba Qatmi	Shabwa
10.	Shroog Bakily	Shabwa
11.	Al-Mafod/Ermah	Shabwa
12.	Jaba/Al-Hanak	Shabwa
13.	As Sadarah	Hadramout

14.	Mayfa	Hadramout
15.	Bor	Hadramout
16.	Al-Radood	Hadramout
17.	Al-Raidah/Shamalyah	Hadramout
18.	Rakhawat Sharqia	Al-Mahara
19.	Harut/Dabut	Al-Mahara
20.	Al-Faydami	Al-Mahara

Note: No.14 (Mayfa), No.15 (Bor) and No.20 (Al-Faydami) are substitutes, based upon the request by the Yemeni side.

This basic design study has made reference to the results of the Project Formulation Study of the above 20 project sites in order to conduct an effective and efficient field study. In an effort to confirm the actual conditions at each project site, the study team exchanged views with the concerned officials of the Republic of Yemen, collected relevant information and made a questionnaire survey on the current situation. As a result of such efforts on both sides, the nine (9) candidate sites out of twenty (20) were selected for the technical field survey for this basic design study, as will later be described in detail in Chap. 2, Sec. 3.2. This section reports on the outlines of the 20 candidate sites, based upon the data and information obtained through such process.

3.1.2 Socio-Economic Conditions in the Candidate Sites

In the territory of the former South Yemen, the focus of development was concentrated in the capital city of Aden, leaving infrastructure of the rural area lagging behind. In regard to the water sector, the efforts to address the development of water supply for the rural population remained sluggish until 1986 when the government committed to undertaking it under the third 5-Year National Plan and assigned the PWC as the executing agency of the project. With this arrangement, the function of managing the rural water supply scheme virtually shifted from the MLG to the PWC, and larger numbers of projects were executed under its auspices. (Refer to Chap 2, Sec. 2.2.2) The 20 candidate sites in the request from the Yemeni government were selected, based upon the consultation between the PWC and the local governments, among the sites formerly planned and surveyed by the PWC, which had been either partially completed or left untouched.

According to the examination by this basic design study, a greater part of these 20 sites are among the centers of local administration playing a significant social and economic role, though differing in their styles and the economic bases. The following table shows the classification of their current stances:

Table-3.2 Classification of the Stances of the 20 Candidate Sites

	Group	Site Name
1.	District capital and surrounding villages	No.2: Moodeyah
		No.7: Rosud
		No.11: Al-Mafod/Ermah
2.	Subdistrict capital and surrounding villages	No.1: Al-Faith/Bani Baker
		No.5: Ahwar
		No.8: Gaishan
		No.13: As Sadarah
		No.14: Mayfa
3.	Major rural communities in the eastern most Al-Mahara Governorate bordering with the Sultanate of Oman (Fishing ports along the coast)	No.18: Rakhawat Sharqia
		No.19: Harut/Dabut
4.	Village clusters composed of the communities of the same tribal clan	Remaining 10 sites. Population differs with the sites as below. 1) 8,000 - 10,000 (2 sites) No.16:Al-Radood No.17:Al-Raidah/Shamalya 2) 5,000 - 8,000 (5 sites) No.2, No.3, No.9, No.12, No.20 3) Less than 5,000 No.4, No.10, No.15

The capitals of the districts and subdistricts in the above chart are the hubs of local administration with the presence of government offices and other public institutions where socio-economic activities are vigorous. For the surrounding villages, agriculture has still been their mainstay of living, yet a larger part of the population now inflows to the central area during the daytime, transforming villages into a suburban type of communities with a large numbers of salaried workers. (This trend is conspicuous especially in the sites of Moodeyah and Ahwar of the Abyan governorate.)

Even if they are not such administrative units, the villages in the Southern part is often larger in size than most of their counterparts in the Northern part, each of them normally forming the communities of the single tribal clan, as is the case with the Northern ones. This fact is illustrated by the two (2) sites with a population of nearly 10,000 in Group 4 of the above classification, each of them having a central village with a population of no less than 5,000 within its crowded premise. Without relevant water facilities, such a type of village clusters requires a large-scale of water supply system. Among the aforementioned examples, the site of "Al-Raidah/Shamalya" is composed of several villages of larger size scattered in the vast highland platform where water sources are hardly available and water facilities have not yet been provided. Most of the households in this site depend on water vending brought in by tanker truck from remote sources year-round. This condition seems to reflect the fact that rural infrastructure in the former South Yemen is still lagging behind to a larger extent than in North Yemen.

Although the economic base varies in each rural community, the major sources of residents' income include the following:

1. Agriculture
2. Stockbreeding
3. Fishing
4. Remittance from the people working in the Gulf countries
5. Wages and salaries mostly as employees of the government institutions

Agriculture operation appears remarkably thriving in the three sites of "Al-Radood", "Bor" and "As Sadarah" among 20 ones. The former two sites are located in the fertile basin of the Wadi Hadramout, while the latter utilizes affluent spring and surface flow to irrigate a large oil palm plantation (the number of oil palms is said to be over 500,000) through the management of a cooperative union. Even in these sites where the residents seem to have a means to live on, the numbers of workers leaving for the Gulf states are found high. For the sites of "Ahwar" and "Mayfa," the agricultural development projects of large scale have been carried out with foreign assistance, featuring dam construction on the channels of the wadis with surface runoff, passing through the regions. As a result, Ahwar can now enjoy harvests twice a year. On the contrary, significant development could hardly be

expected in the agricultural sector in other sites, because of the shortages of water resources and farmland. Since rainfall is by far smaller in the South than in the North, farming having no choice but to depend on it has much limitation, and residents in many locations resort to cattlebreeding instead as an important means of livelihood. There are reportedly cases of some villages in the project sites from which a major labor force has moved to the Gulf states, leaving their own agriculture behind. During the Gulf War in 1991, approximately one million migrant workers were reportedly repatriated from the Gulf states. However, the results of the filed survey during this basic design study indicate that a significant number of migrant workers from the project sites still remain in the Gulf countries and continue to be a major source of income for the remaining families.

Five project sites, including three in Al-Mahara governorate and "Ahwar" in Abyan, and "Mayfa" in Hadramout, are situated along the coastline which extends approximately 1,600 km facing the Gulf of Aden. Although these sites engage in fishery, the scale has still been small and progress of the fishing sector in the South remains yet to be seen mainly through the efforts of the private sectors, as the united government wishes.

The living standards at the project sites appear nearly the same as those of the rural communities in the North. Numerous mansion-like large houses are seen in this part of Yemen, apparently using remittances from migrant workers as the financial source. The Southern communities with such big houses appear enjoying a well-off and better living standard. According to the results of this field study, an average monthly income of a family in many of the sites ranges from YR4,000 to YR6,000 (approx. 35,000-55,000 yen). This is close to the level of the family income in an average type of villages in the North which are supposed to be relatively rich. However, with an average daily cost to feed a family of 7 to 12 reportedly to be in a range of YR 150 these days, the average family is considered to keep its living at a subsistence level.

3.1.3 Population and Livestock

The following table shows the populations, the numbers of villages constituting the sites and the numbers of livestock in the 20 candidate

sites, based on the interviews within the site and the answers to the questionnaires received from the responsible water offices or other organizations related with water projects.

Table-3.3 Population and Livestock in the Project Site

No.	Site Name	Governorate	Number of Village	Populat. (1993)	Livestock
1.	Al-Faith/Bani Baker	Lahj	4	28,000	19,000
2.	Jabel Halmin	Lahj	9	6,500	
3.	Tukar	Lahj	32	5,000	15,000
4.	Adeenah	Lahj	6	3,500	1,500
5.	Ahwar	Abyan	17	33,000	34,650
6.	Moodeyah	Abyan	28	39,500	100,000
7.	Rosud	Abyan	7	9,300	
8.	Gaishan	Abyan	24	4,500	12,700
9.	Hadinat Ba Qatmi	Shabwa	19	7,000	16,300
10.	Shroog Bakily	Shabwa	14	1,400	11,000
11.	Al-Mafod/Ermah	Shabwa	15	8,500	15,000
12.	Jaba/Al-Hanak	Shabwa	20	6,400	
13.	As Sadarah	Hadramout	8	11,000	31,500
14.	Mayfa	Hadramout	5	7,000	
15.	Bor	Hadramout	14	3,000	
16.	Al-Radood	Hadramout	12	9,000	
17.	Al-Raidah/Shamalya	Hadramout	5	9,500	25,000
18.	Rakhawat Sharqia	Al-Mahara	5	2,000	
19.	Harut/Dabut	Al-Mahara	2	4,000	4,100
20.	Al-Faydami	Al-Mahara	4	5,600	

Concerning the population growth, this project intends to employ the nation's average growth rate for the rural population, based on the official data published by the government and modified by the former PWC which played a major role in the development of the rural water supply in the South, since there is hardly any reliable information available regarding the trend in the population change in the project sites. The PWC examined the 1988 census conducted by the South Yemeni government and decided a growth rate, taking the sizes and conditions of the villages into account. This project will also follow this standard (2.6% for centers of local administration and other rural communities having a stable economic base, which was the nation's

average rate of growth announced by the government, and 2% for the rest of the rural communities.)

The transfer of population is remarkable at all project sites as workers migrate to the Gulf countries, and the Bedouins, nomads following a traditional migratory cycle with their animals who are ubiquitous in the southern and eastern governorates, are constantly on the move. Among the 20 sites listed in the above table, interviews were conducted in the villages of the candidate sites where the field survey was performed. The following trends were revealed.

1. The sudden increase in the populations of the villages due to the repatriation of workers after the Gulf Crisis/War has now subsided. If conditions improve, a large number of workers are expected to leave Yemen again. (As a reverse phenomenon, some portion of rich returnees have been resettled and are now working for domestic companies on their own. However, the majority of the 25% unemployment rate is believed to be occupied by returnees.)

2. Significant change in the rural life is yet to be seen which influence the lifestyle of the Bedouins who move seasonally with their livestock, and the settlements of Bedouins are not growing.

This basic study does not include immigrants who were not living in the villages at the time of the study. As many factors remain unclear in regard to the Bedouins, there is no choice but accept the population reported by each village, which may or may not include the Bedouins. As an example, in the "Al-Hoobyt" village in the site of "Al-Mafod/Ermah," 1,000 people among the total population of 1,400 have left for foreign countries, and 400 people are registered as the current population by the questionnaire's population study. In "Gaishan", several Bedouin families now live in a settlement near the existing open well as a public water source, and are included in the settlement population.

In regard to livestock, there are project sites (a part of the villages in Al-Mafod/Ermah, Al-Raidah/Shamalya and Ahwar) which depend on stockbreeding for their livelihood, and the survey was conducted in a possible range. (The blank columns for the number of animals in the

above chart represent those who did not answer the questions related to livestock or indicate that the survey on this item was not conducted in those sites. Data formerly obtained through the survey by the PWC between 1988 and 1990 was used for some sites. (Concerning the water supply for livestock, refer to Sec. 5.1, in Chapter 5.)

3.1.4 Health and Sanitation

Based on the interviews conducted at each sites, malaria and diarrhoea with fever are the two major problems at all sites. Bilharzia, which is one of the most prevailing water-borne diseases, is also reported at several sites. Malaria is not directly related to the water supply, but it has been sweeping the entire Southern regions as well as the coastal area of the North. The 1990 Ministry of Health statistics on the main disease caseload shows the rate of digestive organ disease to be high, including water-transmitted diseases. The explosive occurrence of water-transmitted diseases was not heard of during the interviews at the project sites for this basic design study. However, there was an outbreak of cholera in Lahj governorate in the spring of 1993, which spread northward into the neighboring Taizz governorate. This reflects the fact that the water supply conditions in the rural areas, including those at the project sites, have scarcely improved and that the habit of using unsafe water continues. The majority of the victims are infants, and the infant mortality rate in Yemen remains yet to improve, ranked high even among the developing countries.

One of the factors compounding this situation is the practice with the disposal of waste water throughout nation. Even at the project sites, such as Ahwar and Moodeyah where a semi-urban type of communities are developing, discharge from houses is seen as foul-smelling sewage puddles in places, and progressing deterioration in environment remains unheeded to. According to the general director of the water office in Ahwar, to whom the study team asked during the survey to pay attention to such a situation, drainage from new buildings permeates the ground through soakaway pits, while older houses without these facilities discharge waste directly onto the ground. The delay in the sanitary disposal of waste water even in the urban areas, including the capital of Sana'a, has already been a longstanding problem, and waste from households in rural settlements is increasingly growing a serious problem as water consumption increases with the improvement of rural