No.

GENERAL AUTHORITY FOR
RURAL WATER SUPPLY PROJECTS
MINISTRY OF WATER AND ENVIRONMENT
THE REPUBLIC OF YEMEN

RURAL WATER SUPPLY COMPONENT OF THE STUDY FOR WATER RESOURCES MANAGEMENT AND RURAL WATER SUPPLY IMPROVEMENT IN THE REPUBLIC OF YEMEN

FINAL REPORT

SUMMARY REPORT

NOVEMBER 2007

JAPAN INTERNATIONAL COOPERATION AGENCY

JAPAN TECHNO CO., LTD.
EARTH SYSTEM SCIENCE CO., LTD.

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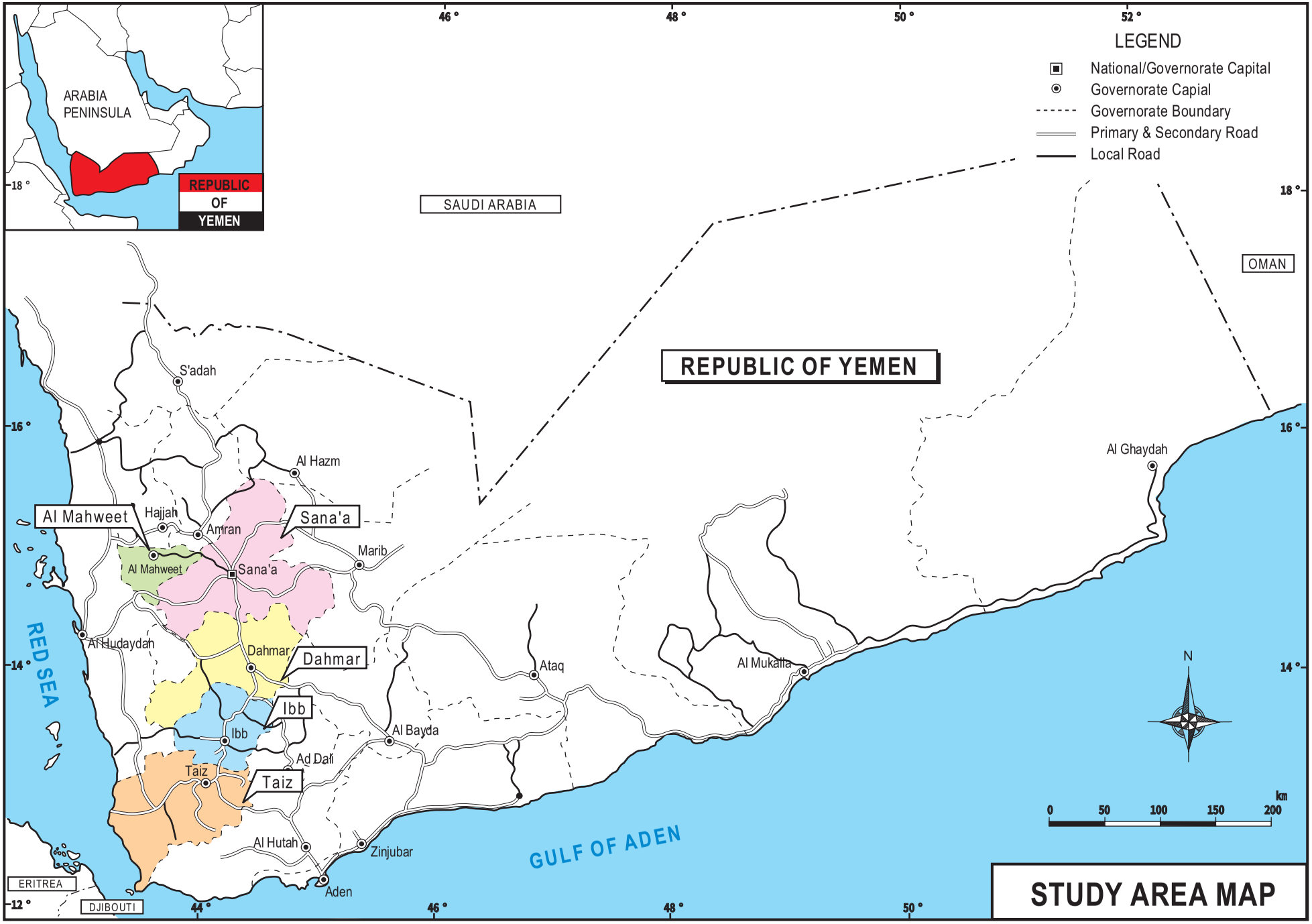
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EXECUTIVE SUMMARY

The Rural Water Supply Component of the Study for the Water Resources Management and Rural Water Supply Improvement in the Republic of Yemen (hereinafter referred to as "the Study") was carried out in accordance with the Scope of Work agreed upon by the Ministry of Water and Environment (hereinafter referred to as "MWE") and the Japan International Cooperation Agency (hereinafter referred to as "JICA") in Sana'a on July 2, 2005.

The government of the Republic of Yemen has given development and conservation of depleting water resources as one of the main national policies to develop its economy and raise the national living standard. Since precipitation is low around the country and perennial rivers are scarce, most major towns and rural villages rely on groundwater from deep wells as their water source. In this respect, improvements in water supply in rural areas are delayed, and the water supply coverage for rural areas is reported as about 42% at the end of 2006.

To comprehensively cope with the water problem, the Yemeni government formulated the National Water Sector Strategy and Investment Program (NWSSIP) for 2005 to 2009 through the assistance of the World Bank, the Netherlands and other donors. Although the program is substantially progressing, financial problems are hindering its scheduled advancement.

The General Authority for Rural Water Supply Projects (GARWSP) under MWE is responsible for rural water supply improvements in Yemen. Presently, the Yemeni government is promoting decentralization, and development plans including rural water at the governorate level are being made. GARWSP is restructuring its organization, and branch offices are receiving power to support autonomous governorates and districts to encourage water supply improvements at selected communities.

In order to establish the implementation structure, GARWSP has requested JICA for capacity building of its headquarters and branch offices. Based on the request from the Yemeni government for implementation of a development study, JICA dispatched a Preliminary Study Team in February 2005 and a Preparatory Study Team in June 2005, and agreed to the implementation of the rural water supply component. During discussions with the Preparatory Study Team and GARWSP, the scope of works for the development study was agreed, and governorates having priority for branch strengthening by GARWSP and rural areas having urgency for water supply improvement were selected.

Study Objectives and Schedule

The objectives of the Study are as follows.

1. Formulation of a practical rural water supply improvement plan for 23 sites screened from the 36 candidate sites located in 5 governorates (Al Mahweet, Sana'a, Dahmar, Ibb and Taiz).
2. Capacity development of GARWSP headquarters and 3 branch offices (Al Mahweet, Sana'a and Dahmar).

The Study is divided into Phase I from November 2005 to January 2007, and Phase II from February 2007 to November 2007, with activities both in Yemen and Japan.

Screening and Ranking of Candidate Sites

Using selection criteria agreed through discussions with GARWSP, the candidate sites were screened. Then the screened sites were ranked using mutually agreed ranking factors.

The results of screening and ranking are listed below along with their design populations.

No.	Governorate	Code	Site Name	Ranking	Design Population
1	Al Mahweet	A-02	Jabal Al Taraf	19	3,619
2		A-03	Ozlat Al Jaradi	16	27,584
3	Sana'a	S-02	Jarban	20	1,977
4		S-03	Al Kharaba	17	1,670
5		S-04	Qamlan-Bait Al Najrani	10	772
6		S-05	Afesh	12	4,517
7		S-07	Bait Al Hadrami	9	3,130
8		S-09	Ruhm	21	5,605
9		S-11	Al Hesn-Al Abyad	13	2,911
10	Dahmar	D-01	Elow Al Mikhlaf	1	1,249
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13		D-05	Mayfa'at Yaer	3	2,044
14		D-07	Al Asakera	6	2,623
15		D-08	Masneat Abdul Aziz	2	548
16	Ibb	I-01	Asfal Bani Saba	5	11,884
17		I-02	Al Sana	11	7,691
18		I-04	Al Jahlah & Al Meshraq	15	13,359
19	Taiz	T-02	Bani Al Suror	22	11,978
20		T-03	Sheb Humran	18	30,290
21		T-04	Yafoq Bani Hamad	14	8,735
22		T-05	Al Azaez	23	15,040
23		T-06	Al Khunha	8	2,015
				Total	164,728

Rural Water Supply Improvement Plan

A rural water supply improvement plan was formulated for the screened sites listed above. Design standards to be adopted and concept for planning were decided upon discussions with GARWSP. The planned facilities include pumping unit for water resource and booster, pump house, storage tank, pipeline and public tapstand. The sites were categorized into new construction and rehabilitation, and planning was made through the following concept.

Site Category	Definition	Situation	Facilities Plan
New Construction Site	No water supply facilities exist or existing water supply facilities are not functioning	Since residents of these sites are not able to receive a continuous supply of clean water, they must rely on water from unprotected sources	・Procurement and installation of pumping units ・Construction of pump houses ・Construction of storage tanks ・Procurement and installation of pipelines ・Construction of public tapstands, if requested
Rehabilitation Site	Existing water supply facilities are completely or partially functioning	Residents of these sites should be willing to contribute to a portion of the works, like replacement and extension of distribution pipelines	・Replacement of existing pumping units ・Procurement and installation of pumping unit for new deep well with necessary pump house construction and pipeline connection from new deep well to existing tank

Furthermore, each site can be classified into scale categories according to size of construction works based on parameters such as population, site area extent and height difference. The number of sites for each scale category is shown below.

Site Category	Scale Category				Total
	Small	Medium	Large	Extra Large	
New Construction	4	6	5	0	15
Rehabilitation	1	1	1	5	8
Total	5	7	6	5	23

The candidate water sources for planning are public deep wells and spring sources, and some sites have more than one water source available for designing. The results of pumping tests determine the extent of coverage possible with the target water source, and results of water quality analyses reveal the possibility for drinking.

Implementation should be demarcated between GARWSP, Local Authorities, beneficiary community and assistance organization such as donor. The target sites should form a community-based water committee for sustainable operation and maintenance of the completed water supply facilities. Evaluation on economics, financial aspects, institutional aspects, appropriate technology and natural/social environment resulted in a project feasible in all aspects.

Pilot Project

From the screened sites, 3 sites requiring small works were selected for the pilot project as a test case for capacity development. Particulars of the pilot project are listed below.

Number		1.	2.	3.
Site Code		A-02	S-03	D-08
Site Name		Jabal Al Taraf	Al Kharaba	Masneat Abdul Aziz
Governorate		Al Mahweet	Sana'a	Dahmar
District		Al Mahweet	Bani Matar	Mayfa'a
Design Population		3,619	1,670	548
Work Category		Rehabilitation	New Construction	New Construction
Existing Water Supply Facilities		・Deep well ・Pump house with pumping unit for deep well ・Booster station with pumping unit for booster ・Storage and booster tanks ・Pipeline network ・House connections	・Deep well	・Deep well ・Pump house ・Storage tank
Work Description		・Procurement and installation of pumping unit for deep well ・Procurement and installation of pumping unit for booster	・Procurement and installation of pumping unit for deep well ・Construction of pump house, storage tank and public tapstands ・Procurement and installation of pipelines	・Procurement and installation of pumping unit for deep well ・Rehabilitation of existing pump house and storage tank ・Procurement and installation of pipelines
Contribution from community on construction work		・Removal of existing pumping units ・Assistance for installation of new pumping units	・Construction of access road to tank ・Demolition of old, deteriorated pump house ・Transport of materials ・Provision of space for contractor's site camp ・Assistance for installation of new pumping unit	・(Construction of pump house before pilot project) ・Rehabilitation of existing pump house ・Transport of materials ・Provision of space for contractor's site camp ・Assistance for installation of new pumping unit
Evaluation	GARWSP interventions	・Received OJT on supervision, but need further training ・Good coordination by headquarters staff ・Drilled deep wells to be used as target water sources		
	Social mobilization	・Improved mode of community-based management entity ・Improved technical and managerial expertise in scheme management, and operation and maintenance ・Enhanced community ownership in operation and maintenance of the supply scheme ・Collective decision making and improved accountability and transparency ・Established interactive channel (interface) between user communities and local authorities		

Action Plan for Capacity Development of GARWSP

As a result of capacity assessment of GARWSP headquarters and 3 branch offices (Al Mahweet, Sana'a and Dahmar) performed at an early stage of the Study, as well as results of the pilot project, an action plan for capacity development was formulated. By reviewing the capacity assessment results, 10 key capacity areas (major capacity development issues) were identified by GARWSP. Following identification of key capacity areas, a systematic SWOT (Strength, Weakness, Opportunity and Threat) analysis was carried out through a workshop with GARWSP. The results of SWOT analysis for each capacity area and action plan of GARWSP for capacity development are compiled as a matrix. Among the wide variety of objectives and activity sets for capacity development, the following are considered as major focus needs for capacity development of GARWSP in its organizational management and functional operations.

Adoption of demand responsive approach (DRA)

Following the lesson learnt from using a supply driven approach of water supply projects implemented in the past through the initiative of the administration which gave reason for low sense of ownership by the community, the importance of DRA at every stage of the project cycle is emphasized in the National Water Policy as well as the National Water Sector Strategy. DRA is the main approach for implementation of water supply projects in developing countries, but since this is a relatively new concept for Yemen, establishment of its methodology is gradually being developed. The project cycle for implementation of water supply projects, application of DRA into community assistance by the administration, especially GARWSP branch offices, is essential.

Institutional strengthening under decentralization

The main issue in the national strategy of Yemen for the rural water supply sub-sector as well as the sub-sector development strategy for GARWSP is the promotion of implementation of rural water supply projects organized under GARWSP branch offices and local councils. While responsibilities for project implementation are being transferred to local authorities, capacities of GARWSP branch offices and local councils for project cycle management, involving planning, implementation, supervision and monitoring, need to be strengthened. Based on responsibility allocations of each branch office and local council clearly identified through the capacity assessment made during the first fiscal year study, a plan for capacity development of the system was considered.

Community-based operation and maintenance, and capacity building

For sustained provision of a community-based rural water supply service, capacity building on operation and maintenance of the target community as well as periodic provision of administrative support in technical assistance and monitoring are required. Capacity building on participatory formation of water committees, fostering of community based operation and maintenance, and periodic monitoring are needed for GARWSP, especially their branch offices. Building of capacity for community-based operation and maintenance requires a comprehensive strengthening of skills for (1) technical aspects of operation and maintenance, (2) organizational management, and (3) financial aspects including accounting, tariff setting, fee collection and funds management. Therefore, a plan for GARWSP branch offices to acquire these capacity building skills was considered.

Increasing awareness on water and sanitation

In past rural water supply projects, placement of importance on health and hygiene through construction of sanitation facilities (such as toilets) and awareness building on community sanitation was very low, and impacts of water supply improvement on health and hygiene could not be effectively conveyed. Also, construction of rural sanitation facilities was not a responsibility of GARWSP, but due to growing concern for this sector, the Ministry of Water and Environment formulated a strategy for the sanitation sector, and its implementation by GARWSP is under consideration. In this study, health and hygiene, especially measures for raising awareness of residents on water and sanitation, was considered. More definitely, participatory methods such as PHAST (participatory health and sanitation transformation), a sanitation awareness improvement method whose effectiveness has been confirmed in many developing countries, was introduced. Furthermore, measures for conservation of domestic water sources, such as protection of above ground sections of water sources by residents, were considered.

A matrix which forms the action plan for capacity development of GARWSP is presented in Chapter 8 of the Main Report.

Conclusion

The conclusions made through execution of the Study are as follows.

- An objective of this Study was the formulation of a rural water supply improvement plan of piped water schemes for 36 sites in 5 governorates. The results of pumping tests as well as those from socio-economic and other surveys were used as information for the screening procedure. Excluding the 13 sites which had problems with their water sources water supply facilities plan and operation and maintenance plan were formulated for the remaining 23 sites in 5 governorates, and feasibility of the plans was confirmed.
- Development of alternative water sources for the 13 sites which were screened out is necessary. However, if appropriate alternatives cannot be found, then other solutions are recommended for consideration.
- From the 23 sites targeted for water supply facilities plan and operation and maintenance plan in this Study, 3 sites were selected for implementation as a pilot project. For the remaining 20 sites, early realization of projects is anticipated through support from the Yemeni government or donors.
- Assessment on present capacities for project implementation and institutional management was made together with the executing agency, GARWSP, using a participatory approach to formulate a capacity development plan. GARWSP is adopting this plan to prepare for future project activities, but cooperation and support by the donor community is needed to realize these activities.
- A key issue for capacity development of GARWSP is strengthening the capacity for project implementation based on DRA (Demand Responsive Approach). As a result of DRA interventions, ownership of residents was enhanced, community-based management system was strengthened and effectiveness on sustainability of water supply facilities was reconfirmed. Experiences accumulated through DRA interventions, on-the-job training (OJT) and training of trainers (TOT) conducted in this Study were effective for strengthening the capacity for project implementation of GARWSP, and therefore these acquired experiences should be continuously applied and transferred on to other staff members.
- For GARWSP, enhancement of sanitation awareness to target communities was not part of their project implementation process. In this Study, importance was placed on the synergistic effect of community sanitation awareness on the living environment for water supply projects. The realization of activities aimed at enhancement of sanitation awareness of target communities will have an effective influence on water supply projects.

- In the sector reform and decentralization policy being promoted for this sub-sector, roles and responsibilities of GARWSP branch offices and local authorities on water supply project implementation were not clear. In this Study, each policy and strategy for sector reform and decentralization were reviewed, and roles and responsibilities of GARWSP branches and local authorities were clarified and a coordination role focused on GARWSP branch offices is recommended.

This study was conducted in hopes of contributing to the improvement of rural water supply conditions in the Republic of Yemen and development of capacity in GARWSP organization.

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CHAPTER 1 INTRODUCTION

1.1 Study Background

This report was compiled for the Rural Water Supply Component of the Study for the Water Resources Management and Rural Water Supply Improvement in the Republic of Yemen (hereinafter referred to as "the Study") in accordance with the Scope of Work agreed upon by the Ministry of Water and Environment (hereinafter referred to as "MWE") and the Japan International Cooperation Agency (hereinafter referred to as "JICA") in Sana'a on July 2, 2005. JICA organized a Study Team (hereinafter referred to as "the JICA Study Team") consisting of ten experts in various fields related to the Study.

The government of the Republic of Yemen has given development and conservation of depleting water resources as one of the main national policies to develop its economy and raise the national living standard. After formation of the Republic of Yemen with the former Socialist South Yemen in 1990, and going through the civil war, the new government announced its First Five Year Plan in 1994 with a main objective to overcome the water crisis. Since precipitation is low around the country and perennial rivers are scarce, most major towns and rural villages rely on groundwater from boreholes as their water source. In this respect, improvements in water supply in rural areas are delayed, and the water supply coverage for rural areas is reported as about 42% at the end of 2006.

To comprehensively cope with the water problem, the Yemeni government formulated the National Water Sector Strategy and Investment Program (NWSSIP) for 2005 to 2009. This program was initiated through the assistance of the World Bank, the Netherlands and other donors. Although the program is substantially progressing, financial problems are hindering its scheduled advancement.

The General Authority for Rural Water Supply Projects (GARWSP) is responsible for rural water supply improvements in Yemen. Presently, the Yemeni government is promoting decentralization, and development plans including rural water at the governorate level are being made. GARWSP is restructuring its organization, and branch offices are receiving power to support autonomous governorates and districts to encourage water supply improvements at selected communities.

In order to establish the implementation structure, GARWSP has requested JICA for capacity building of its headquarters and branch offices. Based on the request from the Yemeni government for implementation of a development study, JICA dispatched a Preliminary Study Team in February 2005 and a Preparatory Study Team in June 2005, and agreed to the implementation of the rural water supply component. During discussions with the Preparatory Study Team and GARWSP, the scope of works for the development study was agreed, and governorates having priority for branch strengthening by GARWSP and rural areas having urgency for water supply improvement were selected.

1.2 Study Objectives

The objectives of the Study are summarized in the following table.

Table 1-1 Study Objectives

Study Objective	Description
1. Formulation of a practical rural water supply improvement plan	1. Candidate sites: 36 sites in 5 Governorates 1) Al Mahweet Governorate: 4 sites 2) Sana'a Governorate: 14 sites 3) Dahmar Governorate: 8 sites 4) Ibb Governorate: 4 sites 5) Taiz Governorate: 6 sites 2. Targeted number of sites for water supply facilities improvement plan: about 25 sites
2. Capacity development of GARWSP headquarters and branch offices	1. Targeted institutions: 1) GARWSP headquarters (Sana'a) 2) GARWSP Sana'a branch office 3) GARWSP Dahmar branch office 4) GARWSP Al Mahweet branch office 2. Method: OJT

1.3 Study Area

The Study area covers thirty six (36) candidate sites in five (5) governorates: Al Mahweet Governorate, Sana'a Governorate, Dahmar Governorate, Ibb Governorate and Taiz Governorate. The candidate sites for the study are listed in Table 1-2. The study area and candidate sites are shown on the map in Figure 1-1.

Table 1-2 List of Candidate Sites

No.	Code	Site	Governorate	District
1	A-01	Al Sha'afel Al Olyah & Al Sufla	Al Mahweet	Al Khabt
2	A-02	Jabal Al Taraf		Al Mahweet
3	A-03	Ozlat Al Jaradi		Al Rujum
4	A-04	Al Khamis - Bani Ali		Bani Sa'ad
5	S-01	Bani Waleed - Al Asboor	Sana'a	Al Haymah Al Kharijiyah
6	S-02	Jarban		Hamdan
7	S-03	Al Kharaba		Bani Matar
8	S-04	Qamlan - Bait Al Najrani		
9	S-05	Afesh		Belad Al Rous
10	S-06	Al Lejam		Sanhan & Bani Bahlowl
11	S-07	Bait Al Hadrami		
12	S-08	Dajah & Sarfah		
13	S-09	Ruhm		
14	S-10	Tawa'ar		Al Hesn
15	S-11	Al Hesn - Al Abyad		Jehana
16	S-12	Mahdah		
17	S-13	Al Ga'ra		Alteyal
18	S-14	Al Ghail		Nehm
19	D-01	Elow Al Mikhlaf	Dahmar	Jabal Al Sharq
20	D-02	Hamal Bait Al Jabar		
21	D-03	Hegrat Al A’asham		
22	D-04	Al Kuob		Duran
23	D-05	Mayfa'at Yaer		Ans
24	D-06	Wardasan		
25	D-07	Al Asakera		Mayfa'a
26	D-08	Masneat Abdul Aziz		
27	I-01	Asfal Bani Saba	Ibb	Al Qafr
28	I-02	Al Sana		Al Makhader
29	I-03	Mamsa Al Marqab		
30	I-04	Al Jahlah & Al Meshraq		Ibb
31	T-01	Al Muayteeb	Taiz	Mawiyah
32	T-02	Bani Al Suror		Al Ma'afer
33	T-03	Sheb Humran		
34	T-04	Yafoq Bani Hamad		Al Mawaset
35	T-05	Al Azaez		Al Shamayaten
36	T-06	Al Khunha		Al Wazieyah

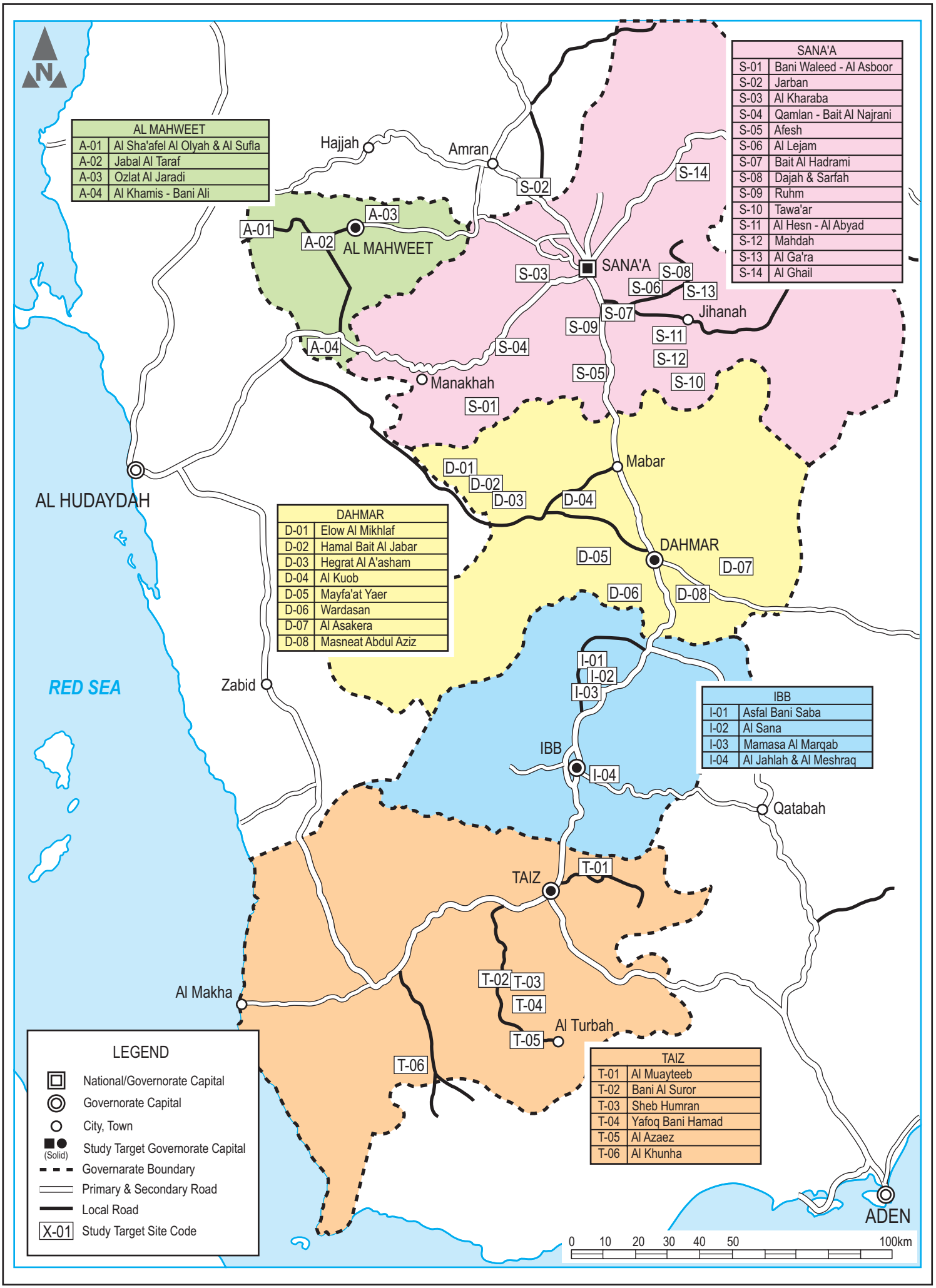

Figure 1-1 Location Map of Candidate Sites

1.4 Basic Study Concepts

The JICA Study Team executed the Study in accordance with the following basic concepts:

1) Existing data and information were organised systematically and used effectively to fully comprehend local conditions related to socio-economic environment, water supply, sanitation, hydrogeology and other relevant subjects. Field surveys were conducted to predict water resources potentials and collect information on socio-economic activities and community awareness. The results were compiled to formulate an optimum development plan for rural water supply improvement and capacity development. In addition, similar studies carried out through other donor organisations as well as previous projects implemented through JICA and the government of Japan related to the Study were reviewed and reflected in the present Study.

2) The Study was carried out for mutual understanding of current water supply conditions, local needs and technology transfer requirements in order to:
   (a) Establish optimum solutions to the prevailing problems of water shortage in rural areas;
   (b) Formulate a water supply improvement plan which is most suitable in terms of available groundwater resources and water supply requirements; and
   (c) Prepare an appropriate plan for institutional strengthening and capacity development of GARWSP through the pilot project.

3) The Study was executed in cooperation with counterpart personnel from MWE, GARWSP and other relevant agencies in order to complete the Study according to the schedule with emphasis on technology transfer in pursuit of capacity building for water resources survey, design and construction of water supply facilities, and its proper management.

4) Through this development study, a pilot project was implemented at sites selected through screening of candidate sites, based on the results of surveys on socio-economic conditions, existing water supply facilities, operation and maintenance, and community participation.

5) Through seminars/workshops, the results of the Study were openly disclosed and views were exchanged with stakeholders who included government personnel from the water supply and sanitation related sectors, as well as representatives from concerned donor/international agencies, NGO’s and other relevant organizations.

1.5 Study Schedule

The Study started in November 2005 and completed in November 2007, for a period of about twenty four (24) months with activities in Yemen and Japan. This is divided into two (2) phases: Phase I from November 2005 to January 2007, and Phase II from February 2007 to November 2007. Activities for each phase are described below.

Table 1-3 Study Schedule

Phase I: Formulation of Rural Water Supply Improvement Plan for Screened Sites and Capacity Assessment of GARWSP (November 2005 to January 2007)	
First Fiscal Year	
1. Preparatory Work in Japan (1) Existing data review and analysis (2) Determination of basic policy and methodology for the study (3) Preparation of Inception Report (IC/R)	End November to Beginning December 2005
2. First Study in Yemen (1) Explanation of IC/R (2) Basic survey of candidate sites for formulation of rural water supply improvement plan 1) Socio-economic survey of candidate sites 2) Survey of existing water supply facilities at candidate sites 3) Survey of existing water sources 4) Inventory of candidate sites (3) Capacity assessment on rural water supply improvement	Mid-December 2005 to Mid-March 2006
Second Fiscal Year	
3. Second Study in Yemen (1) Survey on formulation of rural water supply improvement plan for screened sites 1) Groundwater survey of candidate sites 2) Projection of water demand 3) Evaluation of water resources potential 4) Assistance for initial environmental examination (IEE) 5) Complementary field surveys at screened sites (2) Selection of sites for rural water supply improvement	June to End December 2006
4. First Work in Japan (1) Formulation of rural water supply improvement plan for screened sites (2) Consideration on policy for capacity building of GARWSP headquarters/branch offices (3) Preparation of Interim Report (IT/R)	End December 2006 to End January 2007
Phase II: Assistance for Formulation of Action Plan on Capacity Development (February to November 2007)	
5. Third Study in Yemen (1) Holding first seminar (2) Preparation for Pilot Project	February to March 2007
Third Fiscal Year	
1. Fourth Study in Yemen (1) Assistance for capacity building of GARWSP headquarters and branch offices 1) Implementation of pilot project 2) Assistance to water committee formation activities 3) Identification of problems in operation and maintenance and measures for their improvement (2) Preparation and explanation of Progress Report (PR/R)	Mid-April to July 2007
7. Fifth Study in Yemen (1) Preparation and submission of Draft Final Report (DF/R) (2) Holding second seminar	September to Mid-October 2007
8. Second Work in Japan (1) Preparation and Completion of Final Report (F/R)	Mid-October to End November 2007

CHAPTER 2 RURAL WATER SUPPLY IMPROVEMENT PLAN

2.1 Target Sites

A screening was carried out on the 36 candidate sites using the following selection criteria to retain sites appropriate for formulation of rural water supply improvement planning.

- Availability of reliable water source
- Non-satisfactory water supply situation
- Willingness for contribution from beneficiary
- No duplication with similar projects
- No conflicts over land use and water rights
- No problem with accessibility

Then the screened sites were ranked through a point system using the following ranking parameters.

- Difficulty for procurement of water
- Needs for water supply improvement
- Water source potential
- Capacity for payment of operation and maintenance fees

The screened sites are listed below along with their rankings and design population.

Table 2-1 List of Screened Sites

No.	Governorate	Code	Site Name	Ranking	Design Population
1	Al Mawheet	A-02	Jabal Al Taraf	19	3,619
2		A-03	Ozlat Al Jaradi	16	27,584
3	Sana'a	S-02	Jarban	20	1,977
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22		T-05	Al Azaez	23	15,040
23		T-06	Al Khunha	8	2,015
				Total	164,728

2.2 Preliminary Design of Water Supply Facilities

The following criteria based on GARWSP customary practice for rural water supply planning will be adopted in this study as agreed between GARWSP and JICA Study Team.

Table 2-2 Design Criteria for Water Supply Planning

Parameter	Criteria
Design Period	10 years
Population Growth Rate	2.07 – 3.04 %/year (different for each Governorate)
Unit Water Supply Rate	Maximum: 40 lit/capita/day Minimum : 25 lit/capita/day
Daily Average Supply	(Design Population) x (Unit Water Supply Rate)
Daily Maximum Supply	(Daily Average Supply) x (Factor:1.0)
Hourly Maximum Supply	(Daily Maximum Supply) / 24 hours x (Peak Flow Factor:2-4)
Pump Operation Hours (For ideal operation only)	Population 2,000 or less : 8 hours/day Population more than 2,000 : 12 hours/day
Successful Yield for Deep well	25-40 gal/min (1.5-2.5 lit/sec)
Water Quality Standards	Maximum value of acceptable limits of Yemeni Standards based on WHO Guidelines for Drinking Water Quality

The target sites can be classified into 2 categories with planning concepts as shown below.

Table 2-3 Site Category and Planning Concept

Site Category	Definition	Situation	Facilities Plan
New Construction Site	No water supply facilities exist or existing water supply facilities are not functioning	Since residents of these sites are not able to receive a continuous supply of clean water, they must rely on water from unprotected sources	• Procurement and installation of pumping units • Construction of pump houses • Construction of storage tanks • Procurement and laying of pipelines • Construction of public tapstands, if requested
Rehabilitation Site	Existing water supply facilities are completely or partially functioning	Residents of these sites should be willing to contribute a portion of the works, like replacement and extension of distribution pipelines	• Replacement of existing pumping unit • Procurement and installation of pumping unit for new deep well with necessary pump house construction and pipeline connection from new deep well to existing tank

Furthermore, each site can be classified into scale categories according to size of construction works based on parameters such as population, site area extent and height difference (see table below for classification of each site).

Table 2-4 Site Categorization by Construction Scale

Code	Governorate	Name	Scale of New Construction Site	Scale of Rehabilitation Site
A-02	Al Mawheet	Jabal Al Taraf		Large
A-03		Ozlat Al Jaradi		Extra Large
S-02	Sana'a	Jarban	Medium	
S-03		Al Kharaba	Small	
S-04		Qamlan-Bait Al Najrani	Small	
S-05		Afesh		Medium
S-07		Bait Al Hadrami	Small	
S-09		Ruhm	Medium	
S-11		Al Hesn-Al Abyad		Small
D-01	Dahmar	Elow Al Mikhlaf	Medium	
D-02		Hamal-Bait Al Jabar	Medium	
D-03		Hegrat Al A'asham	Medium	
D-05		Mayfa'at Yaer	Medium	
D-07		Al Asakera	Large	
D-08		Masneat Abdul Aziz	Small	
I-01	Ibb	Asfal Bani Saba	Large	
I-02		Al Sana	Large	
I-04		Al Jahlah & Al Meshraq	Large	
T-02	Taiz	Bani Al Suror		Extra Large
T-03		Sheb Humran		Extra Large
T-04		Yafoq Bani Hamad		Extra Large
T-05		Al Azaez		Extra Large
T-06		Al Khunha	Large	
Total			Small: 4 Medium: 6 Large: 5	Small: 1 Medium: 1 Large: 1 Extra Large: 1
			15 Sites	8 Sites

The candidate water sources for planning are public deep wells and spring sources as a result of surveys made by the Study Team. Some sites have more than one water source available to be used for designing. The results of pumping tests determine the extent of coverage possible with the target water source, and results of water quality analyses reveal the possibility for drinking.

The main facilities designed for this study are as follows.

- Pumping units for water source and booster
- Pump house for water source or booster
- Water storage tank
- Pipeline (pumping main and distribution)
- Supply tap facilities

The water supply facilities plan for each of the screened sites is shown in Table 2-5. Layouts of the planned facilities for each screened site are attached to the Main Report.

2.3 Implementation

For assured sustainability of the facilities, availability of major material, equipment and spare parts in the local market is essential. Although most of them are available locally in Yemen, quality control of procurement is needed because inferior products are frequently seen.

The screened sites should be requested for assistance to donor organizations. Requests can be made from the list of ranked sites, in accordance with the budget constraints and assistance concept of the donor organization. The works can be implemented through demarcations as proposed below.

Table 2-6 Proposed Allocation of Work

Stakeholder	Yemen			Donor
	GARWSP	Local Authority	Beneficiary Community	
Work Allocation	・Procurement ・Supervision ・Coordination	・Formation/strengthening of community-based water committees ・Capacity building ・Follow-up/Monitoring	・Transport within site ・Pipe layout ・Rehabilitation works ・Procurement of service pipe and connections to households ・Operation and maintenance	・Procurement and installation of pumping units ・Pump house construction ・Storage tank construction ・Procurement and installation of pipelines ・Support to social mobilization ・Overall supervision

Table 2-5 Facilities Plan for Screened Sites

No.	Code	Site Name	Type	Required Equipment and Facilities															Existing Equipment and Facilities														
				Pumping Unit					Pipeline			Pump House			Water Storage Tank				Pumping Unit					Pipeline		Pump House			Water Storage Tank					
				Water Source		Booster	Power		Pumping Main	Distrib. Main	Total	Water Source	Water Source & Booster	Booster	Water Tank (m^3)				Water Source		Booster	Power		Pumping Main	Distrib. Main	Water Source	Water Source & Booster	Booster	Water Tank (m^3)					
				S/M	VTL	HRZ	GNR	D/E	km	km	km	Type-A	Type-B	Type-C	25	50	75	100	S/M	VTL	HRZ	GNR	D/E	-	-	Type-A	Type-B	Type-C	25	50	75	100	150	200
AL MAHWEET GOVERNORATE																																	
1	A-02	Jabal Al Taraf	R		1	1		2												(1)	(1)		(2)	Exist.	Exist.	1		2	1			1		
2	A-03	Ozlat Al Jaradi	R	1		2	3												(1)		(2)	(3)		Exist.	Exist.	1		1		1	1			1
SANA'A GOVERNORATE																																	
3	S-02	Jarban	N	1		1	1	1	3.7	6.8	10.5		1		1	1																	
4	S-03	Al Kharaba	N		1			1	1.1	3.6	4.7	1				1																	
5	S-04	Qamlan-Bait Al Najrani	N		1			1	0.5	2.2	2.7	1			1					(1)			(1)			(1)							
6	S-05	Afesh	R	1		1	1	1	0.0	0.4	0.4													Exist.	Exist.	1		1		1		1		
7	S-07	Bait Al Hadrami	N	1			1		0.2	7.2	7.4	1					1																
8	S-09	Ruhm	N	1			1		3.3	13.0	16.3	1				2																	
9	S-11	Al Hesn-Al Abyad	R	1			1		0.5		0.5	1								1	1		2	Exist.	Exist.	1		1	1	1				
DAHMAR GOVERNORATE																																	
10	D-01	Elow Al Mikhlaf	N		1	2		3	1.7	9.1	10.8		1	1	1															2			
11	D-02	Hamal-Bait Al Jabar	N	1			1		0.8	10.7	11.5	1																			1			
12	D-03	Hegrat Al A'asham	N		1	1		2	0.4	5.2	5.7																1		1	1				
13	D-05	Mayfa'at Yaer	N		1	2		3	0.6	2.2	2.8	1		2	2	1				(1)	(1)		(2)	Exist.		(1)		(1)	(2)					
14	D-07	Al Asakera	N	1		2	1	2	2.3	10.3	12.7	1		2			1													2			
15	D-08	Masneat Al Abdul Aziz	N		1			1	1.8	1.4	3.1															1			1					
IBB GOVERNORATE																																	
16	I-01	Asfal Bani Saba	N	1		2	1	2	3.9	15.2	19.1	1		2		1	1	1															
17	I-02	Al Sana	N	1		2	1	2	3.6	15.5	19.0	1		2		1	2																
18	I-04	Al Jahlah & Al Meshraq	N		1	2		3	2.0	18.1	20.1		1			1		2															
TAIZ GOVERNORATE																																	
19	T-02	Bani Al Suror	R	2	1	3	2	4	3.0		3.0	1		1		1			(2)		(2)	(2)	(2)	Exist.	Exist.	1	1		2		1	1	2	
20	T-03	Sheb Humran	R	1	1	2	1	3	1.4		1.4	1							(1)		(2)	(1)	(2)	Exist.	Exist.	2		3	1		5			
21	T-04	Yafoq Bani Hamad	R	1		1	1	1											(1)		(1)	(1)	(1)	Exist.	Exist.	1		1	1			1		
22	T-05	Al Azaez	R	2	1	1	2	2	2.0		2.0									(2)	(1)		(3)	Exist.	Exist.	3		1		1				1
23	T-06	Al Khunha	N		1			1	1.0	15.4	16.5	1				1																	
TOTAL				16	12	25	18	35	33.8	136.4	170.1	13	3	10	5	10	5	3	0 (5)	1 (5)	1 (10)	0 (7)	2 (13)	-	-	12 (2)	2	10 (1)	8 (2)	9	8	4	2	2

N: New construction
R: Rehabilitation

S/M: Submersible GNR: Generator
VTL: Vertical D/E: Diesel engine
HRZ: Horizontal

No. in paratheses ( ) indicates existing equipment and facilities which cannot be used for the plan due to deterioration

2.4 Operation and Maintenance

The approach to sustainable operation and maintenance of rural water supply facilities is summarized below.

- A community-based organization (CBO) must be formed
- The CBO is approved by and registered with the Ministry of Local Administration
- The constructed water supply facilities are handed over to the CBO through the Local Councils
- GARWSP branch office conducts training to CBO

2.5 Initial Cost Estimation

Estimation of the local (direct) construction cost by local contractors or suppliers (this does not include consulting fees, contingencies and other such costs) for 23 screened sites along with costs broken down into new construction sites and rehabilitation sites are shown below.

- Total cost for 23 sites: ¥784,700,000 or YR1,302,603,000 (¥1 = YR1.66)
- Total cost for 15 new construction sites: About ¥640 million or YR1,100 million (Average about ¥43 million/site)
- Total cost for 8 rehabilitation sites: About ¥140 million or YR200 million (Average about ¥18 million/site)

Costs required to operate and maintain the water supply facilities in a proper and continuous manner include fuel costs for daily operation, cost to procure spare parts when repairs are needed, salary costs for operators and replacement cost of equipment upon their life. The average monthly cost for operation and maintenance is about YR270/person/month, while average unit cost for operation and maintenance becomes about YR 230/m^3. The required monthly operation and maintenance cost amounts to 4.7% of the average income of the target sites, slightly exceeding the percentage recommended by international organizations (4%). However, it was observed that for some sites the percentage exceeds more than 7% due to their smaller population (small scale merit of economy) and/or lower income level (poverty). In such sites where small scale merit of economy and lower income level are observed, replacement cost will be reduced or excluded from the operation and maintenance cost as a policy and strategy for poverty alleviation, bearing such cost through provision of government subsidies.

2.6 Evaluation

Evaluation of the rural water supply improvement plan was made as follows.

Table 2-7 Evaluation of Rural Water Supply Improvement Plan

Issue	Factor		Evaluation
Economics	Project Cost	Initial Capital Cost for Construction	Feasible for development purposes
		Running Cost	Feasible as basic human needs
		Replacement Cost	Feasible for continued service
	Economic Benefits	Cost reduction in procuring daily water	Feasible as positive economic activity
		Willingness to pay for use of increased water	Feasible to raise standard of living
		Improvements in public health	Feasible to raise health standards
		Water fetchers have more opportunities for productive activities	Feasible to reduce gender imbalance
Financial Aspects	Financial Balance of Operation and Maintenance System		Feasible since over 90% of beneficiaries are willing to pay
	Feasibility of Operation and Maintenance Cost		Feasible since fee is in the range of amount willing-to-pay
Institutional Aspects	Effectiveness of operation and maintenance system		Feasible through an effective program of sensibilization and education
	Sustainability of operation and maintenance system		Sustainable with a demand responsive approach
	Compliance with policies/ strategies of sub-sector		Can contribute to Millennium Development Goals to increase coverage of rural water supply
Appropriate Technology	Water Source	Groundwater pumped up from public boreholes and spring sources	Feasible for this study due to their sustainability
	Water Supply System	Gravity supply system with public tapstand or house connections	Feasible in consideration of the geographical features and cultural characteristics of Yemen
	Design standards adopted for this study		Feasible for application to local conditions of this study
Natural/Social Environment	Influence on surrounding boreholes		No impact with proper planning
	Influence on water quality		No impact with proper protection
	Water fetching time reduction		No impact with proper education and sensibilization
	Influence on sanitary environment		No impact with proper education
	Acceptance into society		No impact with proper awareness activities
	Impact on vendors		No impact
	Impact on private water owners		No impact
	Impact on gender		No impact with proper sensibilization
	Impact on tribal communes		No impact with proper distribution management

CHAPTER 3 PILOT PROJECT

3.1 Concept for Pilot Project

A pilot project was implemented from April 2007. The implementation of the pilot project reflected the results of capacity assessment and considered institutional development for rural water supply improvement. The pilot project included technology transfer on supervision of construction works, and contributions from the residents, such as transport of pipes and other materials from the stock yard to the construction areas, and pipe connections to individual households. The issues for consideration included the following.

- Roles and responsibilities of GARWSP (headquarters and branch offices), governorate/district local authorities, and rural communities
- Measures for raising awareness of residents on water and sanitation
- Procedures for capacity building of water committee activities
- Proper operation and maintenance of water supply facilities
- Awareness on conservation of water resources for drinking

3.2 Site Selection and Scope of Work

The pilot project sites were selected from the screened sites located in governorates of Al Mawheet, Sana'a and Dahmar, in accordance with the following conditions.

Table 3-1 Conditions for Selection of Pilot Project Site

Parameter	Condition
Existing Water Supply Facilities	• Reliable water source such as deep well is available
Required Work	• Small scale construction or rehabilitation
Willingness of Beneficiaries	• Willing to contribute to water supply facilities construction • Willing to contribute to operation and maintenance of the completed facilities • Willing to form a community-based water committee or improve an existing water committee
Capacity of responsible GARWSP Branch Office	• Requires capacity building, and possesses staff and budget sufficient for implementation

As a result of selection procedures according to the above conditions, the sites selected for pilot project are listed below as agreed with GARWSP.

Table 3-2 Sites Selected for Pilot Project

No.	Code	Governorate	District	Site Name	Design Population
1	A-02	Al Mawheet	Al Mawheet	Jabal Al Taraf	3,619
2	S-03	Sana'a	Bani Matar	Al Kharaba	1,610
3	D-08	Dahmar	Mayfa'a	Masneat Abdul Aziz	548

The work category and works required for the selected sites listed above are shown in the following table.

Table 3-3 Scope of Work for Pilot Project

No.	1	2	3
Code	A-02	S-03	D-08
Site Name	Jabal Al Taraf	Al Kharaba	Masneat Abdul Aziz
Work Category	Rehabilitation	New Construction	New Construction
Existing Water Facilities	・Deep well ・Pump house with pumping unit for deep well ・Pump house with pumping unit for booster ・Storage and booster tank ・Pipeline network ・House connections	・Deep well	・Deep well ・Pump house ・Storage tank
Required Works	・Procurement and installation of pumping unit for deep well ・Procurement and installation of pumping unit for booster	・Procurement and installation of pumping unit for deep well ・Construction of pump house, storage tank and public tapstands ・Procurement and installation of pipeline	・Procurement and installation of pumping unit for deep well ・Rehabilitation of existing pump house and storage tank ・Procurement and installation of pipeline ・Construction of public tapstands

3.3 Pilot Project Implementation

The pilot project proceeded through the following activities.

- Short-listing of contractors registered under GARWSP
- Tendering and contracting for construction works
- Procurement of materials and equipment for construction such as pumping units, concrete structure materials and piping materials
- Construction works at the selected sites
- OJT on supervision of construction works to GARWSP staff
- Training on technical operation and maintenance of completed facilities to community's operators
- Hand-over of completed water supply facilities to the target communities
- Social mobilization
  - Briefing to community on pilot project concept
  - Formation of community-based water committee or capacity improvement of an existing water committee
  - Sensibilization and education on sanitation
  - Sensibilization on proper use of water, necessity for efficient operation and maintenance, importance of paying water fees and other awareness issues
- Follow-up and monitoring

GARWSP has capacity to implement construction works on water supply facilities, but with limited staff and budget, completion within the scheduled implementation period would be difficult. Therefore, in accordance with the results of capacity assessment, the work allotted to GARWSP was supervision and coordination along with OJT on supervision procedures. Under supervision of Japanese Study Team members, the work allocated to the Japanese side was carried out by a local contractor selected through tendering. Work for the pilot project was allocated as shown in the following table.

Table 3-4 Work Demarcation for Pilot Project

Stakeholder		Work Allocation
Yemen	GARWSP	・Supervision ・Coordination
	Local Authority	・Formation/strengthening of community-based water committee ・Capacity building ・Follow-up and monitoring
	Community	・Access road construction ・Removal of existing pumping unit wherever necessary ・Internal transport ・Pipe layout ・Rehabilitation of existing pump house and storage tank wherever necessary ・House connections ・Operation and maintenance
JICA Study Team		・Procurement of equipment and materials ・Installation of pumping unit ・Construction of pump house and storage tank ・Pipeline laying/connection ・Support to social mobilization ・Overall supervision/OJT

The pilot project construction commenced in the middle of April 2007 when tendering procedures started and completed in the beginning of July 2007 when the facilities were handed-over to the target communities, for about 3 months. Formation of new water committees and strengthening of the existing committee, as well as social mobilization activities started during the construction stage and continued until the end of August 2007. Also, follow-up and monitoring activities started after completion of facilities construction, and these activities lasted until August 2007.

The following activities for capacity development were conducted through the pilot project.

- Assistance to capacity building on supervision of project implementation to engineers and technicians of GARWSP headquarters and 3 target branch offices
- Training on technical operation and maintenance of water supply facilities to operators of pilot sites who were selected by the target communities
- Improvement of community-based management through assistance to water committee formation and strengthening as well as awareness activities on proper water usage and sanitation education
- Identification of obstacles and proposal for countermeasures on improvement in operation and maintenance

3.4 Evaluation of Pilot Project Implementation

The following evaluation was made on outputs of implementation of the pilot project.

Table 3-5 Evaluation of Pilot Project Implementation

Stakeholder	Activity	Evaluation
GARWSP	Supervision	Received OJT by Study Team, but further training required
	Coordination	Good coordination by GARWSP HQ staff
	Contribution	Drilled deep wells to be used as target water sources
Beneficiary community of A-02: Jabal Al Taraf	Contribution to construction works	Sufficient contribution to project through following: - Removal of existing pumping units - Assistance for installation of new pumping units
Beneficiary community of S-03: Al Kharaba		Sufficient contribution to project through following: - Construction of access road to tank - Demolition of old, deteriorated pump house - Internal transportation of piping materials - Provision of space for contractor's site camp - Assistance for installation of new pumping unit
Beneficiary community of D-08: Masneat Abdul Aziz		Sufficient contribution to project through following: - (Construction of pump house before pilot project) - Rehabilitation of existing pump house - Internal transportation of piping materials - Provision of space for contractor's site camp - Assistance for installation of new pumping unit
Local contractor	Construction works	- Acceptable quality of works according to specifications - Works progressed on schedule - Works completed without any major accidents or problems
Beneficiary communities, Water committees, Local authorities	Social mobilization	- Improved mode of community-based management entity - Improved technical and managerial expertise in scheme management, and operation and maintenance, - Enhanced community ownership in operation and maintenance of the supply scheme, - Collective decision making and improved accountability and transparency - Established interactive channel (interface) between user communities and local authorities.

CHAPTER 4 ACTION PLAN FOR CAPACITY DEVELOPMENT

4.1 Approach and Methodology

Enhancing the sense of GARWSP's ownership in the process to prepare the action plan for capacity development is emphasized as a prime issue of significance, since the plan has to be further deliberated, implemented, and monitored and evaluated by GARWSP itself in the future. In order to realize development of the action plan based on the decision making by GARWSP through capacity assessment and analysis in a participatory manner, a supervisory committee and working group were formed under GARWSP. The supervisory committee consists of a chairman and relevant general directors to manage the development process and provide decision making for the plan preparation, while appointing a working group that consists of 9 senior staff from each department/section and 3 branch office directors (Sana'a, Al-Mahweet, and Dahmar) to review current capacity of GARWSP in its management and functional operation and prepare the action plan for capacity development.

Several activities and meetings with the supervisory committee and working group were held to finalize the capacity assessment and prepare the action plan of GARWSP for capacity development. As a consequence of the successive review meeting with GARWSP's supervisory committee and working group for capacity assessment, key capacity areas (major capacity development issues) required for improvement are identified as described in the following sections.

In order to develop the action plan constructively, a systematic planning framework (matrix) for capacity development is employed. The action plan for each identified capacity area is prepared in a comprehensive manner, based on the systematic SWOT (strength, weakness, opportunity, and threat) analysis through matrix building. In reviewing what capacities exist, it is actually strengths as well as weaknesses that will come forth, while opportunities and threats, which may exist on any level of system/enabling environment, organization/entity and individual, are identified and transformed to the basis of action plans for improvement. Thus, the matrix is combined with a SWOT analysis that underpins the horizontal parameters, complemented by the narrative review of strengths and weakness that considers all three capacity layers. Bridging from assessment to strategy and programme formation, the matrix then turns to opportunities and threats as basis for capacity development actions focusing attention on each of the levels to identify appropriate and complementary support measures. Finally, it focuses on the objectives and actions to be undertaken by GARWSP, which are served as action plan of GARWSP for capacity development. The Action Plan could be finalized with determination of human resources, financial resources, physical resources, development partners, and implementation period required for each action for capacity development.

4.2 Identification of Key Capacity Areas

Reviewing 'capacity assessment' of GARWSP in its organizational management and functional operation carried out in earlier stages of Phase one of the Study, ten (10) key capacity areas (major capacity development issues) are identified by GARWSP working group and supervisory committee. Those identified capacity areas are summarized in the following table.

Table 4-1 Identified Key Capacity Areas

No.	Key Capacity Issues
1	National policies-strategies of sub-sector development and reform, and strategic plans of relevant national authority (i.e. GARWSP) are formulated in consisted manners. Legal and legislative framework for sub-sector development institutions is developed based on national sub-sector development and reform policies-strategies.
2	National sector authority (i.e. MWE), and in particular, relevant sub-sector authority (i.e. GARWSP) are able to lead other national sub-sector development institutions (e.g. RWSSP, SFD, and PWP) and ESAs constructively through the process of establishing, implementing, and monitoring the sub-sector development policies and strategies.
3	Functional roles and responsibilities of each sub-sector development institution at national and local level are clearly defined, and appropriately shared in the decentralization framework facilitated in the sub-sector development.
4	Good institutional structure and mechanism exists at GARWSP headquarters and branch offices to achieve organization's mission and goal efficiently and effectively.
5	Formal and informal leadership exists at appropriate level for achievement of organizational goal of GARWSP.
6	Human resource of GARWSP is strategically planned, developed, and assessed and rewarded properly.
7	Financial management (financial planning, financial accountability, and financial monitoring) is properly undertaken.
8	Facilities and equipment for organizational operation is adequately available.
9	Program/service management for organizational operation (planning, implementation, and monitoring) is efficiently and effectively carried out.
10	Effective and efficient process management is in place to facilitate proper planning, problem-solving practice, and decision making of the organization/institution.

4.3 SWOT (Strength, Weakness, Opportunity and Threat) Analysis

Following identification of key capacity areas, a systematic SWOT analysis was carried out through workshop with GARWSP working group. As explained earlier, currently existing capacity for each capacity area is assessed as strengths and weaknesses, while analysing opportunities and threats which turns to basis of capacity action plan at different three layers (system/enabling environment, organization/entity, and individual). Finally, actions to be undertaken solely by GARWSP are driven as action plan of GARWSP for capacity development. The results of SWOT analysis for each capacity area and action plan of GARWSP for capacity development are compiled as a matrix (refer to Chapter 8 of Main Report).

4.4 Proposed Action Plan

Opportunities and threats identified for each capacity area are turned to the objectives and various sets of activities required for improvement of capacities. Among wide variety of objectives and activity sets for capacity development, the following are considered as major focus needs for capacity development of GARWSP in its organizational management and functional operations.

(1) Adoption of Demand Responsive Approach

Following the lesson learnt from using a supply driven approach of water supply projects implemented in the past through the initiative of the administration which gave reason for low sense of ownership by the community, the importance of a demand responsive approach (DRA) at every stage of the project cycle is emphasized in the National Water Policy as well as the National Water Sector Strategy. DRA is the main approach for implementation of water supply projects in developing countries, but since this is a relatively new concept for Yemen, establishment of its methodology is gradually being developed. The project cycle for implementation of water supply projects using DRA is composed of the following participatory activities.

a. Identification and analysis of community development needs
b. Request for project implementation to government
c. Formulation of an action plan by the community
d. Participation in preparing a water supply plan and selecting technology alternatives

e. Sharing the cost of construction by the community
f. Facilities construction and formation of water committee
g. Capacity building of water committee
h. Community-based operation and maintenance
i. Monitoring

During the course of the above activities, application of DRA into community assistance by the administration, especially GARWSP branch offices, is essential. Also, since these are significant factors for capacity building of these branch offices, the concepts for capacity development in the rural water supply sector were determined.

(2) Institutional Strengthening under Decentralization

The main issue in the national strategy of Yemen for the rural water supply sub-sector as well as the sub-sector development strategy for GARWSP is the promotion of implementation of rural water supply projects organized under GARWSP branch offices and local councils. While responsibilities for project implementation are being transferred to local authorities, capacities of GARWSP branch offices and local councils for project cycle management, involving planning, implementation, supervision and monitoring, need to be strengthened. Based on responsibility allocations of each branch office and local council clearly identified through the capacity assessment made during the first fiscal year study, a plan for capacity development of the system was considered.

(3) Community-Based Operation and Maintenance and Capacity Building

For sustained provision of a community based rural water supply service, capacity building on operation and maintenance of the target community as well as periodic provision of administrative support in technical assistance and monitoring are required. Capacity building on participatory formation of water committees, fostering of community based operation and maintenance, and periodic monitoring are needed for GARWSP, especially their branch offices. Building of capacity for community based operation and maintenance requires a comprehensive strengthening of skills for (1) technical aspects of operation and maintenance, (2) organizational management, and (3) financial aspects including accounting, tariff setting, fee collection and funds management. Therefore, a plan for GARWSP branch offices to acquire these capacity building skills was considered.

(4) Increasing Awareness on Water and Sanitation

In past rural water supply projects, placement of importance on health and hygiene through construction of sanitation facilities (such as toilets) and awareness building on community sanitation was very low, and impacts of water supply improvement on health and hygiene could not be effectively conveyed. Also, construction of rural sanitation facilities was not a responsibility of GARWSP, but due to growing concern for this sector, the Ministry of Water and Environment formulated a strategy for the sanitation sector, and its implementation by GARWSP is under consideration. In this study, health and hygiene, especially measures for raising awareness of residents on water and sanitation, was considered. More definitely, participatory methods such as PHAST (participatory health and sanitation transformation), a sanitation awareness improvement method whose effectiveness has been confirmed in many developing countries, was introduced. Furthermore, measures for conservation of domestic water sources, such as protection of above ground sections of water sources by residents, were considered.

The matrix presented in Chapter 8 of the Main Report forms the action plan for capacity development of GARWSP compiled from results of SWOT analysis. This matrix was finalized by specifying resources and potential partners to undertake actions for capacity development through consultation with GARWSP during the Study.

CHAPTER 5 CONCLUDING REMARKS

Conclusions made through the execution of this Study are as follows.

(1) An objective of this Study was the formulation of a rural water supply improvement plan of piped water schemes for 36 sites in 5 governorates. At all of the target sites, since GARWSP prepared deep wells to be used as water sources, pumping tests were conducted for all of the target water sources, and results from these tests as well as those from socio-economic and other surveys were used as information for the screening procedure. Excluding the 13 sites which had problems with their water sources (problems with water quality, pumping rate or groundwater potential), water supply facilities plan and operation and maintenance plan were formulated for the remaining 23 sites in 5 governorates, and feasibility of the plans was confirmed.

(2) Development of alternative water sources for the 13 sites which were screened out is necessary. However, if appropriate alternatives cannot be found, then other solutions such as 1) a handpump system or a point-source scheme for low quantity sources; 2) installation of small-scale water treatment units for poor quality sources; and 3) installation of rainwater harvesters as complementary supply are recommended for consideration.

(3) From the 23 sites targeted for water supply facilities plan and operation and maintenance plan in this Study, 3 sites were selected for implementation as a pilot project. For the remaining 20 sites, early realization of projects is anticipated through support from the Yemeni government or donors.

(4) Assessment on present capacities for project implementation and institutional management was made together with the executing agency, GARWSP, using a participatory approach to formulate a capacity development plan. GARWSP is adopting this plan to prepare for future project activities, but cooperation and support by the donor community is needed to realize these activities.

(5) A key issue for capacity development of GARWSP is strengthening the capacity for project implementation based on DRA (Demand Responsive Approach). Although GARWSP places project implementation using DRA as a basic concept, practical applications are not being followed. In this Study, concrete activities such as social mobilization needed for DRA interventions were introduced at each stage of the project cycle, and these were actually carried out during the pilot project. As a result of DRA interventions, ownership of residents was enhanced, community-based management system was strengthened and effectiveness on sustainability of water supply facilities was reconfirmed. Experiences accumulated through DRA interventions, on-the-job training (OJT) and training of trainers (TOT) conducted in this Study were effective for strengthening the capacity for project implementation of GARWSP, and therefore these acquired experiences should be continuously applied and transferred on to other staff members.

(6) For GARWSP, enhancement of sanitation awareness to target communities was not part of their project implementation process. In this Study, importance was placed on the synergistic effect of community sanitation awareness on the living environment for water supply projects. Therefore, concrete activities such as training of community facilitators focused on women and adoption of the participatory sanitation education method PHAST (Participatory Health and Sanitation Transformation) were planned and applied in the pilot project. The realization of activities aimed at enhancement of sanitation awareness of target communities will have an effective influence on water supply projects.

(7) In the sector reform and decentralization policy being promoted for this sub-sector, roles and responsibilities of GARWSP branch offices and local authorities on water supply project implementation were not clear. In this Study, each policy and strategy for sector reform and decentralization were reviewed, and roles and responsibilities of GARWSP branches and local authorities were clarified and a coordination role focused on GARWSP branch offices is recommended.

From results of implementing the Study, the following recommendations are made.

(1) Through this study, groundwater in Yemen was confirmed to be a very precious resource for water supply to the Yemeni population, and therefore, effective and conservative development of this resource has great significance. Presently, while the crisis due to depletion of groundwater sources in Yemen is being warned, the Water Law (2002) and other laws and institutional regulations on integrated water resources management are being prepared. Consequently, conservation of water sources such as introduction of licensed use of all deep wells for agricultural and irrigation purposes and prohibition of new drillings for agricultural and irrigation use is being promoted. Furthermore, a characteristic of integrated water resources management of Yemen is the participatory and self-control method of water resources management by the users of wells for agriculture and irrigation. However, the target wells of this Study to be used for drinking and domestic purposes also need to be conserved and managed at the user level. Concrete actions such as formation of water users associations (WUAs); formulation of WUA agreement on resources management and conservation of groundwater; prohibition on use for agricultural and irrigation purposes; and monitoring by local authorities and GARWSP branches need to be considered.

(2) For the 23 target sites, the required average monthly operation and maintenance cost including facilities replacement cost was calculated to be 4.7% of the average income of the target sites. However, for 3 sites where income is low due to concentration of poor households and per household operation and maintenance costs are high due to small population, the percentage becomes 8 to 14%. For these sites, the burden of the

operation and maintenance cost which includes facilities replacement cost can evoke further poverty. Therefore, for these sites, as a poverty reduction policy of the government, only routine operational costs and costs for maintenance and small repairs should be borne by the users to assure low-cost supply of domestic water to the poor, and future renewal costs should be funded by GARWSP branch offices or local authorities.

(3) Presently in Yemen, sector reform and decentralization of rural water supply services is being promoted as national policy and strategy. However, promotion on decentralization of GARWSP and strengthening of powers of branch offices is needed, but through conformity and coordination with the national policy and strategy.

(4) Although GARWSP is the responsible organization for development of this sub-sector on the national level, it was established recently in 2002, and restructured into present status under the Ministry of Water and Environment (MWE) in 2004. This organization was established through support mainly from World Bank. On the other hand, other organizations such as RWSSP (Rural Water Supply and Sanitation Project) and SFD (Social Fund for Development) are also taking responsibilities for development of this sub-sector independently and in parallel to GARWSP. However, for realization of sector coordination by MWE and GARWSP as clearly defined in the National Water Sector Strategy and Investment Program (NWSSIP), a display of development initiative and strategic action of development investments by these 2 organizations are required. For this realization, comprehensive capacity development of GARWSP headquarters and branch offices is needed.

(5) One of the key issues for capacity development of GARWSP is organizational development. In the capacity assessment carried out in this Study, development issues were identified from the viewpoints of 1) institutional organization, 2) leadership, 3) human resources, 4) financial aspects, 5) facilities and equipment, 6) program and service management, 7) process management and 8) organizational culture, style and mission. The results were compiled as the action plan for capacity development and promotion of this plan is anticipated.

(6) In order for GARWSP to indicate development initiative for this sub-sector, formulation of a strategic mid-term plan for project investment is urgently needed. Although the development budget of GARWSP is over 60% of the overall investment cost for this sub-sector, from the lack of a strategic project investment plan and existence of incomplete projects, formulation of a project investment plan for GARWSP branch offices based on DRA and plan coordination by GARWSP headquarters need to be promoted in a concrete manner. Since this is also one of the key capacity development issues, the objectives set for GARWSP in NWSSIP need to be achieved. Under good sector coordination by GARWSP, effective development investments can be promoted.

(7) Through social mobilization carried out in this Study and during the pilot project, the following strategies and approaches are recommended for formulation of the operation and maintenance plan of this Study.

a. At all stages of the project cycle, DRA intervention is further promoted. At each stage of this Study, good practices of DRA are identified and analyzed from similar projects and the pilot project, and these are summarized below. In the future, activities for project implementation by GARWSP branches and local authorities are anticipated.

Stage 1: Participatory Planning Stage

- Needs identification of target communities and submission of requests by communities
- Prioritization of community development needs by GARWSP branch offices and formulation of strategic development and investment plan
- Participatory development needs assessment and survey on amount willing-to-pay and able-to-pay
- Formulation of participatory community development plan and informed choice of technology by communities
- Clarification of roles between GARWSP branch offices, local authorities and communities

Stage 2: Implementation Stage

- Project implementation according to allocated roles
- Supervision of works by communities

Stage 3: Operation and Maintenance Stage

- Improvement of community-based management system
- Capacity building on operation and maintenance to community organization
- Establishment of an interface with GARWSP branch offices and local authorities, and creation of a monitoring system

b. Following the flow of decentralization being promoted by Yemen, clarification of roles between GARWSP branches, local authorities and communities is necessary for implementation of rural water supply projects. In the pilot project of this Study, an agreement between the 3 stakeholders was concluded, and the project was implemented upon clarifying each role. Concerning roles after completion of works, technical monitoring was carried out by GARWSP branch offices, and training and supervision on managerial and financial aspects of community organization were conducted by local authorities. For sustainability of rural water supply facilities through community initiatives, administrative support is essential and therefore, performance of allotted roles by both stakeholders is anticipated.

c. Rural water supply facilities in the target area are generally operated and maintained by Sheikhs (traditional tribal heads) or Aquils (village leaders). However, this traditional system for operation and maintenance is greatly influenced by the capability and financial power of the Sheikh or Aquil. Further, since the community thinks the facilities are owned by the Sheikh or Aquil, this creates an obstacle for fostering sense of ownership. In this Study, the formation of WUA was recommended to be carried out through selection of executives, preparation of management agreement and legal registration by the users to improve institutional organization and enhance sense of ownership. Also, in the WUA formation process, collaboration of GARWSP branches and local authorities is required.

d. Establishment of a community-based operation and maintenance system requires technical training on operation and maintenance to the target community as well as training and monitoring on institutional and financial management. The former training should by handled by GARWSP branch offices and the latter activities by local authorities.

e. By forming a WUA as a community organization and making important decisions on management of facilities and funds collectively by all users at general meetings can further improve sense of ownership. Moreover, if local authorities conduct periodic auditing and WUA releases the results to users, then accountability of funds can be enhanced.

f. Most of the development budget of GARWSP is spent on new well drillings and construction of storage tanks, but if it is used for monitoring of existing water facilities and strengthening of operator training, then break downs due to overload on facilities and equipment as well as to improper operation can be prevented as an effective use of the development budget. Establishment of interface between users, GARWSP branch office and local authorities, and periodic execution of monitoring are important activities.

This concludes the “Rural Water Supply Component of the Study for Water Resources Management and Rural Water Supply Improvement in the Republic of Yemen” in hopes of contributing to the improvement of rural water supply conditions and development of capacity in GARWSP organization.