

BASIC DESIGN STUDY REPORT

ON

THE PROJECT FOR RURAL WATER SUPPLY
IN
CENTRAL UGANDA
IN
THE REPUBLIC OF UGANDA

AUGUST 2003

JAPAN INTERNATIONAL COOPERATION AGENCY
PACIFIC CONSULTANTS INTERNATIONAL
MITSUBISHI MATERIALS NATURAL RESOURCES DEVELOPMENT CORP.

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PREFACE

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

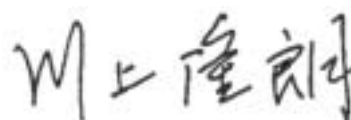
JICA sent to Uganda a study team from February 11 to March 22, 2003.

The team held discussions with the officials concerned of the Government of the Republic of Uganda, 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 Uganda in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this 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 Uganda for their close cooperation extended to the teams.

August 2003

A handwritten signature in black ink, consisting of stylized Japanese characters, likely reading '川上隆朗' (Kawakami Takao).

Takao Kawakami

President

Japan International Cooperation Agency

August 2003

LETTER OF TRANSMITTAL

We are pleased to submit to you the basic design study report on the Project for Rural Water Supply in Central Uganda in the Republic of Uganda.

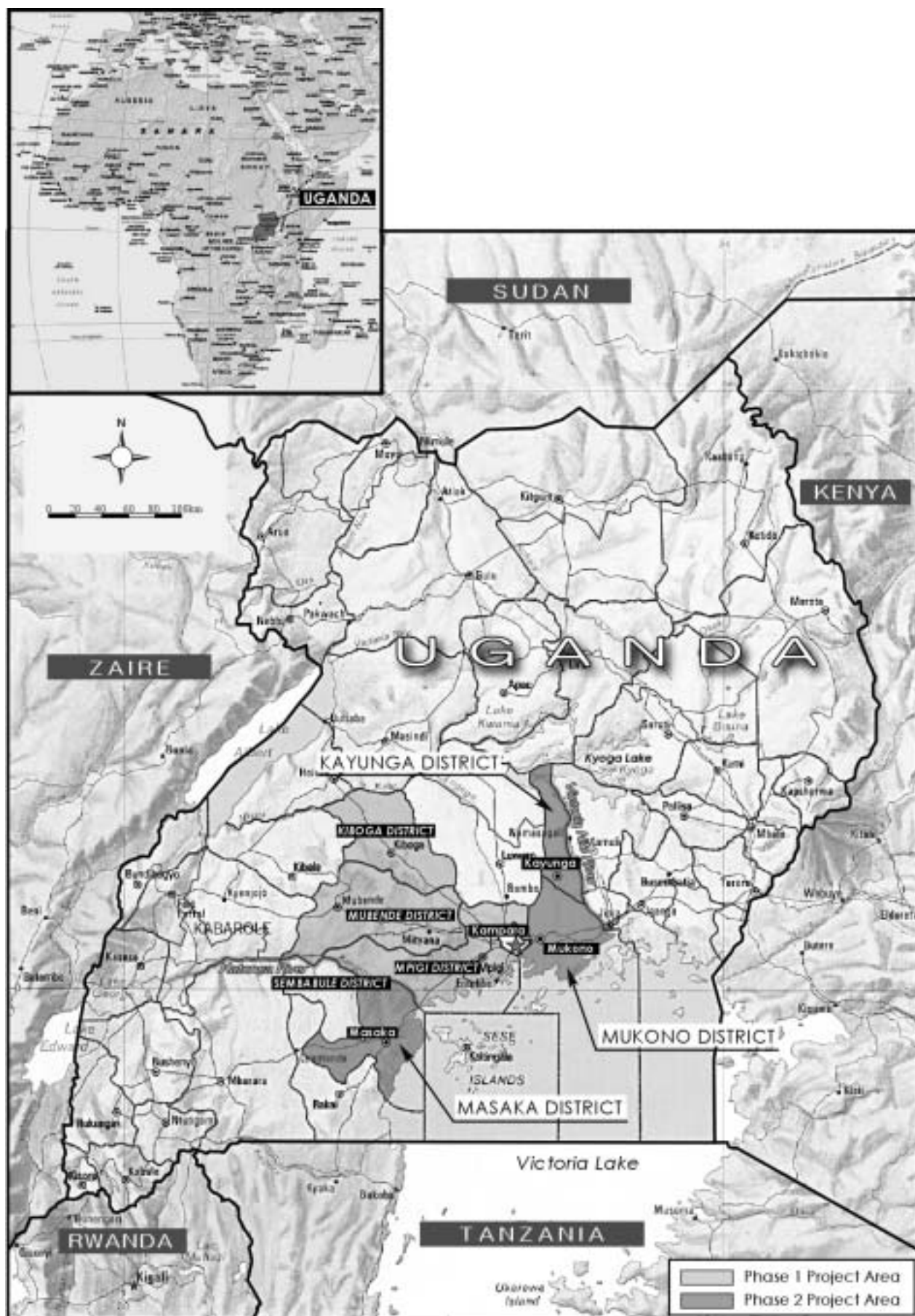
This study was conducted by Pacific Consultants International and Mitsubishi Materials Natural Resources Development Corp., under a contract to JICA, during the period from February, 2003 to August, 2003. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Uganda and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

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

Very truly yours,

A handwritten signature in black ink, appearing to read 'Soichiro Yumoto', is centered above the printed name.

Soichiro Yumoto
Project Manager,
Basic Design Study Team on
the Project for Rural Water Supply in Central Uganda,
the Republic of Uganda
Pacific Consultants International



Abbreviations

MFA :	Ministry of Foreign Affairs
MFPEd :	Ministry of Finance, Planning and Economic Development
MGLSD :	Ministry of Gender, Labor and Social Development
MH :	Ministry of Health
ME :	Ministry of Education
MLG :	Ministry of Local Government
MWLE :	Ministry of Water, Lands and Environment
DWD :	Directorate of Water Development
DGSMV :	Department of Geological Survey and Mines of Uganda
PEAP :	Poverty Eradication Action Plan
PRSC :	Poverty Reduction Support Credit
SWAP :	Sector Wide Approach
PAF :	Poverty Action Fund
PMS :	Policy and Management Support
HIPC :	Heavily Indebted Poor Countries
MTEF :	Medium Term Expenditure Framework
MTBF :	Medium Term Budget Framework
SIP15 :	Rural Water Supply and Sanitation Strategic Investment Plan 2000-2015
OP5 :	Rural Water and Sanitation Operation Plan 2002-2007
WSC :	Water and Sanitation Committee
LC :	Local Council
O&M :	Operation and Maintenance
HPM :	Hand Pump Mechanic
TSU :	Technical Support Unit
VLom :	Village Level Operation and Maintenance
CDA :	Community Development Assistants
SIDA :	Swedish International Development Authority
DANIDA :	Danish International Development Assistance
UNICEF :	United Nations Children's Fund
DFID :	Department for International Development
USAID :	The United States Agency for International Development
EU :	European Union
SNV :	Netherlands Development Organization
UWASNET :	Ugandan Water and Sanitation NGO Network
GTZ :	German Agency for Technical Cooperation
RUWASA :	Rural Water and Sanitation Eastern Uganda Project
WES :	Water and Environmental Sanitation
CBO :	Community-Based Organization
TOT :	Training of Trainers
PAF :	Poverty Alleviation Fund

SUMMARY

The Republic of Uganda (hereinafter referred to as “Uganda”) has made poverty eradication a national target. The Poverty Eradication Action Plan (PEAP) in 1997 lays out four pillars of development: i) the establishment of a system turned to economic growth and structural reform, ii) securing good governance and security, iii) income improvement of poor class, and iv) the improvement of the quality of life of poor class. Five fields (roads, agriculture, health, education, and water and sanitation) are priority sectors in PEAP, and water and the sanitation sector is considered as important fields which contribute to the improvement of the quality of life for the poor in the above-mentioned four pillars.

In Uganda, rural water supply project began in full scale around 1990. The Rural Water and Sanitation Eastern Uganda Project (RUWASA) by DANIDA began by targeting ten districts in the east part of Uganda. The first stage was executed over five years (1991-1995), and the second stage was executed over about six years (1996-2001). In addition, UNICEF executed the Water and Environmental Sanitation (WES) program with the financial support of SIDA for 35 districts other than the ten districts in the east. Its first stage was executed over six years (1990-1995), and the second stage also for six years (1995-2000). The project for rural water supply (known as the 1st. Phase project) by Japanese grant aid since 1997 was begun in parallel with these water supply projects for three districts (Mpigi, Mubende, and Kiboga). Deep well with hand pump (435 sites) and the gravity water supply facilities with public tap (one site) were constructed by 2001. The number of deep wells constructed including these projects reached 9,354 sites for the period 1991-2000, and the water supply circumstances of the rural areas of Uganda have improved greatly. However, the rural water supply rate varies over a wide range from 23.7% (Pader district) to 79.9% (Rukungiri district). This situation is not satisfactory since the rural water supply rate is 54.9% as a nationwide average as of June, 2002. The rural water supply rate of Mukono, Kayunga, and the Masaka districts (the target areas of this Project) are low: 59.1%, 48.6% and 34.5%, respectively. The Government of Uganda requested the Government of Japan for grant aid for supplying safe water by groundwater development in Masaka, Mukono and Kayunga districts considering the impacts of the 1st. Phase project. According to the request on February 2001, the contents of the request are the followings:

- Construction of 150 sites of deep well facilities with hand pump
- Procurement of equipment and materials for groundwater investigation and activities of education and facilitation
- Execution of software assistance to make villager maintenance possible for the constructed water supply facilities

The Project is to construct the deep borehole water supply facilities with hand pump units in order to increase the service rate to 60.8 %, 50.9 % and 36.2 % in the Mukono, Kayunga and Masaka districts, respectively. The objective of the Project is to improve the water supply and sanitation situation in the rural areas of Uganda for improvement of living environment of the villagers. To achieve these objectives, the software assistance activities will be conducted together with the construction of facilities to improve the facilitation system of the district water

offices for the sustainable operation and maintenance by villagers, and to reinforce the sustainable operation and maintenance of the water supply facilities by Water and Sanitation Committees (hereinafter referred to as “WSC”). The unit rate contract system of cumulative drilled depth will be employed in implementing the Project in order to reduce the expenses of the contractor by mitigating the contractor’s risks of unsuccessful borehole expenses that are shouldered by the contractor. The Japanese grant includes the borehole drilling (11,970 m (equivalent to approx. 120 water supply facilities with hand pump units) in maximum) to be performed under the unit rate contract system for improving the water supply situation of Uganda, the procurement of equipment and materials for survey and educational activities, and provision of funds for software assistance for smooth and sustainable operation and maintenance of the borehole facilities to be constructed.

The basic design of the Japanese assistance has the following design policy.

- Since rainy and dry seasons are not clear in the Project area, it is not desirable to stop the construction works during the rainy season to maximize effective construction throughout the available implementation period. The days available for construction will be set considering the climate characteristics of the Project area, and the construction plan will be established to fit the road conditions of the areas.
- In Uganda, when the borehole facilities are constructed, the government will assist in providing the technical knowledge to villagers for the smooth operation and maintenance of constructed boreholes, and raising awareness among the villagers that the constructed borehole is a property of village. It is necessary to coordinate and facilitate these activities in the Project.
- U2/U3 types of hand pump units will be used in the Project, since they are available in the Ugandan market and their operation and maintenance technology is assured.
- The population served by one borehole facility and the water consumption per capita are set at 300 and 20 l/day/capita respectively in accordance with the Ugandan standard. However, in order to provide one borehole facility to one village, the population served will be adjusted to the actual situation of the village considering the population distribution, etc.
- The rate of successful drilling is set at 70 % considering the records of the 1st. Phase project and the results of geophysical survey conducted this basic design.
- Local drilling contractors will be utilized in implementing the Project. Because of the privatization policy of the Ugandan government, the number of private drilling companies is increasing. However, construction quality varies widely from contractor to contractor, and the period for some contractors after their registration for DWD is considered short. It is necessary, therefore, to select the contractors competent for completing the works in time during the limited construction period and for ensuring the quality required for the grant aid project.

According to the request, the construction of water supply facilities were for 150 out of the 200 target villages. The 150 villages were selected based on the conditions of: i) the existing water supply facilities in operation, and ii) the difficult access for the villages because of the isolated location, and field surveys were carried out for these villages. The present situation of each

village was further studied from natural and socio-economic conditions based on field survey results, and this resulted in the exclusion of 30 villages. Hence, 120 villages were selected as the cooperation target as shown in the following table.

Requested and Selected Villages in Each District

District	Original Request Villages	Confirmed Villages*	Excluded Villages		Target Villages
			Natural Conditions	Socio-economic Conditions	
Masaka	100	63	12	2	49
Mukono	50	46	13	-	33
Kayunga	50	41	3	-	38
Total	200	150	28	2	120

Note *: 150 villages were confirmed in the Minutes of Discussion.

Under the recent movement of political decentralization, various political/administrative powers are being transferred from the central offices to the district administration offices reducing the scale of the central administration. Since DWD is facing the serious shortage of staff experienced enough to implement such projects, TSU (Technical Support Unit) was established for the capacity building of the district water offices. The software assistance will be provided, putting emphases on the direct activities to villagers to ensure the sustainability of the water supply facilities to be constructed under the Project. The OJT of the staff of rural administration who are expected to play a core role in rural water supply projects will take place in the course of such software assistance to develop their abilities.

Summary of specification details of equipment to be procured are shown in the following table.

Specifications of Equipment to be Procured

	Item	Quantity	Specification Details	Station
1. Equipment for Field Survey				
1.1	Electric Resistivity and Electrical Logging Equipment	1 set	Electric Resistivity ; Digital stacking type, Range -10V to +10V Electrical Logging ; NR more 5kohm-m, SP PE 16" or 64", NG 10 kCPS	Rural Water Dpt. DWD
1.2	Portable Water Analysis kit	3 kits	Portable unit (Parameter: Total Solids, Total Hardness, Fe, Mn, F, Cl, SO ₄ , NO ₂ , NO ₃) , Turbidity Meter (0-19.9 mS/cm), pH Meter (0-14 pH), Regents (for 200 water samples)	District Office
1.3	Water Level Meter	3 kits	Rope method with thermometer (100 m length)	
1.4	Vehicles for Supervisory Works	2 units	Displacement: 2800 cc, Double Cab Pick-up type	Rural Water Dpt. DWD
2. Equipment for Administrative Training and Facilitation				
2.1	Laptop Computer	1 set	CPU; 2.0 GHz, Memory; 256 MB, HARD DISK; 40 GB CD-R/RW, Modem	Rural Water Dpt. DWD
2.2	Color Printer	1 set	Color, Max size; A4, Memory; 512 KB	District Office
2.3	GPS	3 kits	Receiver 12 channel, Accuracy 7 m, 95% 2D RMS	
2.4	Section cutout model of the handpump	3 units	Model: U2/U3 Handpump	
2.5	Digital Still Camera	3 kits	2 million Pixel, Zoom Lens: x 3	
2.6	Motorcycle	3 units	Displacement: 125 cc, Off-road type	
2.7	Maintenance Tools	46sets	Manufacturer standard tools	

By constructing 120 deep borehole water supply facilities under the Project, 36,000 villagers will receive the safe drinking water, and the sanitation and living conditions in the areas will be improved. The water coverage rate in the Mukono, Kayunga and Masaka districts will be improved from 59.1 %, 48.6 % and 34.5 % to 60.8 %, 50.9 % and 36.3 %, respectively. The software assistance will be carried out to ensure the sustainability of the water supply facilities, and the villagers will be sensitized in collection of water charge as well as health and sanitation. Initial contribution will be collected and the operation and maintenance system of the facilities will be established in each WSC. The capacity building of the district water officers will be given through the OJT in the course of the software assistance, and the number and quality of the staff of the district water offices will improve, which will realize the operation and maintenance by villagers in the villages other than those for the Project. In addition, the equipment and materials procured will improve village facilitation, operation and maintenance of the existing boreholes and monitoring of groundwater in the district water offices.

Total project cost required for the execution of project by Japanese Grant Aid is estimated to be about 655 million Yen (about 627 million Yen by Japanese side and 428 million UGS (28 million Yen) by Ugandan side) based on responsibility of Government of Japan and Uganda. The breakdown of the project cost of Japanese side is shown in the following table.

Breakdown of Cost by Japanese Side

(Unit: Million Yen)

Project Cost Items	Masaka District (49 sites)	Mukono District (33 sites)	Kayunga District (38 sites)	Total
(1) Facilities	173.6	114.3	131.7	419.6
(2) Equipment	23.3	0.0	0.0	23.3
Sub-total	196.9	114.3	131.7	442.9
(3) Detailed Design – Supervision– Technical Assistance	84.4	46.6	53.6	184.6
Total	281.3	160.9	185.3	627.5

The construction schedule will be divided into two terms in this Project. Phase 1 will be 8 month and phase 2 will be 11 month, and total construction schedule will be 19 month.

The Project aims to bring benefits to the people living in the rural areas of Uganda where there are many poor people, and the beneficial people are expected to be as much as 36,000. The water supply facilities to be constructed under the Project are expected to be operated and maintained by villagers under the guidance of the district water offices as well as Community Development Assistance (hereinafter referred to as “CDA”) in each sub-county. The equipment and materials to be procured for village facilitation under the Project are also expected to be utilized under the guidance of the district water offices to create sustainable and effective conditions of rural water supply. This Project is to improve the living conditions of villagers with the framework of SIP15 under PEAP. No adverse environmental impact is expected. In the context mentioned above, the Project is considered adequate for the Japanese grant aid.

The software assistance will be done for the operation and maintenance and management of the water supply facilities to be constructed. However, in order to implement the Project smoothly and effectively, it is indispensable to establish the complete operation and maintenance system after the construction of facilities, and the following items are required to be fulfilled by the

Government of Uganda.

- Proper budget allocation for the Project and the capacity building of district water offices necessary for the project implementation on district level
- Coordination with the other donors for effective implementation of community mobilization and sensitization
- Proper management of data base on the existing boreholes and the water quality monitoring
- Operation and maintenance fees (water charge) properly set for the sustainable management of the facilities
- Proper staff for establishing the sustainable repair and inspection system of hand pump units

Basic Design Study Report

on The Project for Rural Water Supply in Central Uganda in The Republic of Uganda

Preface
Letter of Transmittal
Project Location Map
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CHAPTER 1 BACKGROUND OF THE PROJECT

CHAPTER 1 BACKGROUND OF THE PROJECT

Uganda has made poverty eradication a national target. The Poverty Eradication Action Plan (PEAP) in 1997 lays out four pillars of development: i) the establishment of a system for economic growth and structural reform, ii) securing good governance and security, iii) income improvement of the poor, and iv) the improvement of the quality of life of the poor. Roads, agriculture, health, education, water and sanitation are five priority sectors in PEAP, and water and sanitation sector is considered important as it contributes to the improvement of the quality of life for the poor.

The Uganda rural water supply project began in full scale around 1990. The Rural Water and Sanitation Eastern Uganda Project (RUWASA) by DANIDA began by targeting ten districts in the east part of Uganda. The first stage was executed over five years (1991-1995), and the second stage was executed over six years (1996-2001). In addition, UNICEF executed the Water and Environmental Sanitation (WES) program with the financial support of SIDA for 35 districts other than the ten districts in the east. Its first stage was executed over six years (1990-1995), and the second stage also for six years (1995-2000). In parallel with these water supply projects, the Project for Rural Water Supply (known as the 1st Phase project) by Japanese grant aid began in 1997 in three districts (Mpigi, Mubende, and Kiboga). Deep well with hand pump (435 sites) and the gravity water supply facilities with public tap (one site) were constructed by 2001. The number of deep wells constructed by these projects reached 9,354 for the period 1991-2000, and the water supply circumstances of the rural areas of Uganda improved greatly. The nationwide rural water supply rate is 54.9% as of June 2002. The district wide rural water supply rate ranges from 23.7% (Pader district) to 79.9% (Rukungiri district), showing a big gap between the highest and lowest, and the need to level off the disparity. The rural water supply rate of Mukono, Kayunga and Masaka districts, the target areas of the Project are 59.1%, 48.6% and 34.5%, respectively.

Based on the 1st. Phase project, the Government of Uganda requested the Government of Japan for the grant aid for supplying safe water by developing groundwater in Masaka, Mukono and Kayunga districts. The request dated February 2001 consists of the following items.

- Construction of 150 deep boreholes of water supply facilities with hand pump units
- Procurement of equipment and materials for survey, community mobilization and sensitization
- Software assistance for facilitating the operation and maintenance of the water supply facilities by villagers

CHAPTER 2 CONTENTS OF THE PROJECT

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2.1 Basic Concept of the Project

2.1.1 National Target and Project Objectives

Uganda has made poverty eradication a national target. The Poverty Eradication Action Plan (PEAP) in 1997 puts the poverty on the improvement of the quality of life of the poor among the four pillars of development. Water and sanitation sector is considered as the important field for improvement of the life of the poor.

This project is to improve the water supply situation in Mukono, Kayunga and Masaka districts for the improvement of living standards of the poverty peoples in the districts. The following effects are expected by implementing this project.

- i) The service rates of Mukono, Kayunga and Masaka districts will be improved to 60.8 %, 50.9 % and 36.2 %, respectively.
- ii) The community mobilization and sensitization system of the Water Offices of Mukono, Kayunga and Masaka districts will be improved, and the operation and maintenance system by the Water and Sanitation Committee (WSC) of each village will be reinforced.
- iii) The health, medical and living standards of Mukono, Kayunga and Masaka districts will be improved.

2.1.2 Basic Policy of the Project

Since the Uganda government aims to improve the water supply rate of the rural area and is achieving some improvement of situation of water supply and sanitation and poverty eradication, it requested in February 2001 the construction of deep wells with hand pumps (150 sites), the necessary study for executing the project, and the procurement of materials for education and soft assistance for the sustainable maintenance and operation of the constructed water supply facilities. This project for Masaka, Mukono, and Kayunga districts is based on this request.

<Construction of Water Supply Facilities>

While 200 villages were listed, 150 water supply facilities were requested to be constructed on the request letter. Field survey was carried out in the selected 150 villages, and the construction facilities were discussed with Uganda side under the policy of the maximum 150 facilities. It was requested to consider the target villages in the new list, since the present site conditions are different from those at the time of the original request, and the 150 villages were selected for studying from the new list considering situations of the existing water supply facilities in the villages, access to the villages, etc. The 120 villages as the cooperative target villages were selected for the construction of water supply facilities from the viewpoints of the natural and the socio-economic conditions among these villages.

<Procurement of Equipment and Materials>

The appropriateness of the requested equipment and materials were studied considering the situation of the existing equipment and materials and the project implementation system. As a result, the following equipment and materials were selected.

Comparison of the Equipment and Materials for Procurement

Request	Basic Design	Remarks
1. Equipment for Field Survey		
1.1 Electric Resistivity and Electrical Logging Equipment, 1 set	Same	
1.2 Portable Water Analysis kit, 3 sets	Same	
1.3 Water Level Meter, 3 kits	Same	
1.4 Vehicles for Supervisory Works, 2 units	Same	
2. Equipment for Training and Facilitation		
2.1 Laptop Computer, 1 set	Same	
2.2 GPS, 3 kits	Same	
2.3 Color Printer for Laptop Computer, 1 set	Same	
2.4 Vehicle Mounted Mobile Audio-Visual Equipment (inc. Section cutout Model of the Hand Pump), 1 set	Section cutout Model of the Hand Pump, 3 units	Cost performance is not considered appropriate.
2.5 Slide Projector, 1 set	Excluded	
2.6 Digital Video Camera, 1 set	Excluded	
2.7 Digital Still Camera, 1 set	3 sets	For each district water office
2.8 Motorcycle, 3 units	Same	
2.9 Bicycle 106 units	Excluded	The equipment for general use can not be procured.
2.10 Maintenance Tools for hand pump, 53 sets	46 sets	The sub-counties where the facilities are planned to be constructed are considered.

<Software Assistance>

The operation and maintenance of the water supply facilities with hand pump unit are conducted by WSC. Although there exist the systems for supporting to the WSC activities, they are not functioning effectively. Thus, software assistance to improve the operation and maintenance of water supply facilities by the villagers is included in the project. Since the capacity building of such Ugandan supporting system is carried out by Technical Support Unit (TSU) with the assistance of SIDA, DANIDA., etc., the mobilization and sensitization of the villagers will be done under the software assistance of the project utilizing a local NGO.

2.1.3 Basic Concept of the Project

This project is to construct water supply facilities, to procure equipment and materials for mobilization and sensitization of the villagers, and to provide software assistance in capacity building of operation and maintenance system of WSC, and to have the following outputs.

<Direct Effects>

- i) Water supply facilities with deep tubewells are constructed.
- ii) Supporting system of the district Water Office to the villagers for the sustainable operation and maintenance is improved.
- iii) WSCs are established in each village, and the operation and management systems of the water supply system with hand pump units are reinforced.
- iv) The repair and maintenance skills of the Hand Pump Mechanics (HPM) are improved and the repair and maintenance system of hand pump units is prepared.

<Indirect effects>

- i) Health and sanitation situations of the villages for construction of water supply facilities

are improved.

- ii) Villagers understand the worth of safe water and hand pump.
- iii) Villagers understand the importance of WSC.

The basic plan of the Project is shown in Table 2.1.1.

2.2 Basic Design of the Requested Japanese Assistance

2.2.1 Design Policy

The unit rate contract system of cumulative drilled depth will be employed in implementing the Project in order to reduce the construction costs, since the contractor's risks of unsuccessful borehole expenses is considered to cause the increase of construction costs. The Japanese grant includes the borehole drilling (maximum of 11,970 m equivalent to approx. 120 water supply facilities with hand pump units) to be performed under the unit rate contract system, and the construction of platforms including hand pump installation. To improve the water supply situation of Uganda, the procurement of equipment and materials for groundwater development survey and educational activities, and provision of funds for software assistance for smooth and sustainable operation and maintenance of the borehole facilities are to be done. The Project is based on the following policies.

(1) Policy on Natural Conditions

- Since rainy and dry seasons are not clear in the Project area, it is not desirable to stop the construction works during the rainy season to maximize effective construction throughout the available implementation period. The days available for construction will be set considering the climatic characteristics of the Project area, and the construction plan will be established to fit the road conditions of the areas.
- There are probably three types of groundwater storage in the target area: one is fissures in a fractured zone or open joints in fresh rocks, the second is voids in gravelly zone of weathered rocks, and the third is pores in sandy layers in the swamp deposit and basal conglomerate formation. An appropriate plan for drilling depth, well structure and drilling method is set up for the development of these three ground water storages.

(2) Policy on Socio-economical Conditions

- In Uganda, when the borehole facilities are constructed, the government assist in providing the technical knowledge to villagers for the smooth operation and maintenance of the boreholes, and raising awareness among the villagers that the constructed borehole is a property of village. It is necessary to coordinate and facilitate these activities in the Project.
- The fence around a borehole and the access road from main road to the site will be constructed by the community in order to increase the sense of ownership of the borehole facility. The community will participate in the construction as labourers free of charge.

(3) Policy on Construction Conditions

- Local drilling contractors should be utilized in the Project. Because of the privatization policy of the Ugandan government, the number of private drilling companies is increasing, and there are 17 contractors registered in DWD at present. However, construction quality varies widely from contractor to contractor, and the period of some contractors after their

registration of DWD is considered short. It is necessary, therefore, to select the contractors competent for completing the works in time during the limited construction period and for ensuring the quality required for the grant aid project.

- The materials to be incorporated in the construction works should conform to BS, DIN, ISO, ASTM, etc. prevailing in Uganda and/or those compatible to these standards in order to make the construction easier and to assure the quality of the constructed facilities, as well as the operation and maintenance of the facilities.
- The equipment and materials for the construction should be of Ugandan origin or of makers or manufacturers who have factories or agents in Uganda in order to avoid difficulties in operation and maintenance.

(4) Policy on Capacity of Executing Organization for Operation and Maintenance

- In accordance with the decentralization policy of the Ugandan government, the responsibilities of the organizations and agencies related to water supply and sanitation are being transferred to the district administration, scaling down the central government organizations. However, there are not enough staff in the district water offices capable of facilitating and supporting villagers for the construction of water supply facilities and their operation and maintenance. The Technical Support Unit (TSU) was established for capacity building of such district administrations. In the Project, software support consisting of facilitation of villagers will be given in order to assure the sustainability of the water supply facilities constructed under the Project. In the course of such software support, on-the-job training (OJT) of water officers and Community Development Assistants (CDAs) who are the core of the project will also be conducted.
- Locally available materials and equipment will be used so that the villagers are able to obtain spare parts easily.
- In order to enable hand pump mechanics (HPMs) to repair the hand pumps constructed in the Project, repair tools and technical assistance on methods, procedures, etc. of hand pump repairing will be provided to such HPMs.

(5) Policy on Scope and Grade of Facilities and Materials

<Borehole Construction>

- There are three types of groundwater storage in the target area, and it is not considered easy to develop such stored water. Realistic values and methods on drilling sites, borehole depths and diameters relating to the borehole structures, depths to the base rocks, success rates of drilling, and standards for successful boreholes will be determined based on geophysical survey results and analysis, records of the Project for Rural Water Supply which was implemented as a Japanese grant aid project (hereinafter referred to as 1st. Phase Project), database of the existing boreholes in the target areas, etc.
- U2/U3 types of hand pump units will be used in the Project since they are available in the Ugandan market and their operation and maintenance technology is assured.
- The population served by one borehole facility and the water consumption per capita are set at 300 and 20 l/day/capita respectively in accordance with the Ugandan standard. As for the population served, however, it will be adjusted to the actual situation of the village based on the population distribution, etc.

- Common materials obtained in Uganda will be used for the Project, and the boreholes to be constructed will be of a structure that will ensure the protection of groundwater and the environment around the boreholes.
- The methods of drilling and the structures of boreholes will be basically of those types commonly applied in Uganda, and the construction costs will be reduced to maximize the efficiency of investment and assistance.

<Procurement of Equipment and Materials>

- The equipment and materials for the Project will be mainly procured in the local markets.
- The types and specifications of equipment and materials to be procured will be selected so as to utilize them effectively to obtain value for money.

(6) Policy of Implementation Period

- The implementation schedule of the Project will be prepared based on the methods and the procedures by which the Project can be implemented within a two fiscal-year period.
- Since the rainfall pattern is not considered constant in the project areas, and the continuous rainfall is not recorded frequently, the days on which rainfall records exceed 10 mm will be considered to be those when the construction and the movement of drilling rigs are impossible in preparing the construction plan.
- Since the drilling sites should be determined based on the agreement of villagers, and since it is then necessary to carry out hydrogeological survey in coordination with the facilitation activities to be performed under the software assistance, the procedures of the detailed design should be set so as to carry out these activities smoothly.

2.2.2 Basic Plan

(1) Overall Plan

According to the request on February 2001, the contents of the request are the followings:

- Construction of 150 sites of deep well facilities with handpump
- Procurement of equipment and materials for investigation and activities of education and facilitation
- Execution of software assistance to make villager maintenance possible for the constructed water supply facilities

The above-mentioned matters were discussed with Government of Uganda in the study, and the requested contents were confirmed as shown below.

<Villages for Construction of Borehole Facilities>

According to the request, the construction of water supply facilities were for 150 out of the target villages 200 villages. If many wells are constructed in a short period, it is considered difficult to assure the sustainability of all well facilities under the present maintenance support system of Uganda. Hence, the construction of facilities were discussed with Government of Uganda for a maximum of 150 sites for enhancing their durability. Government of Uganda requested the consideration of a new list to reflect the variation about the target villages from the time of the original request to the present. The 150 villages were selected based on the

conditions of: i) the existing water supply facilities in operation, and ii) the road access to the villages.

The present situation of each village was further studied from natural and socio-economic conditions based on field survey results, and this resulted in the exclusion of 30 villages. Hence, 120 villages were selected as the cooperation target as shown in the following table.

Requested and Selected Villages in Each District

Name of District	Original Request Villages	Confirmed Villages*	Excluded Villages		Target Villages
			Natural Conditions	Socio-economic Conditions	
Masaka	100	63	12	2	49
Mukono	50	46	13	-	33
Kayunga	50	41	3	-	38
Total	200	150	28	2	120

Note *: 150 villages were confirmed in the Minutes of Discussion.

Study and target villages are shown in Table 2.2.1 and these locations are described in Fig. 2.2.1 and Fig. 2.2.2.

<Confirmation of Appropriate Target Villages According to Natural Conditions>

Village selection was based on six criteria as shown in the following table for natural conditions, and each criterion was ranked, and appropriateness of execution of the project was evaluated for each village

Criteria of Village Selection

Selection Criterion	Rank of Selection		
	A	B	C
i) Existing Water Supply Facilities	No safe water supply facilities	Water source of shallow well or spring	There is deep well.
ii) Access Conditions	Possibility of access for large-size car throughout year	Occasionally impossible for passing during rainy season	Impossible for access by large-sized car
iii) Geological Conditions (Kind of Geology)	Sedimentary rock or sedimentary layer area	Granite area	Gneiss area
iv) Topographic Conditions	Area with wide catchment area	Located on hillside or low elevation	Top of mountain
v) Possibility of Groundwater Storage (Results of geophysical survey)	Judged as high possibility	Judged as medium possibility	Difficulty or high salty water possibility
vi) Water quality conditions surrounding the existing wells	Clear standard value as results of all water quality analysis	Acceptable value	Over acceptable value surrounding wells and especially over acceptable value of Fe and F

The villages ranked as “C” for total evaluation by natural conditions were excluded from the list of target villages, but if the possibility of groundwater storage (evaluation by the results of geophysical survey) was classified “A” and the topographic condition was classified “C”, the total evaluation is classified “A”. There were no villages classified “C” on access, geology and water quality. 28 villages were classified as “C” by total evaluation as the results of

confirmation of the natural conditions as shown in Table 2.2.2 and these villages were excluded from the list of target villages.

<Confirmation of Appropriate Target Villages According to Socio-economic Conditions>

The confirmation of target villages was made based on the results of the questionnaire of socio-economic conditions conducted for village leaders (two persons per village). The items evaluated were willingness of water charge payment, difficulty of getting water (distance and time to the existing water source) and health and hygiene aspect (prevalence of infectious disease).

- Willingness of water charge payment:

Combinations of answer of two leaders choosing “1. pay”, “2. no pay” and “3. no understanding” were classified as shown in the table.

Evaluation of Willingness for Water Charge Payment

Combination of Answers		Evaluation	Note: 1. “Pay” 2. “No Pay” 3. “No understanding”
Answer 1	Answer 2		
1	1	A	
1	3	A	
1	2	B	
3	3	B	
2	3	C	
2	2	D	

- Difficulty of getting water:

According to answer of questions on distance and time to the existing water source (the mean value was adopted because of two answers), the

Classification of Distance and Time Fetching Water

Class.	Description
A	More than sixty minutes or no safe water supply facilities
B	More than one km distance
C	Less than one km distance and more than thirty minutes
D	Other than the abovementioned

water supply facilities (well with hand pump, protected spring water or level II water supply facilities) and the provision of safe water were classified as shown in the above table.

- Health and hygiene:

Number (total of two answers) of infectious disease choosing “1. very many”, “2. many” from “1. very many”, “2. many”, “3. few” and “4. very few” of answer of questionnaire about occurrence of water borne disease were classified as shown in the table.

Classification of number of water borne disease problems

Class.	Contents
A	more than 10
B	7 - 9
C	4 - 6
D	1 - 3

The results of evaluation of above-mentioned items are shown in Table 2.2.3. There are two villages that two answerers answered “no pay” for the item of willingness of water charge payment. It is considered that this matter will be a problem for the sustainability of the project. Therefore, the two villages marked “C” were excluded from Grant Aid. Even if it was judged that necessity of “difficulty of water” and “health and hygiene aspect” was lower than the other villages, these villages were not excluded from Grant Aid because the difficulties in getting water in all the villages are considered severe. Where the evaluation of villages for “difficulty of water” or “health and hygiene aspect” was “D”, it was considered that total evaluation was “B”; otherwise, the total evaluation was “A”.

<Procurement of Equipment>

The required equipment and materials consist of: i) investigation equipment and ii) education

and facilitation equipment for maintenance by villagers. The contents of equipment confirmed by the field survey are shown in the following table.

List of the Required Equipment

No.	Item	Qty	No.	Item	Qty
1. Investigation Equipment			2.3	Color printer for laptop computer	1 set
1.1	Geophysical equipment and electrical logging equipment	1 set	2.4	Vehicle mounted audio visual equipment including cutout model of hand pump	1 set
1.2	Portable Water Quality Analysis Kit	3 sets	2.5	Slide Projector (connection to computer by S-video)	1 set
1.3	Water level measurement tool	3 sets	2.6	Digital Video Camera	1 set
1.4	Vehicle for supervision	2 cars	2.7	Digital Camera	1 set
2. Equipment of Education and Facilitation			2.8	Motorcycle	3 sets
2.1	Lap top computer (CD-R/RW, internet connection)	1 kit	2.9	Bicycle	106 sets
2.2	GPS	3 sets	2.10	Repair Tools for hand pump	53 sets

<Software Assistance>

Although the operation and maintenance of the borehole facilities are to be done by WSC, and the government support system to assist the villagers in performing these activities was established, such system is not functioning smoothly. Activities to facilitate villagers for operation and maintenance are to be carried out by CDAs. These CDAs belong to the Ministry of Gender, Labour and Social Development and are also responsible for the facilitation in the health and sanitation in addition to the water supply. The number of CDAs is also short, and some subcounties have no CDA. The county water officers, on the other hand, do not have enough experience to support community facilitation because they are newly recruited and transferred from the central offices of the government due to the decentralization policy. The capacity building of these district office staff (who are considered to be responsible for field works relating to the construction of water supply facilities) has just started by Technical Support Unit (TSU) established in DWD under the assistance of SIDA, DANIDA, etc. TSU will be divided into eight areas in the country and is planned to perform the capacity building of staff of the District Water Offices. As it will take some time until the effect of assistance by TSU reaches field level officers and staff, DWD is looking into a possibility to have local NGOs/Consultants execute the facilitation activities on contract basis. Many tubewells will be constructed in a short period when the Project is implemented. Since there is a limitation in allocating enough budget to conduct the activities for supporting the villagers, it is considered difficult for the Ugandan government to carry out such supporting activity in a timely manner. The software assistance consisting of the facilitation of villagers and OJT of CDAs and county water officers will be executed in the Project in order to realize the sustainable operation and maintenance of the Project borehole facilities with the participation of the villagers.

(2) Facility Plan

<Water Supply Plan>

According to the standard for water supply in Uganda, the supply unit is 20 liters per day per capita and population to be supplied by a deep well is 300 capita per well. Since hand pump typed U-2 can pump up 780 liter per hour and water demand for 300 villagers is 6,000 liters per day, the daily operation time of a hand pump is 7.7 hours (6,000 liters per day divided by 780 liters per hour). If the operation time of a pump is 12 hours per day, working rate of the pump is only 64% (7.7 hours divided 12 hours). So a well can supply water to more than 300 villagers and the population for water supply will be flexibly considered for the Project. When plural wells are constructed in one village, there is concern that management and maintenance for only one of the wells would be made. In order to avoid such concern, only one well facility will be constructed in a village.

<Water Source>

Quality of Source Water

The water source of this project is groundwater. According to the water quality test data of existing deep wells in the project area, potable groundwater can be supplied to the target villages because the probability of unsuccessful wells due to unsafe water quality is only about 4.7%. The items of water quality test that need attention are contents of total iron, total hardness and chloride. According to the existing data, most wells judged as unsuccessful due to water quality exceed the DWD's acceptable values of these parameters. Water quality is, therefore, not significant in the proposed area, but the test items should be checked during the implementation stage of the project.

Criteria for Successful Wells

Criteria for a successful well are to be studied for both yield and water quality. A well yield should be more than 12 liters per minute (720 liters per hour) in accordance with the specifications of selected hand pumps typed U2/U3. When a well does not give this yield, the well will be considered as an unsuccessful well. In addition, the specific capacity of a well is set up as 1 liter per minute per meter for the following reasons.

When yield of a well is specified as a certain numerical value, the meaning of the value is described as follow. The capability of a stratum to hold water is classified into two types. One is gravitational movement, called the "specific yield" of a stratum, and the another is holding water at the stratum itself and is called "specific retention". The specific yield of gravels and sands will be up to 10 % in capacity ratio. A fracture zone in rocks is equal to the yield of gravels, but a clay layer has high specific retention and its yield is zero in practice.

When water is pumped up from a well, a gravitational difference arises between the water level in the well and the stratum head (aquifer), and groundwater immediately begins to flow to the well. The difference appearing as drawdown depends on the well loss and the aquifer loss. Dynamic water level can be called the lowest drawdown that appears when constant pumping continues for several hours. Specific capacity is the value when the quantity of pumping is

divided by the dynamic water level. Dynamic water level is, therefore, inevitably decided when the specific capacity and the pumping rate of a well are specified.

The yield specified indicates the meanings mentioned above and a fixed quantity of water can be drawn from a well on condition that the dynamic water level is only stable as the yield specified. It should not be thought that daily water demand can be pumped up from a well with rapid drawdown or that the dynamic water level is unstable. Some mechanical parts of the pump can become damaged and the pump may breakdown often, because the pump is set deeper than the specified pumping head with long pump work time. Thus, it is necessary to specify the specific capacity with the yield of the well in order to avoid this problem.

In special cases in the 1st. Phase project when the yields of wells are less than 12 liters per minute and more than 6.0 liters per minute, these wells were regarded as half-successful wells. But all the half-successful wells will be considered unsuccessful wells in this project, for two reasons. One is that the payment to the contractor is made by total drilled lengths according to the bill of quantities attached in the contract document. Another is a very complicated cost estimation. When villagers urgently request to use a half-successful well, the project will consult with the DWD about the request. After DWD agrees that the well will be left as the un-abandoned well in the village, the project hands over the well to DWD with capping on the topmost casing pipes. DWD will, then, bear the cost to construct the upper structures and install hand pumps at its expenses, and be liable for defects if any.

Criteria of water quality for the project basically adopt the water quality standard of DWD with some allowable limits.

Success Rate of Borehole Drilling

The following table summarizes the success rates in each geologic stratum based on the records of all the deep wells drilled by the 1st. Phase Project. The records include some half-successful wells for which yield was less than 12 liters per minute, which is a standard value for successful tubewells for DWD, but more than 6 liters per minute. However, the success rate of this plan is based on records where half-successful wells were classified as failure wells.

Previous success rates are calculated for each geologic stratum and in each district. The target villages are, therefore, classified into 4 geologic strata in every district according to the geologic maps and the success rate for the plan is estimated by using the previous rates. However, Karagwe system and swamp deposits in this project area were not included in the previous project area so that successful rates of both the stratum presume 80% according to the hydrogeologic condition of the site. As the result, the success rate in the plan becomes 71% based on a weighted average.

Summary of Success Rates Based on Data of Previous Project

Stratum	Previous Project		Quantities									
	Drilled wells	Successful Rate (%)	Number of target wells			Successful wells			Success rate on an average (%)			
			Kayunga	Mukono	Masaka	Kayunga	Mukono	Masaka	Kayunga	Mukono	Masaka	Weighted Average
Granite Complex	283	70.0	38	19	21	26.6	13.3	14.7	70.0	67.9	73.7	71.0
Gneiss Complex	7	42.9	0	0	0	0	0	0				
Buganda -Toro Sries	318	64.8	0	14	7	0	9.1	4.6				
Midiana Sries	20	95.0	0	0	0	0	0	0				
Singo Sries	8	62.5	0	0	0	0	0	0				
Karagwe System	0	80.0	0	0	11	0	0	8.8				
Swamp Deposits	0	80.0	0	0	10	0	0	8				
Total	636	68.4	38	33	49	26.6	22.4	36.1				

The target villages are classified into 3 ranks (“A”, “B” and “C”) in the general evaluation of the community inventory from the natural condition survey in the project area. Villages ranked “A” have very high potential for groundwater storage, and villages ranked “B” have a probability of 2/3. Villages ranked “C” have low potential of groundwater storage. Accordingly, it is assumed that the success rate for the rank “A” is 95%, for the rank “B” is 67%, and for the rank “C” is 0%. Hence, a success rate for wells on this project is estimated as shown in the following table. The overall weighted average success rate is thus estimated at 77%.

Success Rate Based on Natural Condition in the Project Site

General evaluation	Target villages	success rate assumed (a)	Numbers of Wells (b)			Successful wells (c)=(a)x(b)			Successful rates (d)=(c)/(b)			Weighted Average
			Kayunga	Mukono	Masaka	Kayunga	Mukono	Masaka	Kayunga	Mukono	Masaka	
A	41	0.95	11	12	18	10.5	11.4	17.1	75.3	77.3	77.4	77.0
B	79	0.67	27	21	31	18.1	14.1	20.8				
C	0	0.00	0	0	0	0.0	0.0	0.0				
Total	120	–	38	33	49	28.6	25.5	37.9				

The success rate for this plan was examined by both the previous result and the general evaluation of natural site conditions as mentioned above. The examination indicates that the rate becomes 74% for the average of the rates of 71 % and 77 %.

The water quality test data in the project area which were summarized in the community

inventory obtained from the DWD was analyzed. It was found that although some samples of deep wells satisfied the specified yield, they did not satisfy DWD's water quality standard. Some of these samples are in every district. Then a rate of incidence was calculated by which the number of samples was divided by the total samples. The number of failure wells and the failure rate were computed by multiplication of the rate of incidence and wells of the plan. The following table shows this calculation process and its result.

Failure Rates Due to over Water Quality Standard of DWD

District	No. of Samples	Samples of Which yields are Acceptable but not Satisfying the Standard	Failure Rates	No. of Target Wells	Failure Wells	Failure Rates (%)
Kayunga	174	10	5.8 %	38	2.3	6.1
Mukono	112	4	3.6 %	33	1.2	3.7
Masaka	90	3	3.4 %	49	1.7	3.5
Total	376	17	4.6 %	120	5.6	4.7

As mentioned above, the rate of occurrence i.e. the failure rate where water quality does not satisfy the specified values is 4.7 %. By subtracting 4.7 % from 74 % (= 69.3 %) and rounding off, 70% is proposed as the success rate of wells in this plan.

<Countermeasure for Occurrence of Failure Wells>

In consideration that difficult drilling works will occur in some well sites owing to the low success rate of 70% in the plan, reserved points for re-drilling will be prepared during the well site selection in the detail design stage.

As a procedure for deep well construction, the second drilling point (after failure at the first selected point) should be found by geophysical survey based on drilling records. However, the second point for drilling will be set up in the detail design stage to achieve cost reduction of well construction. Re-drilling will begin at the second point when the first drilling fails. If the re-drilling is also failure, the well construction work will stop in that village, and another target village will be selected for the third drilling work in place of the former village on condition that the population is relatively large, the village has few existing wells, and there are no problems found for operation and maintenance of the facilities.

Water Level in Wells and Pump Depth

The average static water level in successful wells observed in the 1st phase project is 20 meters under the ground surface. A criterion of a successful well of this plan is set up at more than 12 liters per minute as yield. The tendency of water level in a well based on this yield in order to set up an average depth of pump is considered below.

It becomes a condition that dynamic water level at the pumping rate of 12 liters per minute must not exceed 40 m which is capacity of hand pumps when calculating average depth of hand pumps. Namely, in case the static water level is 20 meters, the dynamic water level must be 20 meters because the static water level of 20 meters is deducted from the pump capability of 40 meters. The case mentioned above indicates that the specific capacity at the yield of 12 liters per minute must be more than 0.6 liters per minute per meter.

The specific capacity gradually decreases with increasing pumping rates, and drawdown gradually goes down with the increase of pumping time. The water level 1 or 3 hours after the start of pumping will be generally stable, but the water level in a well with less quantity of yield than the pumping rate will not reach stability in many cases.

From this point of view, the specific capacity in case of wells equipped with a hand pump is generally specified at 1 liter per minute per meter in consideration of the seasonal movement of water level. In this case, the pumping rate of 12 liters per minute makes the drawdown of 12 meters. Therefore, when a specific capacity is 0.6 liters per minute per meter, many difficulties occur in which the well does not safely supply water throughout the year.

From the above reason, average depth of a handpump in this project is set up as 35 meters from the ground surface as follows:

- Static water level: 20 (m)
- Minimum yield: 12 (liters/min)
- Safety factor: 3 (m)
- Specific capacity: 1 (liter/ min/ m)
- Drawdown: 12 (m)
- Installation depth: 35 (m) {20m+12m+3m}

Drilling Quantity for Well Construction

The total boreholes for successful wells constructed in 120 target villages is calculated from the average success rate mentioned above as follows:

- Successful well: 120 total sites
- Boreholes to be drilled: 120 divided by 70% = 171
- Unsuccessful wells: 171 - 120 = 51

In order to estimate drilling length and depth to fresh rock for the plan, as shown in Table 2.2.4, the average length and the depth for each district are calculated in the following table. The average depth of drilling is 70 meters and the depth to the fresh rock is 39 meters based on the inventory of existing deep wells in the project area.

Drilling Depth and Depth to Base Rocks for the Plan

District	No. of Data	Existing Wells		Plan				
		Average Drilling Length	Average Depth to Rocks	No. of Wells	Drilling Length*	Depth to Rocks*	Average Drilling Length	Average Depth to Rocks
Kayunga	356	65.7	33.8	38	2,537.5	1,250	66	33
Mukono	175	61	32	33	1899.7	1004.9	58	30
Masaka	278	86	48	49	4009.3	2404.1	82	49
Total	809	-	-	120	8447.0	4659.0	70	39

On the other hand, based on the geo-electric survey analysis, the average thickness of overburden was analyzed and weighted average of three districts turned out to be 50 m as shown in the following table. The average depth to rocks of 39 meters calculated from DWD data is much shallower because the data includes the area where overburden is thinner than the

geologic conditions in this project area. In consideration of this point, the depth to rocks at the drilling points in this plan is set as 50 meters.

Depth to Rocks Estimated by Geo-electric Results

District	No. of Wells	Average Depth to Rocks (m)
Kayunga	38	41
Mukono	33	47
Masaka	49	56
Total	120	50 (Weighted Average)

In accordance with the average of well length and average depth to rocks as set above, quantities of concerned well construction works are computed as follows:

- Average length of well: 70 m
- Average depth to rocks: 50 m
- Drilling length in total: 11,970 m (70 x 171)
- Depth to rocks in total: 50 x 171 = 8,550 m
- Length of well casing in total: 9,637 m (11,970 x 80% + 0.5 x 121)
- Length of well screen in total: 2,394 m (11,970 x 20%)

<Well Facilities>

Typical Structure of Well

A typical well structure in this plan is designed by focusing on reduction of well construction costs and achieving stable supply of groundwater for long period.

There are many well construction cases in Uganda that adopt a method with uncased hole in the fresh rock portion, but the method indicates some weak points as follows:

- (a) After drilling to base rock formation, well casing without screens is installed and the casing is fixed by mortar or cement grouting. Thus drilling work will be interrupted for at least 24 hours until the grouted mortar or cement mixture hardens. This interrupted time raises the cost of the well construction as a result.
- (b) When drilling fresh rocks by DTH method through the well casing pipes, the drilling damages the grouted mixture and contacts the rocks with its vibrations and shocks. Consequently, polluted water intrudes from the ground into the well and the damaged base rocks cause collapsing of the wall of drill hole.
- (c) Open cracks in rocks and voids in weathered rocks usually store no small quantity of groundwater. The groundwater stored in weathered rocks is an especially important target in case of the geologic structure in this project area. Therefore, the use of blank casing without screen is not applied for the Project.

Thus the proposed typical well structure is to be equipped with casing with screens to the

bottom of the drill hole for the reasons mentioned above.

In order to reduce the construction cost, well construction procedures are proposed to construct a stable well structure for long-time use. This is done by utilizing drilling tool equipment by local contractors as follows:

Construction Procedure for Typical Well

Procedure	Explanation
1	The top soil is excavated to 5.50 m by fish tail bit or tricorn bit 11 inches in diameter by rotary system of mud water circulation or reverse circulation system. Then in order to give sufficient head of mud water for prevention of collapse of the top soil, conductor pipe of more than 9 inches diameters is installed. The pipe must be fixed by pressing or by hammering to 6 meters.
2	Overburden formation, weathered rock formation or residual deposits is drilled with 8-1/2 and 8-3/4 inch diameter by mud water circulation or reverse circulation system until fresh rocks.
3	The mud water containing drill cuts must be replaced with fresh mud water after mud drilling reaches to the fresh rocks.
4	Electric logging shall be carried out immediately for checking the existence of aquifers.
5	Work casing of 8 inches inner diameter must be installed, and 50 cm or more of tip of the casing is fixed by casing-drill method in the rock. When casing-drill method is difficult, precedent drilling by DTH inside the casing can be used together.
6	A base rock is drilled to predetermined depth using DTH of 6 inches diameter or more. When encountering a water vein during drilling, the yield and depth encountered are recorded.
7	Electric logging of a base rock portion shall be carried out immediately after drilling to predetermined depth. A well casing schedule is designed based on the results of both the electric loggings.
8	Even if drilling reaches a predetermined depth and does not encounter a water vein, and the result of the electric loggings shows few aquifers, the drilling work shall be interrupted and the contractor must inform it to the consulting engineer. The contractor resumes the work according to instructions by the engineer.
9	When the existence of aquifers can be confirmed, the screens and well casing pipes shall be installed according to the casing schedule.
10	Immediately after placing gravel to the predetermined depth, well development by air lifting must be started, and the topmost gravel is always measured in the meantime. When subsidence of the topmost of gravel is measured, additional volume of gravel shall immediately filled and the topmost level must be kept always.
11	Yield shall be measured and recorded during development. The borehole installation works of clay seal, back filling and grouting shall be done immediately after completing well development.
12	A submersible pump is installed and a predetermined well yield testing shall be carried out.
13	A sample for water quality tests must be taken just before the end of the yield testing, and the sample shall be transported to a laboratory immediately.
14	When a water quality test result satisfies the DWD water quality standard, the predetermined, well facility must be constructed and a hand pump must also be installed.

Based on the well construction procedure mentioned above, a typical well structure is to be designed as follows.

- (a) PVC well casing with a 5 inch inner diameter was adopted in the phase 1 project. In this Project PVC well casing with a 4 inch inner diameter is to be installed throughout the drilled hole because all wells will be equipped with a handpump as level I water supply facility and reduction of the cost is of almost importance.
- (b) Opening ratio of a screen is 4% as follows:

Calculation of Opening Ratio of Screens

Calculation conditions	
Diameter of screen:	4"(10 cm)
Outside circumference:	31.4 cm
Width of a slot :	0.1 cm
Slot length :	1/5 of the circumference, 6.28 cm
Arrangement of a slot :	four pieces per circumference alternatively
Interval of a slot	1 cm.
Calculation result	
Area of a slot :	1.256 cm ² /slot
Slot area per meter :	125.6 cm ²
Screen area per meter :	3,140 cm ²
Opening ratio:	4.0 %

- (c) Screen length is 20% of drilling depth.
- (d) Average length of a well (70 m) and average depth to rocks (50 m) are as mentioned in the former paragraph.
- (e) A conductor pipe with a 10-inch diameter must be installed up to 6-meter depth below the ground surface.
- (f) Furthermore, after drilling overburden work, casing with a 8-inch inner diameter shall be installed until fresh rocks, throughout the very weathered zone and the portion of residual soils with 8-1/2 to 8-3/4 inches.
- (g) The drilling diameter for fresh rocks shall be 6 inches.
- (h) The size of gravels to be utilized for the stabilizer of well casing and the filter between the casing and the wall of drilled hole shall be larger than the above-mentioned slot width of 1mm, and smaller than 6 mm of 1/4 of space between well casing and drilled hole-wall. The material containing minerals that isolate like laterite are to be avoided.

The figures of the typical well structure are shown in Appendix-5-2.

Superstructures of Well

Upper structures of well are designed in accordance with the standard designs of wells in Uganda. The upper structures consist of a base of the handpump, apron, drainage ditch, drainage pit and fence. The base and apron are reinforced concrete structures and the base also has physically strong structure for prevention from the pump being stolen. The drainage pit is to be filled by pebbles and stones, in addition to the drainage ditch that leads waste water on the apron to the pit. The fence is set up surrounding the well facilities to prevent livestock trespassing. Construction of the fence and the drainage pit is executed by beneficiaries to facilitate participation of villagers. The design figure of the upper structure and installation figure for the pump are shown in Appendix-5-3.

Hand Pump

The U2/U3 handpumps which are improved products of India Mark II are in the market in Uganda, and are easy for village level operation and maintenance. The hand pumps were not only installed by the 1st Phase project, but are also widely used in other projects. This project selects the pump types U2/U3.

(3) Procurement Plan of Equipment and Materials

<Basic Consideration for Determination of Equipment and Materials to be Procured>

The basic consideration for determining the equipment and materials to be procured are as follows:

i) Field Research and Analysis Equipment

Electric-resistivity and Borehole-logging Equipment

This equipment is to be used by Rural Water Department, DWD in urgent cases and/or minor surveys. DWD does not have geophysical survey equipment at present. The transfer of political autonomy from central to district government is taking place under recent structural reforms for decentralization. However, it is difficult for district governments to hire capable staff to perform such surveys. Thus, DWD should be responsible for survey on a demand bases for the time being. In order to cope with these circumstances, DWD should organize its own structures by introducing portable equipment. DWD currently has four hydro-geologists who are capable of using the planned survey equipment with operation manuals. This equipment will be provided to district level water departments on rental basis or transferred to district offices in accordance with the future demand.

Portable Water Quality Analysis Kit and Water Level Meter

Each district water office will carry out monitoring on water quality and level of the existing wells. As the total number of wells to be monitored by the water office will increase from now on, it is important to monitor the transition of water quality and level to maintain these wells in good condition for sustainable utilization. The District Water Offices do not have equipment for water quality monitoring. Consequently, portable water analysis kit (Total dissolved solids, Hardness, Iron, Manganese, Fluoride, Chloride ion, Sulfate, Nitrate, Nitrite) and water level meter will be introduced. In order to utilize the analysis kit and meter fully, specialists will be dispatched from the laboratory of Water Resource Management Department, DWD to district offices for technical transfer through on-the-job training.

Vehicles for Supervisory Works

Rural Water Department of DWD currently uses 2 pick-up trucks and one unit of truck mounted service rig for maintenance works of tubewell facilities constructed by the 1st phase project. Both pick-up trucks have already been driven more than 200,000 km (UG0300S: 222,225 km, UG031S: 200,165 km) since the first delivery in 1998, and entire conditions of both have deteriorated remarkably. Request for new pick-up trucks is justified as replacement for the above existing ones for proper transportation of technical staff on field survey and/or construction supervisory works. Consequently, similar type of vehicle having approximately 2.8 L engine will be procured. Even though exact number of the existing vehicles has not been replied, it can be estimated since several tens of units are owned by DWD. It is difficult to use these to the project because most of them have been already allocated for exclusive use for other donor's project.

ii) Equipment for Administrative Training and Facilitation

Laptop Computer with Color Printer

A laptop computer and a color printer are required to enhance mobility for field works/survey

such as technical data processing and reporting, etc. in rural areas, resulting in establishment of efficient management system of supervisory and maintenance works. DWD introduced several sets of desktop computer for each department while laptop type mobile computer system has not been widely used yet. In order to contribute to facilitating such field works, one unit each of the laptop computer and color printer will be procured.

GPS

GPS is to be used by district water office staff of water management to determine exact location of the existing tubewells. The present database system in Uganda causes difficulty for grasping tubewell location due to lack of enough information on coordinates. Since District Water Offices do not have such GPS, one set of this will be allocated for technical staff of each district office.

Vehicle Mounted Mobile Audio-visual Equipment; Slide Projector, Digital Video Camera and Digital Still Camera

Although DWD planned to introduce this equipment, facilitation activities at community level will be performed under responsibility of district governments. Hence, DWD as organization at central level will not have opportunity to provide direct facilitation in communities. Another device for local offices to enhance mobile facilitative activities at the community level seem to be rather suitable from a viewpoint of effectiveness. In terms of value for money, it would not be advantageous since the estimated amount of the above equipment comes to several million yen. In conclusion, Vehicle mounted mobile audio-visual equipment shall not be introduced. Section cutout model of the hand pump is regarded as useful for demonstration of its structure in various occasions. Consequently, one unit of cutout model shall be distributed at each district office (not at DWD) for further efficient facilitation on the community level. In addition, digital still cameras, which are expected to be used more effectively in the construction supervision and operation and maintenance services, will be allocated to each district office because they do not have such cameras.

Motorcycle

The district offices pickup vehicles and motorcycles as shown in the following table.

Present Situation of Vehicle Allocation in District Water Offices

District	Pickup Vehicles	Motorcycles
Masaka	2	3
Mukono	2	3
Kayunga	1	2
Total	5	8

Total number of motorcycles is not sufficient since 6 to 7 officers including District Water Officer, assistant officers and county officers work at the office. Above all, they are necessary for assistant officers and county officers who are in charge of quite big area to improve their mobility and accessibility. Consequently, one unit of motorcycle will be allocated to each district office. Type of motorcycle shall be off-road oriented because conditions of access road to communities are not generally maintained well although main roads are mostly paved.

Bicycle

Bicycles were requested to improve accessibility for CDA and HPM to move among

communities, and they can be expected to bring positive impact in the software assistance. A bicycle is considered inexpensive and can be purchased by private persons. Even if it is officially purchased for the mobilization and sensitization, it may be used for the other purposes. It is better that the Ugandan side procures such equipment, and thus it is excluded from the list of the equipment to be procured under the Project.

Handpump Maintenance Tools

A suitable maintenance tool set will be distributed to each sub-county to carry out proper maintenance and repair works of the project's U2/U3 type hand pumps. According to the request letter, one set of tools was to be allocated to each sub-county in the districts. However, total 46 set is enough since the project covers only 46 sub-counties as shown in the following table.

Number of Sub-counties	
Name of District	Number of Sub-counties
Masaka	18
Mukono	19
Kayunga	9
Total	46

These maintenance tools shall belong to the district water offices and be kept by them, and shall be operated and maintained for lease to HPMs under the responsibility of the district offices. Training program for maintenance and repair works for the hand pumps shall be performed under the software assistance.

Summary of specification details of equipment to be procured are shown in the following table.

Specifications of Equipment to be Procured				
No.	Item	Quantity	Specification Details	Station
1. Equipment for Field Survey				
1.1	Electric Resistivity and Electrical Logging Equipment	1 set	Electric Resistivity ; Digital stacking type, Range -10V to +10V Electrical Logging ; NR more 5kohm-m, SP PE 16" or 64", NG 10 kCPS	Rural Water Dpt. DWD
1.2	Portable Water Analysis kit	3 kits	Portable unit (Parameter: Total Solids, Total Hardness, Fe, Mn, F, Cl, SO ₄ , NO ₂ , NO ₃), Turbidity Meter (0-19.9 mS/cm), pH Meter (0-14 pH), Regents (for 200 water samples)	District Office
1.3	Water Level Meter	3 kits	Rope method with thermometer (100 m length)	
1.4	Vehicles for Supervisory Works	2 units	Displacement: 2800 cc, Double Cab Pick-up type	Rural Water Dpt. DWD
2. Equipment for Administrative Training and Facilitation				
2.1	Laptop Computer	1 set	CPU; 2.0 GHz, Memory; 256 MB, HARD DISK; 40 GB CD-R/RW, Modem	Rural Water Dpt. DWD
2.2	Color Printer	1 set	Color, Max size; A4, Memory; 512 KB	District Office
2.3	GPS	3 kits	Receiver 12 channel, Accuracy 7 m, 95% 2D RMS	
2.4	Section cutout model of the handpump	3 units	Model: U2/U3 Handpump	
2.5	Digital Still Camera	3 kits	2 million Pixel, Zoom Lens: x 3	
2.6	Motorcycle	3 units	Displacement: 125 cc, Off-road type	
2.7	Maintenance Tools	46sets	Manufacturer standard tools	

2.2.3 Basic Design Drawing

Drawings of tubewells with handpumps are as shown in Appendix-5.

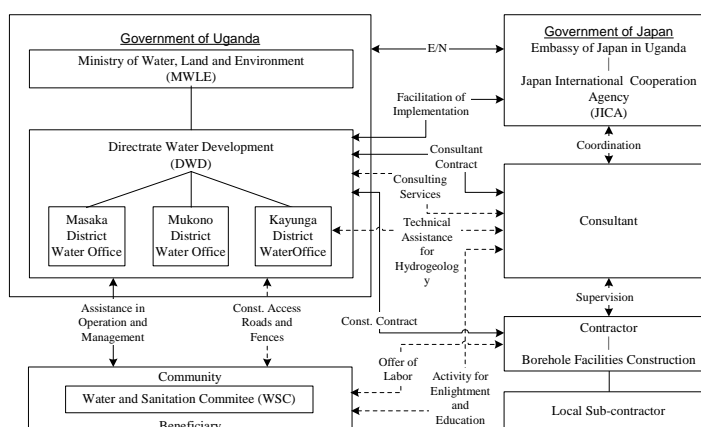
- Location map of villages for borehole construction
- Standard well structure
- Installation of hand pump and relating structure

2.2.4 Implementation Plan

(1) Implementation Policy

<Project Implementation Organization>

The project is to be implemented in accordance with the conditions stipulated in the Exchange of Note agreed between Japanese and Ugandan governments. Directorate of Water Development (DWD) of Ministry of Water, Lands and Environment (MWLE) will be responsible for the implementation of the Project. The operation and maintenance of the facilities and equipment



IMPLEMENTATION ORGANIZATIONS

will be conducted by DWD after the project implementation. DWD will hire a consulting firm for engineering services such as detailed design, preparation of tender documents, support of tender, construction supervision, procurement management, software assistance, etc. Local contractors who can conduct the drilling works of the project will be hired for drilling boreholes. The organizations related to the project and their relationships are presented in the figure above.

<Measures for Cost Reduction>

Application of Local Contractors and Engineers

Many private companies have been established under the privatization policy in Uganda, and 17 firms of drilling works are registered at DWD at present. The capacity of these drilling firms varies; however, a few major firms have the capacity for the required conditions of grant aid. There are many consulting firms that relate to the survey of geological features and hydrogeology, and many consultants have capacity for investigation work, and site supervision of the drilling works. Local sources for local contractors and engineers, etc. will be effectively utilized in the project to reduce construction costs.

Introduction of Unit Rate Contract with Ceiling

Well construction has been generally done on lump sum contract basis in grant aid so far. Since drilling works include many uncertain factors such as the occurrence of unsuccessful wells, this procedure is apt to result in high construction cost because contractors have to include these high risks. Based on the procedure of production payment, a unit rate contract system with the

ceiling set at the amount for the total drilling depth estimated equivalent to the construction of the targeted number of boreholes will be employed by the Project. According to the distinctive features and problem points, the two payment methods are compared in the following table.

Comparison of Payment Method

Payment Method	Lump Sum Contract	Unit Rate Contract (B/Q System) with Ceiling
Description	This system has been generally applied by grant aid projects.	The B/Q System has been generally applied in international contracts, and the system with ceiling is the one of which work items are simplified so as to keep the consistency to the ordinary Lump Sum Contract. It is necessary to apply the proper success rate that actually matches the plan.
Responsibility of Risk and Construction Cost	Contractor ⇒ Contract amount will apt to increase because contractor estimates the amount of risk of unsuccessful boreholes and the planned number of boreholes are constructed by the contractor.	Client (Government of Uganda) ⇒ This system pays for the executed construction quantity resulting in contract unit price and generally cheaper than Lump Sum Contract. However, the planned number of boreholes may not be constructed.
Payment Base	The amount to be paid does not change the work quantities completed by the contractor . ⇒ Payment amount is fixed.	The payment between client and contractor is based on the executed construction volume. ⇒ The work item which is the base of payment and the works to be included such work items should be fare and both the client and the contractor should agree. ⇒ In order to avoid the change of the total paid amount due to completed work volumes, and to enable the contractor to complete all the contracted work volumes, it is necessary for them to agree the treatment of uncompleted work volume at the completion.
Progress Control	Payment is made in a few times under conditions stipulated in the first contract. ⇒ Inspection is only for completed shape and quality of the completed works. ⇒ Supervision and payment are simple.	Payment is made according to construction progress. ⇒ In order to grasp the construction progress it is necessary to monitor and control the construction progress. ⇒ Accurate measurement is required, because the progress of works is considered as the basis of payment.
Problem Point	Since the well construction work involves many uncertain factors such as unsuccessful wells and so on, the contractor estimates a somewhat larger quantity for these risks.	There is some possibility that total payment amount will be more than the payment amount of the contract due to production of construction. In this case, payment will not be able to be made for over expense due to grant aid system, and the ceiling has to be set for the work volume in the contract. In case that the celing is set for the work volumes in the contract, the planned number of boreholes may not be constructed. Furthermore, all the facilities contracted may be completed before the work volumes stipulated in the contract are not done. In this case the total paid amount to the contractor may be reduced. In order to minimize such discrepancy in payment, it is necessary to apply the proper success rate of drilling.

As shown in table, if the Unit Rate Contract with Ceiling is adopted for the drilling works, i) the client has to take the responsibility for risks by uncertain factors; ii) the client and the contractor can conduct fair and reasonable payment for the completed work volumes; iii) it is possible to remove the expenses against risks; iv) construction costs will be reduced; and v) the total cost will reduce as well.

In case of unit rate contract, payment procedures becomes complicated because it is necessary to calculate all the work quantities completed, and supervision work volume will increase. The work quantities may exceed the original ceiling amount. In this case, the payment for exceeded work volume may not be made. In order to resolve these problem in this Project the ceiling amount for payment will be set, and the construction works has to be made within such amount, but the planned number of boreholes may not be constructed. On the other hand, it is possible to construct more boreholes than expected in the original plan, if all of the contracted work volume is not used after completing the planned number of borehole.

(2) Implementation Condition

<Work Plan in Relation to Software Activities>

In determining the site of borehole construction, various factors need to be examined such as villagers' demand, hydrogeological conditions and durability of well facilities. The final decision must be made through adjustment of software and hardware factors with the participation of all the concerned individuals and organizations. The overall work plan and construction procedures should not be imposed on villagers, but instead, include their ideas and intentions. Actual construction progress should be informed to villagers so that they will be well aware of what goes on in their village for raising their ownership.

<Construction Order for Fair Opportunity of Drilling for Each Village>

If the first drilling is unsuccessful, the drilling works will be conducted at another point in the same village. If the drilling is unsuccessful, drilling will not be conducted at this village and it will be conducted at another village. In this case, if the accumulated drilling depth reaches 11,970 m before drilling in all the listed villages, some villages that have been on the list may not be able to get any opportunity for drilling. For this reason, if a drilled well becomes unsuccessful in a village, the next drilling will not be conducted in the same village immediately after the 1st drilling. It will instead be moved to another village.

After the 1st round drilling is done in all the villages, the drilling works at the second sites will take place in the villages where the first drilling was unsuccessful. The villages will be selected with priority through the discussion with the Ugandan side. The drilling at the second site is again unsuccessful, the other villages will be selected from those with successful wells under the Project.

The collection of the community contribution money will commence at the time when a village is chosen to be a candidate for the 2nd well construction. This village must not have any problems with establishment of WSC and the collection of community contribution money for the first well.

(3) Scope of Works

The scope of works of the Japanese and the Uganda sides are in the following table.

Scope of Ugandan and Japanese Government

Description	Japanese Side	Uganda Side
(1) Land Acquisition for Facilities and Construction Works		○
(2) Securing of Land and Facilities for Keeping Equipment and Materials ready for Disposition.		○
(3) Preparation of Access Roads to the Sites		○
(4) Drilling Works and Appurtenant Facility Work including Installation of Handpump*	○	○
(5) Installation of Protective Fence and Leak Pit Construction**		○

Note *: Villagers offer manpower for platform construction and installation of handpump.

**: After hand over, construction of fence and leak pit are conducted by the participation of villagers.

(4) Consultant Supervision

The project will be implemented under the Japanese Grant Aid System. A consultant of firm will execute the detailed design study and construction supervision, including software assistance for securing the sustainable maintenance of facilities.

Detailed Design

In this phase, the detailed design, tender documents and other documents necessary for the execution of the Project will be prepared. Software assistance will also take place. The geophysical survey for the decision of the well site which is usually done by the contractor will be done by the consultant of firm in cooperation with the client because selection of well site deeply concerns with the rate of successful wells.

Tendering

The consultant of firm will assist DWD with tendering procedure of the Project. The contract between DWD and the successful tenderer will go into effect after the verification by the Japanese Government.

Construction Supervision

Consultant will assist DWD to complete the Project by the scheduled date mentioned in the Exchange of Note (E/N), including meeting with contractor prior to the commencement of the construction works, witnessing the shipment of the materials and equipment for the project sites, and providing the contractors with instructions related to the construction works, equipment installation, test operations, and post installation inspection. Activity related to software assistance will be continuously executed during construction and after, and an effort will be made to have sustainable maintenance performed by villagers.

(5) Procurement Plan

In principle, most of the materials/equipment required for the Project are to be procured in Uganda or in Japan. OECD-DAC countries are also considered for the equipment and materials to be procured in Japan as the third countries. The countries scheduled for procurement by item are listed below.

Scheduled Procurement Country for Main Equipment/Materials

No.	Items	Countries	
		Japan/Third Countries	Uganda
1. Equipment for Field Survey			
1.1	Electric Resistivity and Electrical Logging Equipment	<input type="radio"/>	
1.2	Portable Water Quality Analysis Kit	<input type="radio"/>	
1.3	Water Level Meter	<input type="radio"/>	
1.4	Vehicle for Supervisory Works		<input type="radio"/>
2. Equipment for Administrative Training and Facilitation			
2.1	Laptop Computer (CD-R/RW, connection of internet)		<input type="radio"/>
2.2	Color Printer for Laptop Computer		<input type="radio"/>
2.3	GPS	<input type="radio"/>	
2.4	Section Cutout Model of the Handpump		<input type="radio"/>
2.5	Digital Still Camera		<input type="radio"/>
2.6	Motorcycle		<input type="radio"/>
2.7	Maintenance Tools		<input type="radio"/>

Note: *: OECD-DAC countries

In the case of procurement in Japan, the equipment and materials will be transported by sea from Japan to Mombassa, and then transported by land (route A109, 860 km) from Mombassa to the border in Busia. It is about 180 km from Busia to Kampala and the total distance is 1,040 km; land transport will take about 2 to 3 days. In the case of procurement in Japan, there are two custom clearances: in Mombassa and in Busia. In the case of Kenya, Uganda and Tanzania, there are no customs duties for international custom clearances; however, there is a value-added tax in Uganda. It is necessary to submit a Proforma Invoice for exemption from taxation of this VAT in advance. Procured equipment and materials will be transported to DWD office in the capital Kampala together with equipment and materials procured in Uganda. The equipment and materials for District Water Offices will be delivered to each office by DWD on its responsibility.

(6) Quality Management Plan

The project is planned on condition that that Japanese drilling contractor will utilize local drilling and construction contractors. Therefore, the staff dispatched by Japanese contractor are required ability of negotiation and leadership to implement construction works with local contractors in time with the quality of works as designated. The Japanese drilling contractor will deploy one local site supervisor to each site to assure the construction quality required for the grant aid project, and they will be in charge of progress and quality control.

The consultant will assign two local engineers (civil and drilling works) for supervision at sites in addition to the Japanese resident engineer in order to conduct the progress and quality control. The consultant will instruct the contractor to submit various data and records on drilling logs, electric logging, pumping tests, water quality analyses, etc. to confirm the quality of the contractor's works. The supervisory staff of the consultant will attend the electric logging and pumping test as much as possible. As for the logging test, the consultant will confirm the results of the tests for the approval of the casing program proposed by the contractor.

The contractor will take a concrete test piece every 10 sites, and take it to the official laboratory

in Kampala for 7 and 28 days compression tests. The concrete quality is controlled by slump tests at each site. Reinforcement bar arrangements will be confirmed by photos in principle. Water quality analyses will be conducted by the contractor in the official agencies for it. All the results relating the concrete quality will be submitted to the consultant for his approval.

(7) Software Assistance

1) Background and Overview

Development activities in Uganda are need based, and are carried out through its system of decentralization that aims to bring politics closer to its citizens. The water sector in Uganda takes a bottom-up, participatory approach in which people first look at their lives, understand the situations, realize their problems, decide how to solve the problems, and plan their activities accordingly.

To solve water problems in a community, people 1) learn about different kinds of water supply facilities such as shallow wells, deep wells, protected springs, non-protected springs, gravity-fed system, etc., 2) understand merits and demerits of the different facilities including monetary and physical contributions that facility users must make, 3) choose a facility that is most appropriate for their community, 4) agree to participate in facility construction, and 5) submit a request to the village council. The council submits the request to a sub-county office, and the sub-county office submits requests from different villages to a district office. This bottom-up process is called Demand Responsive Approach (DRA), a pillar of water facility management in Uganda.

Another pillar of water facility management in Uganda is that water facility users organize Water and Sanitation Committees (WSCs) to do O&M (Operation and Maintenance) by themselves. This is, in short, community-based management. WSCs collect O&M fees (water fees) from facility users, and pay for the repair done by handpump mechanics (HPMs). The National Water Policy in Uganda (1999) calls for both DRA and community-based management.

Rural Water and Sanitation Operation Plan: 2002-7 (OP5) published by DWD pushed the ideas of community-based management of water facilities further and turned them into guidelines. OP5 takes a long-term and comprehensive approach toward poverty reduction including community-based management, gender and development, promotion of health, sanitation and hygiene, etc.

OP5 introduces six Critical Requirements for the screening of requests of water facility construction submitted by communities. The requirements are 1) Memoranda of Understanding, 2) meaningful involvement of women, 3) hygiene promotion and sanitation, 4) community contribution, 5) settlement of land ownership conflicts and 6) O&M plan. In an ideal situation, fulfillment of all the requirements is necessary to pass the screening, and passing means that the community has finished all the preparations to move on to the next stage of facility construction.

These activities are promoted by DWD at present, of which responsibility will be transferred to

the District Water Offices under the movement of political decenterization, but in the present situation, the rural administration including District Water Offices has not yet been well prepared for conducting these activities in terms of both number and quality of their staff. Under these circumstances, this software assistance is provided to assure the sustainability of operation and maintenance of the borehole water supply facilities.

Water supply projects under the Japanese grant aid system have various restrictions on financial management and project implementation. Due to such restrictions, it is not possible for a grant aid project to have project communities choose and decide the kinds of facilities to be constructed as part of project activities. Similarly, the timeframe for community mobilization and sensitization to fulfill the requirements is limited to a certain period. In order to show that this project does not violate Ugandan water policy despite such restrictions, it is necessary to point out to the Ugandan government and other donors that make up SWAp how this project deals with DRA and Critical Requirements within its own project framework.

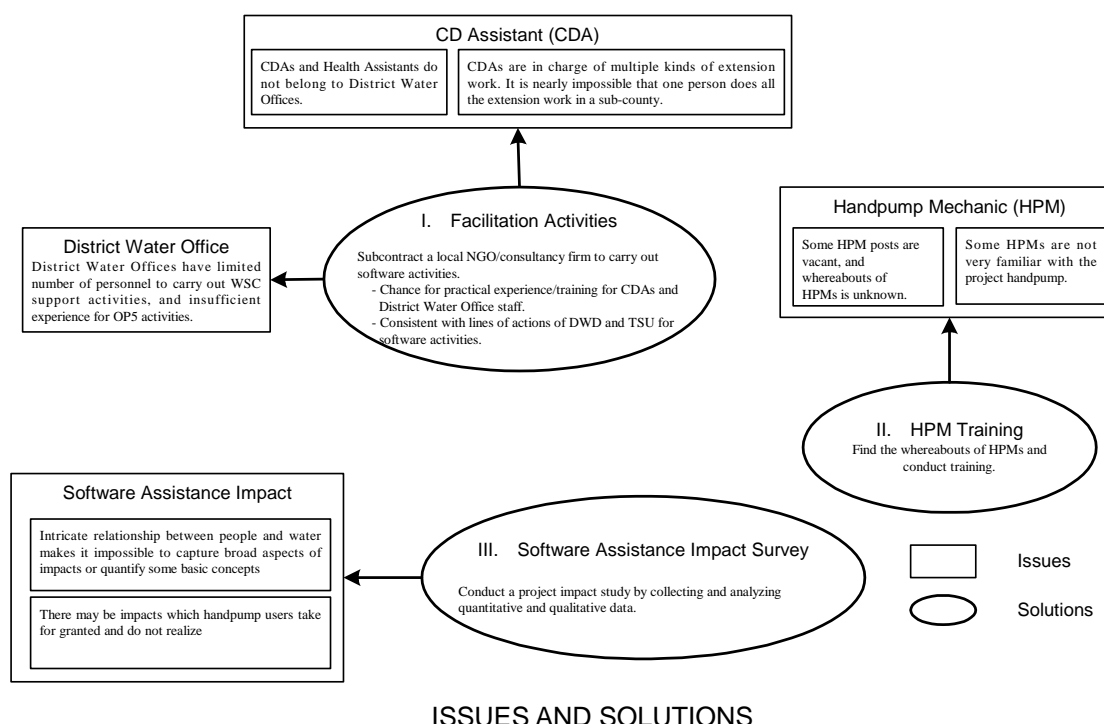
As it will be described later, TSU (Technical Support Unit) was established with the assistance from various international organizations such as DANIDA, SIDA, etc. to improve the capacities of District Water Offices. Capacity building activities by TSU are done on village mobilization and sensitization as well. Meanwhile, DWD is about to hire NGOs to carry out mobilization and sensitization activities in several villages as a pilot trial. These activities by NGOs and their results will give DWD and District Water Offices many opportunities to learn and experience overall planning and management of software activities. In line with these activities, the software assistance of this project is to have a local NGO/consultancy firm carry out mobilization and sensitization activities, and to reinforce the present administrative system through OJT (on-the-job training) of the staff of DWD for the sustainability of the water facilities.

Although monitoring activities after the completion of the Project are not included in the scope of this software assistance, such activities are important because monitoring make sure a) the villagers are using the facilities, b) WSC activities are taking place and c) the project is giving positive effects as originally aimed. From another point of view, it can be stated that, through monitoring, those who are involved, such as villagers, WSC executives, and District Water Office staff become more aware of their roles and responsibilities. As monitoring leads to the sustainability of the water facilities and O&M activities, it needs to be done continuously by villagers, WSC and District Water Offices even after the completion of the during/post construction workshops. Brief summary of monitoring items are presented in Chapter 4.

2) Necessity of Software Assistance (Issues and Solutions)

Before water facility construction, community mobilization and sensitization activities must take place in Uganda. These activities are carried out so that community members organize WSC, participate in O&M, understand the importance of safe water, and improve health, sanitation and hygiene. Although Community Development Assistants (CDAs) are in charge of carrying out the activities, their work is not always done smoothly. This is due to several factors. For example, system of support to WSC has not been firmly established. While OP5 went into

effect from July 2003, local government offices have little experience in managing/implementing community mobilization and sensitization.



The issues of ① Community Mobilization and Sensitization, ② HPMs for hand pump repairing, and ③ Impact and Effectiveness of the Software Assistance are considered and their solutions are summarized in the figure. The details of these issues are discussed below.

① Issues on Community Mobilization and Sensitization and Support to WSC

<Issues>

Community members and WSCs play the major role in ensuring sustainability of hand pump wells. The former are users and owners of hand pump while the latter are organized by the former. Local government offices, especially District Water Offices, play a supporting role by offering various kinds of assistance to WSCs. Reinforcement of such local offices for supporting WSC and monitoring its performance and the reinforcement of WSC are considered indispensable for sustainability of the hand pump well facilities.

Some of the main actors in the government institutional framework of operation and maintenance of the water supply facilities in Uganda are as follows:

Actors Supporting Operation and Maintenance

	MWLE (DWD)	MGLSD	Ministry of Health
District	District Water Officer Ass. Water Officer (Mobilization) Ass. Water Officer (Sanitation) Ass. Water Officer (Water Supply)	Community Development Officer (CDO)	Health Officer (HO)

Actors Supporting Operation and Maintenance

	MWLE (DWD)	MGLSD	Ministry of Health
County	County Water Officer (Incharge of County but belongs to District Water Office: 1 Officer in each County)		
Sub-county	(Private Sector) HPM, Spare Parts Dealer	CDA	HA (Health Assistant)

In implementing mobilization/sensitization activities and WSC support activities, local government offices are likely to face the following issues:

- CDAs and HAs do not belong to District Water Offices
- CDAs are supposed to carry out various kinds of extension activities of which mobilization and sensitization for community-based management of water facility is only a part. It is nearly impossible for one CDA to manage and implement all the extension activities in a sub-county
- Even if the staffs of the District Water Offices are to carry out mobilization/sensitization and WSC support activities, the District Water Offices have limited number of personnel. Their manpower is not sufficient. They also have insufficient experience to carry out activities based on OP5.

<Solutions>

Utilization of Local NGO/Consultant

DWD plans to utilize local NGOs or local consultancy firms to carry out community mobilization and sensitization activities to solve the above issues. Making use of services of the private sectors to develop national economy is one of the Ugandan development policies which is described in the National Water Policy (1999) as “It is the intention of the Government to promote the role of the private sectors in mobilizing and financing resources for the (water) sector”, and in OP5 (2002) as “In the future there will also be a greater use of the private sector/NGOs for community mobilization and hygiene promotion.” Sub-contracting community mobilization and sensitization activities is not just a temporary solution made by this Project, instead, it follows the intension of the Ugandan Government as well as DWD.

Community mobilization and sensitization is supposed to be planned, implemented, managed, and facilitated by local government staff, and they will continue to support WSCs even after the project completion. With this in mind, the mobilization and sensitization workshops should be held in the presence of the local government staff such as CDA, Assistant Water Officer on Mobilization, and Assistant Water Officer on Sanitation. By doing so, the workshops will offer chances of practical experience/training to local government officers who are not very experienced in leading activities of community-based management based on OP5. In terms of a short-time solution, having a subcontractor to carry out community mobilization and sensitization activities assists local government offices by giving them additional manpower. In terms of a long-term solution, community mobilization and sensitization activities by a sub-contractor with the presence of local government officers will lead to capacity building of

local government officers, which will further lead to sustainability of water facilities and strengthening of O&M system.

Capacity Building of District Water Offices and Participatory O&M by TSU

As described in Section 2.4, the capacity building of DWD is conducted by TSU established in 2002. TSU considers mobilization and sensitization activities of District Water Offices, and assistance to WSC/O&M as important. The main for staff consists of three specialists on water and sanitation, public health, and community development and gender.

The mobilization and sensitization activities by local NGOs/consultants are to give the district administration staff opportunities to participate in various practices and training. This does not disturb matches the purpose of capacity building of TSU. In other words, these practices and training will lead to the capacity building of TSU even after the completion of subcontract with local NGOs/consultants.

Community-based management started in many parts of the world because sustainable O&M of water facilities by government organizations was difficult to establish and maintain due to lack of sufficient amount of budget, number of personnel and their capacity. Thus, the main actors in bringing sustainability to water supply facilities under community-based management are facility users and WSC executives who pay O&M fees and manage repair and maintenance activities. On the other hand, villagers and WSC have their limitations despite their central role. They cannot deal with major and costly repairs, and there is possibility that WSC ceases its operation as time goes by or that motivation for O&M shared by the users weakens. Therefore, sustainability of water supply facilities cannot be secured solely by activities or efforts by facility users and WSC.

In addition to facility users, District Water Offices also contribute to sustainability of water facilities and continual existence of WSC. They offer support services by 1) doing major repairs that cannot be done by facility users, 2) giving encouragement and necessary push to WSC, and 3) offering assistance for capacity development to WSC executives. Securing sustainable O&M requires existence of different actors including facility users, WSC executives, local government offices and so on. A sustainable system of O&M is, thus, a network of related organizations and personnel. In this framework, community mobilization and sensitization activities by a subcontractor can be also considered as assistance to link actors in a network and to strengthen the relationship among the actors.

② HPMs for Hand Pump Repair

<Issues>

One of the basic principles/strategies of this Project is that O&M of project hand pumps is carried out by communities through WSC. However, actual hand pump repairs are done by HPMs. For this reason, HPMs play a crucial role in O&M. The current situations of HPM raise the following issues.

- HPMs belong to the private sectors, and District Water Offices do not have complete information on whereabouts of HPMs.
- Some HPMs have moved to other sub-counties while others have changed their jobs.
- Not all HPMs have thorough understanding or knowledge of the project hand pump including its structure, mechanism, how to repair, how to change spare parts, etc.

<Solutions>

To solve the above issues, locations of HPMs need to be identified at first. Secondary, in sub-counties with no HPMs, new HPMs need to be hired. Lastly, both new and old HPMs need to go through training to master how to repair and maintain the project hand pumps. It is necessary to provide training to HPMs to learn about the repair and inspection of the Project hand pumps, since the quality of rizing pipes of the hand pumps will be improved, compared to the ones used in Uganda so far.

③ Impact and Effectiveness of the Software Assistance

<Issues>

By making software assistance impacts and effects known to the public, such information can give ideas and lessons for the future, and be useful to many individuals in the field of rural water supply as well as participatory development. It also serves as a sign of transparency and accountability of this project. Although participatory monitoring and verifications of success/impact indicators on the software assistance design matrix can show some impacts, they cannot show the whole picture of the software assistance impacts due to the following issues.

- Relationship between water and people's life is not a simple cause-effect or quantifiable relationship. Participatory monitoring and success indicators alone cannot grasp the whole situation in which various factors on water and people are intertwined. They cannot measure some basic and important concepts of community management, either. For example, improvement of health can be attributed to many factors other than safe water alone, and it is extremely difficult to quantify "the sense of ownership".
- There may exist impacts which hand pump users take for granted and, thus, do not realize. Such impacts are unlikely to be identified in participatory monitoring, but can be identified by a third party other than the users.

<Solutions>

Conducting project impact study which examines effectiveness of the project both quantitatively and qualitatively with a broad perspective solves these issues. The study should consist of 1) quantitative study on success/impact indicators on the project design matrix and 2) qualitative study based on interviews, discussions, PRA/RRA methods, etc. In this Project, it is necessary to carry out a project impact study on qualitative aspect in order to grasp and analyze the software assistance impact from various viewpoints not only from the quantitative aspect.

3) Goals and Objectives

Based on the above issues and solutions, this software assistance program aims to achieve the goal of this project by implementing software activities. Goals and objectives of this program are as follows:

<Overall Goal>

- ① Sustainability of the project handpumps
- ② Improvement of handpump users' health, sanitation and hygiene in relation to safe water

<Programme Purpose>

- ① Participatory/community-based O&M based on the basic principles of sense of ownership and gender equality
- ② Stronger system of support to WSC
- ③ Improved HPM's activities for handpump repair and maintenance

The Project Design Matrix (PDM) of the software assistance is shown in Table 2.2.5.

4) Outputs

Outputs of the software assistance program activities are of two kinds; one dealing with knowledge and attitudes of the handpump users, and the other with their actions.

Outputs of Software Assistance

knowledge/attitudes		actions
Handpump users understand aims, roles and importance of WSC, and are willing and motivated to take part in WSC	①	Handpump user participate in WSC activities of their own accord
The concerned persons at the local government understand aims, roles and importance of WSC, and are willing and motivated to take part in WSC support	②	Local government officers engage in WSC support activities such as monitoring of WSC and handpump conditions, and major repairs of handpumps
WSC executives understand their roles and organizational management practices, and are willing and motivated to do their jobs	③	WSC executives fulfill their roles such as promotion and monitoring of health, sanitation and hygiene in their communities, monitoring of handpumps, communication with HPMs, collection and management of O&M fees, and holding community meetings
Handpump users understand the importance of safe water (relationship between safe water and health, sanitation, and hygiene)	④	Handpump users engage in activities that will improve their health, sanitation and hygiene conditions such as latrine construction, cleaning of water containers, safe management/disposal of feces, house cleaning, and drinking safe water
Handpump users understand the importance/value of the project handpump as the source of safe water	⑤	Handpump users use their handpumps with care
HPMs understand their roles and responsibilities	⑥	HPM can repair and conduct maintenance of the project handpumps

5) Form of Implementation

This software assistance aims to give management support to the Ugandan side.

6) Activities

The activities of software assistance are subcontracted to a local NGO or a local consultancy firm. The activities are implement by the subcontractor under the supervision and guidance of a Japanese consultant on social development. The program activities are as follows:

- ① Community mobilization and sensitization
- ② HPM training
- ③ Software assistance impact study

Summary of the above activities are in Fig. 2.2.3. Monitoring of WSC activities is done by hand

pump users, WSC as well as the staff of the District Water Offices during and after the Project. Monitoring results and information are to be shared among the concerned parties such as DWD, Ministry of Health, Ministry of Gender, Labour and Social Development, etc.

① Community Mobilization and Sensitization Activities

<Pre-Construction Workshop>

Pre-Construction Workshop is facilitated by consultants from a local NGO or a local consultancy firm. The consultants visit each project village at least five times to facilitate workshop sessions. On the average, a village is visited once every two weeks. Community mobilization and sensitization is supposed to be planned, implemented, managed, and facilitated by local government staff, and they will continue to support WSCs even after the project completion. With this in mind, this workshop is held in the presence of the local government staff such as CD Assistant, Assistant Water Officer on Mobilization, and Assistant Water Officer on Sanitation. By doing so, the workshop offers them chances of practical experience/training. The contents of the workshop sessions are as follows:

Contents of Pre-Construction Workshop

	Content	Participants	Details/Remarks	Number of Days per Village
1	Greeting and courtesy call on sub-county, parish, and village leaders - Introduction/Explanation of the project - Request for cooperation and assistance - Promotion of latrine construction by leaders	Leaders of sub-county, parish, and villages, village elders, opinion leaders, religious leaders, cultural leaders, teachers, and medical personnel	Although direct beneficiaries of this software assistance program are villagers, it is essential to strengthen the support system by local governments such as village, parish and sub-county committees in order to secure sustainable O&M. For this reason this project is to establish close relationship with the local leaders and have them understand the project. During the Pre-Construction Workshop stage, WS facilitators from the local NGO/consultancy firm are to communicate with the leaders frequently and report the WS situations and progress	0.5 Day
	Initial visit to village - Introduction/Explanation of the project - Explanation of Pre-Construction Workshop (objectives, procedures, schedule) - Explanation of what the project expects from community members Introduction/Explanation of community-based O&M - Explanation of O&M fee including community contribution Brief explanation of safe water and health	Villagers and village leaders (chief, elders, teachers, medical personnel, opinion leaders, cultural leaders, religious leaders, leaders of women's group, etc)	This is the first session for villagers, and this session aims to have them understand the general contents of this project Points to be emphasized; - Role of local NGO/consultancy firm - WS schedule - Critical Requirements (OP5) - Possibility of not having a handpump well even after fulfillment of requirements and drilling of well - Participation of villagers in every process: roles and responsibility As this the first contact between the WS facilitators and villagers, the facilitators try their best to understand villagers' thoughts and awareness so that the relationship between the two will be a strong one. Safe water and health/sanitation/hygiene - Sanitation Ladder : By examining sanitation and hygiene conditions, and management/disposal practice of feces in their villages, participants will think about better ways and actions; promotion of latrine construction	
2	Participatory assessment and introduction of different water supply systems (different meetings for men and women if necessary) - Mapping of existing water sources, latrines, and other sanitation/hygiene facilities - Discussion on conditions,	Villagers and village leaders (chief, elders, teachers, medical personnel, opinion leaders, cultural leaders, religious leaders, leaders of women's group, etc)	Mapping is one of the basic exercises of PRA/RRA. In this session, drawing a village map and identifying locations of water sources, latrines and other water, health, sanitation and hygiene facilities will make the villagers think about their living conditions in relation to water. The map the villagers drew will serve as a visual aid, reminding them that their discussions are not on fictional matters, but on matters related to their everyday life. In this way, the first stage of DRA, understanding of the present situations and identification of their problems, is	0.5 Day

Contents of Pre-Construction Workshop

	Content	Participants	Details/Remarks	Number of Days per Village
	<p>problems and solutions concerning water and health/sanitation/hygiene in their communities</p> <ul style="list-style-type: none"> - Introduction/Explanation of water supply facilities: kinds, functions, water safety, investment and cost, cost for repair, maintenance, O&M, etc <p>Decision making on whether to accept the project (construction of handpump well in their community); different meetings for men and women if necessary</p> <p>Explanation and provisional acceptance of MOUs between the community and NGO/consultancy firm as well as local government</p> <ul style="list-style-type: none"> - Roles and responsibilities of the community <p>Selection of well construction sites (4 different sites in order of necessity/priority)</p> <p>Promotion of safe water and health, sanitation and hygiene</p> <p>Sensitization/Awareness education on gender, AIDS, and environment</p>		<p>completed by mapping.</p> <p>Decision on acceptance of this project is to be made based on the understanding of water supply facilities other than deep well. This is in accordance with the DRA. In this session, different kinds of water facilities such as protected springs, unprotected springs, shallow wells and gravity-fed scheme will be introduced so that the villagers will understand strengths/weaknesses, the good/bad, merits/demerits of different facilities. Based on the understanding, they are to think about a facility that is best appropriate for their village and themselves.</p> <p>After reviewing the contents of this projects, Critical Requirements, and different kinds of water facilities, the villagers are to discuss and decide whether to accept the project. MOU is important as it puts roles and responsibilities of the concerned parties in writing. Contents of MOU may include:</p> <ul style="list-style-type: none"> - that WSC is to be organized - relationship between Critical Requirements and well construction - collection/payment of community contribution - O&M by the villagers - collection/payment of O&M fee - list of WSC executives - that the community will try to improve sanitation and hygiene - participation in WS facilitated by local NGO/consultancy firm - repair of handpumps by HPMs <p>(Signing and exchange of MOU will be done after the selection of WSC executives)</p> <p>To raise the sense of ownership shared by villagers, it is absolutely necessary that potential handpump users be involved in decision making on a kind of water facility and site selection. The site selection is to be done while looking at the village map made by themselves, and reviewing their water problems. For the promotion of safe water and improved health, sanitation and hygiene, specific actions such as latrine construction and cleaning of water containers will be introduced one by one. Gender is an essential element of community mobilization and sensitization and is one of the Critical Requirements. In this session, villagers are to understand different roles of men and women and realize that women do almost all activities related to water.</p>	
3	<p>Decision on construction site : adjustment of technical and social standpoints</p> <p>Introduction/ Explanation of WSC</p> <ul style="list-style-type: none"> - roles, responsibilities, rules - importance of O&M and preventive maintenance <p>Selection of WSC executives</p> <p>Decision on the amount and payment methods of community contribution</p> <p>Signing and exchange of MOUs between the community and a local NGO/Consultancy firm as well as local government</p> <p>Collection of community contribution</p>	WSC executives	<p>If the sites selected in the last WS session are deemed inappropriate/infeasible for well construction from a technological standpoint, an engineer is to explain that to the villagers. After understanding the explanation, the villagers are to select a new site. This activity aims to integrate hardware and software point of views / demands.</p> <p>WSC plays the central role in community-based O&M, and must represent all the villagers. After the villagers come to understand the reason why WSC is to be organized and the roles of WSC, WSC executives are to be selected.</p> <p>WSC starts collecting community contribution.</p> <p>Participation in well construction leads to the sense of ownership. The villagers are to agree to contribute their labor, construct a drainage pit, and build a fence around a handpump. Meaning, reasons and methods of monitoring will be explained.</p> <p>Promotion of health/sanitation/hygiene : about diarrhea (drinking safe water, cleaning around the house, hand washing, use of latrines, management/disposal of feces)</p> <p>Gender awareness: household properties and gender // raising awareness that household properties and things that household members use are often owned according to the gender.</p>	0.5 Day

Contents of Pre-Construction Workshop

	Content	Participants	Details/Remarks	Number of Days per Village
	<p>Introduction of plan of activities for well construction</p> <ul style="list-style-type: none"> - role of the community - activities that the villagers are to participate <p>Introduction/Explanation of monitoring</p> <p>Promotion of safe water and health/sanitation/hygiene</p> <p>Sensitization/Awareness education on gender, AIDS, and environment</p>		Household materials related to water, sanitation and hygiene will be focused.	
4	<p>Capacity building of WSC</p> <ul style="list-style-type: none"> - collection and management of O&M fee - bookkeeping - keeping records of meetings, handpump repair <p>Promotion of safe water and health/sanitation/hygiene</p> <p>Sensitization/Awareness education on gender, AIDS, and environment</p>	WSC executives	<p>Capacity building of WSC so that each executive understands his/her role and carries out necessary activities. Decisions need to be made on:</p> <ul style="list-style-type: none"> - methods of O&M fee collection (How much to collect? Collect from whom? Cash or in kind? How to deal with those refuse to pay or cannot pay? Who to collect? Where to keep the money?) - methods of bookkeeping (Who to do bookkeeping? Who to check the book? How often to check?) - ways to use O&M fees (Who to decide what to buy?) - records of WSC meetings for executives (How often to hold a meeting? What to be discussed in a meeting?) - records of community meetings (When to hold a meeting? What to be discussed?) <p>Confirmation of what to be done when WSC promotes health, sanitation and hygiene to villagers</p> <p>Gender awareness : roles of women and water: WSC executives are to realize that many community organizations, and political organizations are led and managed by men, and that activities related with water, sanitation and hygiene are mostly done by women. Based on the realization, they are to understand the importance of women's participation in O&M and WSC.</p>	0.5 Day
5	<p>Capacity building of WSC</p> <ul style="list-style-type: none"> - preventive maintenance - roles and responsibilities of each executive and HPM - relationship with external organizations such as District Water Office, District Health Office, and LC 1 /2/3 - monitoring <p>Making of O&M Plan (Draft)</p> <p>Promotion of safe water and health/sanitation/hygiene</p> <p>Sensitization/Awareness education on gender, AIDS, and environment</p>	WSC executives	<p>Capacity building of WSC so that each executive understands his/her role and carries out necessary activities</p> <ul style="list-style-type: none"> - roles and activities of caretakers (What to do? When to do?) - preventive maintenance, regular maintenance, spare parts - roles and activities of secretary and treasurer - importance of O&M network - coordination with District Water Offices and sub-county - relationship with CDA and health assistant - relationship with HPM, payment method - meaning of monitoring - how to fill out monitoring forms (conditions of handpump operation/repair/cleaning, conditions of O&M fee, conditions of health/sanitation/hygiene) - understanding of the relationship between safe water and health/sanitation/hygiene - how to check the conditions of health/sanitation/hygiene (Who to check? How often to check? What to check?) - Gender and development, social equity <p>O&M Plan is one of the Critical Requirements. Making the O&M Plan will make villagers and WSC executives understand particular activities needed, and how much money is needed for future O&M</p>	0.5 Day

Community meeting facilitated by WSC executives (Local NGO/consultancy firm will not be present).

6	Making of O&M Plan	Villagers and village leaders (chief, elders, teachers, medical personnel, opinion leaders, cultural leaders, religious leaders, leaders of women's group, etc)	Discussion and acceptance of O&M draft plan made by WSC Announcement of progress of collection of community contribution Discussion and acceptance of draft plan of O&M fee collection method made by WSC As the summary of Pre-Construction Workshop, items on Critical Requirements such as community contribution, latrine construction, women's participation are to be identified and discussed Explanation of well construction, labor contribution, handpump installation, during/post-construction workshop, handover, etc.	
	Community contribution			
	Collection/payment of O&M fee			
	Summary of Pre-Construction Workshop			
	Schedule for future			

During the Pre-Construction Workshop stage, facilitators are to check the items of Critical Requirements occasionally by monitoring the number of latrines in each village, their use and cleanliness, and other sanitation and hygiene activities by villagers as well as WSC.

After WSC executives were selected in the third session, the WSC treasure starts to collect community contribution which will be used for O&M in the future. The amount of community contribution is to be 100,000 UGS per community, which is equal to the amount of initial contribution for a PAF water supply project implemented by the local government. Using such PAF standard is appropriate because setting a unique amount only for the project villages, different from the amount set by the local government, is likely to bring confusions among people and non-project communities. Details of collection methods such as whether to collect this amount from each household regardless of its size, and whether to collect the money at once or accept instalment are to be determined by villagers in the workshop.

Although 100,000 UGS is different from the amount of contribution (180,000UGS = 90 US\$) the OP5 requires, it is considered as an adequate amount, because the amnount stipulated in OP5 includes the contribution of labourers for the construction on a full recovery basis and the amount for this Project is considered as the operation and maintenance costs for creating the ownership of villagers.

<Village Screening Based on OP5's Critical Requirements>

Village screening takes place at the time of pre-construction workshop completion. This is done to make sure that the Critical Requirements were fulfilled at the pre-construction stage. Villages that passed the screening become project villages of this project where drilling will take place. The Critical Requirements are made up of 6 categories as follows:

Critical Requirements of OP5

category		contents
1	Memoranda of Understanding	<ul style="list-style-type: none"> - Signed before the go-ahead is given for construction - Signed between 1) GoU and Districts, 2) Districts and Sub-counties, and 3) communities and Sub-counties/District
2	Meaningful Involvement of Women	<ul style="list-style-type: none"> - At least half of WSC executives are women - Promotion to have female WSC executives for empowerment - At least half of water point attendants and HPMS are women - Skill training is given to both men and women - Entire community involves in siting of water sources and the choice of technology, with men and women initially being consulted separately to ensure that women's viewpoints come forth - All communications/information to communities target both women and men

Critical Requirements of OP5

category		contents
3	Hygiene Promotion and Sanitation	<ul style="list-style-type: none"> - All the households of community leaders have latrines that are safe, clean and used - During the mobilization phase, household latrine coverage increases by 30% at least - O&M plan includes how the community intends to increase latrine coverage and usage to a 95% level within the next four years
4	Community Contributions	- Community contributions for borehole is 180,000UGS (cash or in-kind)
5	Settlement of Land and Ownership Conflicts	- No conflicts over land ownership of water points
6	O&MPlan	<ul style="list-style-type: none"> - Full coverage of O&M costs by the community for a minimum of 8 years - Estimated life of capital equipment and parts - Availability of spare parts and their costs - Maintenance costs - Equipment replacement costs - Backup support and services to be provided by the District - Solution to problems likely to happen : lack of commitment by some WSC members to attend meetings; disagreements on allowances for WSC members/HPMs; refusal to pay O&M fee; access and management of HPMs, refusal to participate in cleaning of water sources; unavailability of extension staff; difficulty obtaining tools, spare parts and materials for repair

This software assistance aims for long-term sustainability of project handpumps through community-based O&M. The program makes much of voices, expectations and requests of handpump users, and is consistent with the basic principles of DRA. While the list of candidate villages for well construction was submitted by the Ugandan government, the original requests came from villages to sub-counties, then districts put together the requests from sub-counties and handed them to DWD.

This software assistance deals with the Critical Requirements in a flexible manner so that each requirement is not a rigid prerequisite, but rather a marker to show the overall directions for community mobilization and sensitization activities at the pre-construction stage.

If the Critical Requirements are taken literally and rigidly, water facility will never be constructed in communities where not enough money for community contribution was collected due to absolute poverty. Similarly, construction will not take place in communities where less than half of WSC executives turned out to be women because women in those communities had never had a chance to participate in village politics. Excluding such poor communities and communities with history of low female participation in the public sphere denies the basic principle of poverty reduction and social equity.

In this software assistance, those villages which could not fulfill the Critical Requirements during the pre-construction stage will be examined carefully. If the reason for non-fulfillment is community members' having no motivation or willingness to participate in this project, the village will be eliminated from the list of candidate villages. If the reason is due to unavoidable circumstances such as poverty or lack of chances in the past, the village may pass the screening.

It is good to construct water facilities based on people's need. However, considering the facts that the facilities will be owned by communities, and that sustainability of the facilities is

assured through O&M done by communities, it is not all satisfactory to have people's need as the only determining factor for facility construction. This is because need does not always bring or guarantee sustainability to community-based O&M. It is essential that, in addition to their need, communities demonstrate their willingness, determination and motivation to fulfill their roles and responsibilities for O&M.

The village screening takes place based on the above Critical Requirements. The following checklist for each village/community is used in the screening:

Checklist for Village Screening

Categories of Critical Requirements		Contents	Condition	Explanation of non-fulfillment using concrete examples (*: explanation is mandatory)	✓ if the requirement is not fulfilled	Final judgment
1	Required documents	Letter of introduction of the local NGO /consultancy firm by DWD	Y N			
		Necessary MOUs/letters of agreement	Y N			
2	Women's participation	Proportion of women (WSC executives)		%		
		Understanding, awareness, willingness, and actions toward gender development	good bad	*		
3	Promotion of health, sanitation and hygiene	Understanding, willingness and actions toward latrine usage	good bad	*		
		Understanding, willingness and actions toward health, sanitation and hygiene in relation to safe water	good bad	*		
		Leaders' willingness to contribute to improvement of health, sanitation and hygiene of community members	good bad	*		
4	Community contribution	Amount of community contribution collected	Shills.			
		Understanding of O&M fee and willingness to pay	good bad	*		
		Agreement to participate in construction	Y N			
5	Settlement of	Agreement paper on land	N Y			

Checklist for Village Screening

		WSC and the WS facilitators fill out these columns at the time of the completion of Pre-construction Workshop. If a condition was not fulfilled, its reason(s) must always be explained. Handwriting is acceptable.		Decisions made at the time of final judgement (treatment of unfulfilled conditions: e.g. treated as fulfillment due to unavoidable circumstances, etc.) These columns are filled out by District Water Office. Handwriting is acceptable.		
		←————→		←————→		
Categories of Critical Requirements		Contents	Condition	Explanation of non-fulfillment using concrete examples (*: explanation is mandatory)	✓ if the requirement is not fulfilled	Final judgment
	Land and Ownership Conflicts	contribution				
6	O&M Plan	Way(s) to cover costs for O&M	Y N			
		Estimated life of capital equipments and parts	Y N			
		Spare parts availability and costs	Y N			
		Maintenance costs	Y N			
		Equipment replacement costs	Y N			
		Backup support and services by District	Y N			
		Ways to increase latrine coverage and usage rate to 95% in the next 4 years	Y N			

The above checklist is at first filled out by WSC executives and workshop facilitators at the time of pre-construction workshop completion. Required documents such as MOUs, letters of agreement, and O&M Plan must be attached to the checklist. Detailed explanations of the checklist as well as specific instructions on how to fill out the columns will be given to the workshop facilitators in the facilitator's training. This training is given by the Japanese consultant on social development right before the commencement of the pre-construction workshop of the Term 1 of the Project. After the WSC executives and the facilitators finish filling out a checklist, it is submitted to the relevant District Water Office for screening.

The following is a set of guidelines for the screening.

Screening Guide

category		content	Standard for Passing
1	Required documents	Letter of introduction of the local NGO/consultancy firm by DWD	Must be “Yes”
		Necessary MOUs/letters of agreement	
2	Women’s participation	Proportion of women (WSC executives)	Must be more than 50%. If less than 50%, must have an acceptable/sensible reason. (quality is as important as quantity: even if women occupy more than 50%, it is meaningless if they are not given a chance to express their opinions or participate in different activities)

Screening Guide

category		content	Standard for Passing
		Understanding, awareness, willingness, and actions toward gender development	Must be “Yes”
3	Promotion of health, sanitation and hygiene	Understanding, willingness and actions toward latrine usage	Must be “Yes”
		Understanding, willingness and actions toward health/sanitation/hygiene in relation to safe water	
		Leaders’ willingness to contribute to improvement of health/sanitation/hygiene of community members	
4	Community contribution	Amount of community contribution collected	Must be 100,000 UGS. If less than this amount, must have an acceptable/sensible reason. The amount of money collected is not always proportionate to the degree of understanding. What is important is that villagers fully understand that handpumps are not free gifts and that they must understand the necessity of O&M. In case that the amount does not reach 100,000 UGS but the willingness of O&M is recognized, the plan to collect money must be submitted.
		Understanding of O&M fee and willingness to pay	Must be “Yes”. Even if more than 100,000 UGS was collected for community contribution, villagers’ willingness to keep paying for O&M must be assured for attaining sustainable O&M.
		Agreement to participate in construction	Must be “Yes”
5	Settlement of Land and Ownership Conflicts	Agreement paper on land contribution	Must be “Yes”
6	O&M Plan	Way(s) to cover costs for O&M	Must be “Yes”. What is most important is that villagers understand the importance of O&M and act accordingly
		Estimated life of capital equipments and parts	
		Spare parts availability and costs	
		Maintenance costs	
		Equipment replacement costs	
		Backup support and services by District	
		Ways to increase latrine coverage and usage rate to 95% in the next 4 years	

If all the items are fulfilled and satisfactory, the village passes the screening. If not, mobilization and sanitation officers at District Water Offices and the Japanese consultant on social development, representing the Ugandan and the Japanese sides respectively, will jointly examine the checklist. Final judgments for screening are made during the last two weeks of the pre-construction stage. This is an once-for-all decision so that conditional passing which gives a village certain conditions to fulfill within a certain time frame will never be given as it postpones the construction schedule.

Treatment of unfulfilled items, i.e. whether to make a village pass the screening because of unavoidable circumstances such as absolute poverty, to make a village fail because of the lack of willingness to participate in community-based O&M, etc., is decided during the screening.

The decisions on the treatment are to be written down in the right-hand column of the checklist.

Unlike “the proportion of women ” or “the amount of community contribution”, understanding, awareness and willingness cannot be measured easily, which may make them rather inappropriate to be items for screening. However, these items were purposely chosen to be included in the checklist because 1) quantitative indicators cannot fully represent psychological matters, and 2) this screening should reflect the essence of the OP5 and its Critical Requirements.

Decision for each item as well as the final decisions whether to make the village pass the screening must be made jointly between the Ugandan and the Japanese sides. In case of disagreement, the two sides continue their discussion until they reach a joint agreement. They may consult a third party such as WSC executives, village chiefs, sub-county officers, CD Assistants, Health Assistants, District Health Office staff, District Water Office staff, and DWD staff for their views on the matter. The presence of these individuals in a screening session is not necessary as the purpose to have them involved is to reflect their opinions in the decision making process.

Deleting some villages from the list of project villages is not the major purpose of this screening. The screening is done to make sure that pre-construction workshop completed with expected results. As it is clear from the screening guide, even if a village cannot fulfill a quantitative standard, it may pass the screening provided that it has an understandable reason such as poverty. Similarly, even if a village fulfills a quantitative standard, it may fail the screening provided that the means used to fulfill the item was against what the Critical Requirements aim for. For example, a village where a few rich people paid up the community contribution, but other villagers have no intentions or willingness to pay for O&M in the future may fail.

Decisions are to be made with a consideration that this software assistance deals with the Critical Requirements in a flexible manner so that each item is not a rigid prerequisite, but rather a marker to show the overall directions for community mobilization and sensitization activities at the pre-construction stage.

This soft component program considers that making OP5's 8-year O&M Plan before well construction in this project is too hasty and doing so may give villagers a false hope of having a new hand pump well in their village. This is because even if a village passes the screening, there is a possibility that the village ends up with no hand pump wells, provided that drillings did not bring successful results or the quality of ground water was below the standard. Although the 8-year O&M Plan has a significant value in making villagers realize the financial value of hand pumps, need for O&M, etc. and giving them experience in making a plan for their future actions, O&M Plan made during the pre-construction workshop of this project is to include only those items related to spare parts availability and O&M costs. Considering the duration of the pre-construction workshop, this program chooses to focus on matters directly related to the

importance of O&M. The rest of the plan will be made in the during/post-construction workshop. O&M Plan is more down-to-earth and realistic when villagers make it while watching the construction, using a handpump, and treating O&M as a part of their reality instead of an idea on a sheet of paper.

<During/Post-Construction Workshop>

During/Post-Construction Workshop is also facilitated by those from a local NGO/consultancy firm. Like Pre-Construction Workshop, this workshop is carried out in the presence of the local government staff such as CD Assistant, Assistant Water Officer on Mobilization, and Assistant Water Officer on Sanitation.

Topics and their contents of each workshop session vary from village to village because they are to be set to fit particular conditions of each village such as degree of willingness to participate in project activities, extent of understanding of O&M, construction schedule, etc. Most of the Pre-Construction Workshop sessions aimed to give new information to villagers. During/Post-Construction Workshop, on the other hand, aims to promote transformation of knowledge into actions. The followings are the topics of During/Post-Construction Workshop.

Topics of During/Post-Construction Workshop

Topics / Contents / Explanations	Participants
<u>Confirmation of Well Construction Site</u> Although the site selection was done during the pre-construction workshop, the site should be re-confirmed so that there will be no conflicts or misunderstanding of the construction site.	Villagers & Village Leaders
<u>Participation in Well Construction: Confirmation, Planning and Implementation</u> Although villagers' participation in construction was also explained and agreed upon in the pre-construction workshop, the construction schedule must be notified as soon as it is finalized. A plan should be made so that all the villagers clearly understand who is needed for what kind of work at what time on which day. By participating in well construction, they feel closer to the handpump and this will lead to the sense of ownership. Labor contribution includes repair and/or maintenance of feeder roads to construction sites, and construction of drainage pits and fences.	Villagers & Village Leaders
<u>Making/Signing of Official Documents according to OP5: MOU, Contract, Letter of Agreement, etc</u> The above official documents make it easy to understand nature, contents, time, place and methods of activities as well as roles and responsibilities of the concerned parties/individuals. Although these documents are to be made and/or signed mostly by WSCs, they do so on behalf of villagers. For this reason, it is necessary that not only WSC executives but also villagers understand and agree to the matters in the documents. This will make them understand the nature of relationship between themselves and the project as well as their position and responsibility in the project. This will also increase their understanding of community-based O&M.	WSC, Villagers & Village Leaders
<u>Detailed Plan of O&M</u> O&M plan made during the pre-construction workshop is to be transformed into a detailed plan by adding more items. O&M of handpumps was rather a notion/knowledge in villagers' heads during the pre-construction stage. Looking at drilling, construction of a platform, and handpump installation, and using a handpump will make a handpump a part of villagers' reality. O&M will become more tangible to them. Under such a circumstance, villagers will have better and realistic understanding of importance of O&M, and, thus are in a better position to make a detailed plan of O&M.	WSC, Villagers & Village Leaders
<u>Coordination between WSC and Local Government Organizations</u> Although major actors in O&M of the project handpumps are villagers and WSC, so-called "bonding social capital" including villagers' awareness, establishing an organization, and management of handpump by an organization is not enough to achieve sustainable O&M. So-called "bridging social capital" such as coordination with other WSCs for information exchange and assistance, and coordination with local government organizations (assistance and support) are needed to achieve handpump sustainability. Although the direct beneficiaries of this soft component program are villagers, this does not mean the program ignores bridging social capital. WSC facilitators are to play a role of intermediary so that relations among WSCs and between WSC and the local government will be established and maintained. In the workshop, facilitators will explain the importance of having relations with external organizations. To the local	WSC, Villagers & Village Leaders

Topics of During/Post-Construction Workshop

Topics / Contents / Explanations	Participants
government organizations, facilitators will report the conditions of WSC and the communities whenever necessary.	
<u>Explanation of Handpump Usage</u> When starting to use a handpump, ways to use a handpump, ways to clean handpump areas, and other matters that handpump users need to pay attention to will be explained and discussed. Setting up rules for handpump usage will increase the sense of ownership and leads to sustainability of handpumps.	Villagers & Village Leaders
<u>Promotion of Safe Water and Health/Sanitation/Hygiene</u> This promotion is continued from the pre-construction workshop. Dissemination of information alone does not achieve the goal of community mobilization and sensitization. While knowledge must lead to actions. Short-term workshops tend to give information only. Community mobilization and sensitization of this program aims to improve health/sanitation/hygiene by focusing on small, concrete activities such as latrine construction, hand washing, management/disposal of feces, management of rubbish, clothes washing, cleaning around the house, keeping domestic animals inside a fence, using a clean water container, storing water with a lid on, and so on. For the promotion, workshop participants are to review the contents of the pre-construction workshops and discuss the new actions brought about by their past workshop participation as well as actions that did not change despite the participation. Based on the discussion, they will set objectives, i.e. concrete targets, to improve their actions and physical environment in the during/post-construction workshop period. They will also think over how to achieve the objectives. In this way, participants are to make a plan to improve their health/sanitation/hygiene and, as time goes by, they are to review the degree of achievement through their discussion. After the handpump installation, they are to discuss and think about how the safe water improved their lives. This will further make them realize positive impacts of the project and the importance of safe water.	Villagers & Village Leaders
<u>Promotion and Sensitization of Genders, AIDS, Environment, etc.</u> Similar to the promotion of safe water and health/sanitation/hygiene, one of the most difficult things of sensitization and awareness education is how to have awareness cause new actions. Activities with concrete objectives such as having more than 50% of women among WSC executives or in meetings are rather easy to achieve. However, giving too much attention to such indicators may obscure the basic principles of the program, that is, gender equality. On the other hand, program planning and implementation from female points of views is an important theoretical orientation, but is difficult to bring actions as the theory lacks concreteness. Sensitization aiming for social development needs to be done without one-sided biases and maintain balance between theory and practice. In this program, facilitators are to remind villagers what the workshop is aiming for and how they will achieve the goal, using easy expressions and phrases, and drawing concrete examples from village life. This will make it easier for villagers to understand what should be done, how it should be done, and why it should be done. It will also work to maintain the balance between theory and practice, and achieve the goals faster. Although sensitization opens participants' eyes and makes them feel fresh by giving new ideas at the beginning stage, such freshness tends not to last long. It takes a long time to have knowledge leads to actions and then to social improvement. It is not a sudden leap, but a gradual process. Thus community mobilization and sensitization should continue even after project completion.	WSC, Villagers & Village Leaders
<u>Follow Up and Monitoring by Villagers</u> Rate of achievement of project goals and effectiveness of a project should not be monitored only by those who are outside of the project. It should be done by insiders such as handpump users and WSCs. Such monitoring by insiders will lessen the distance between the users and the project and bring stronger sense of ownership. It will also make them realize their life improvement due to the handpumps. In conducting follow up/monitoring, the users need to understand what to be checked for what reasons. Possible monitoring items/points may include; latrine construction, usage, and cleanliness, villagers' health, existence of feces around houses, drainage of handpump water, management of rubbish, handpump usage, handpump conditions and so on.	Villagers & Village Leaders
<u>Capacity Development of WSC Executives</u> This is also continued from the pre-construction workshop. It aims to improve leadership and management skills. In the during/post-construction workshop, capacity development for monitoring is one of the major topics as WSC is to fill out monitoring forms regularly. Contents of the forms and the ways to fill them out are to be explained. The monitoring forms should include the following items; on WSC management : O&M fee collection, amount collected, topics of discussion in WSC meetings, etc. on villagers : willingness and requests of villagers, benefits of handpump to women and children, etc. on handpump : water amount, quality, cleaning around handpump, repair and maintenance by HPM, etc. on health/sanitation/hygiene : number of latrines and their usage and cleanliness, management of rubbish, management/disposal of feces, drinking of safe water, etc.	WSC

Topics of During/Post-Construction Workshop

Topics / Contents / Explanations	Participants
As matters on O&M fee are of great importance, facilitators are to check conditions of collection, management and usage very carefully.	

In the during/post-construction stage, workshop facilitators are to maintain close relationship with village, parish, sub-county officials, Health Assistants, CD Assistants, and so on. They are to report and exchange information on village and workshop conditions to strengthen support by local government.

This software assistance aims for sustainable O&M through participation of handpump users. Participation does not refer only to physical participation such as presence in workshops or construction of fence around a handpump. It also means psychological participation. Villagers should always know what goes on concerning the project and their handpumps. For this reason, well construction should never be done without being noticed by the potential users. Villagers need to know the progress and the status of well construction. In this project, the contractor for well construction is to provide information on well construction to the villagers by putting an announcement on a village bulletin board and so on, which will promote psychological participation of the users in construction. The workshop facilitators are to coordinate the concerned parties so that the villagers will receive accurate and timely information on well construction from the contractor.

② HPM Training

In order to hold training sessions for HPMs, District Water Offices are to identify the HPMs including their numbers and locations, and the trainers of the training are to set up a training plan based on the information on HPMs and recommendation of District Water Offices. The general contents of the training is as follows:

HPM Training

Activity	Content	Duration
(software) Confirmation of work by HPM	<ul style="list-style-type: none"> - Introduction of the project - Roles and responsibilities of HPM - Coordination/relationship with District Water Offices and other local government offices - Relationship and contract with WSC - Spare parts availability - Contents and how to fill out repair and maintenance records - Contents and how to fill out estimate forms, bills, receipts 	3.5 days
(hardware) Repair and maintenance of the project handpumps	<ul style="list-style-type: none"> - Use of ground water and taint - Kinds of water levels - Structure of the project handpumps - Name and function of each part - Repair tools for the project handpump and their usage - Procedures and special attentions for installation, removal and re-installation of handpump - Safety management and caution for handling - Common mistakes in installation and handling, and coping methods - Points for special attention when working with villagers - Common breakdown and trouble, and their causes 	6.5 days

This two-week training for HPMs includes field practice sessions in which HPMs are to repair existing handpumps in the field.

③ Software Assistance Impact Study

The software assistance impact study is conducted for two months just before the very end of this project. The contents of the study are as follows:

Software Assistance Impact Study

Activity	Content	Data Collection Method	Duration
Quantitative Study	<ul style="list-style-type: none"> - Rate of operation of project handpumps - Rate of handpump repair and maintenance - Rate of O&M fee payment - Rate of participation in WSC meetings; female participation - Rate of women among WSC executives - Latrine coverage rate - Rate of access to safe water 	Obtained from District Water Office, Sub-county Office, WSC, etc	2 weeks
Qualitative Study	<ul style="list-style-type: none"> - Ownership; self-awareness as well owners - Villagers' understanding and willingness toward community-based O&M - Villagers' understanding of safe water - Villagers' understanding and actions toward gender equality, social equity, etc. - Effect of handpump on health, sanitation and hygiene - The way handpumps contribute to improve quality of life - The way handpump users see the project and its effect 	Field study: Interview, discussion, participant observation, PRA/RRA, etc.	4 weeks

The software assistance impact study is done by an individual who knows both this project and its villages well. After finishing data collection, he/she spends two weeks analyzing and writing up a study report. To have fair analysis and to correct a bias that stems from pre-conceptions and too much knowledge of the project to a minimal level, the Japanese consultant on social development will act as his/her advisor.

7) Individuals Concerned and Outputs of Activities

This software assistance involves the following individuals.

Actors and Their Roles in the Software Assistance Program

Actors	Roles
1) Japanese Consultant on Social Development	<ul style="list-style-type: none"> ➤ Overall planning, management and reporting of the software assistance program ➤ Supervision/Guidance of local NGO/consultancy firm ➤ Supervision/Advice on Workshops, Training and Software Assistance Impact Study
2) DWD Counter-Part	<ul style="list-style-type: none"> ➤ Overall planning and management of the program with the Japanese consultant ➤ Supervision/Guidance of local NGO/consultancy firm with the Japanese consultant ➤ Request assistance and cooperation from other ministries and local government offices for program implementation when necessary ➤ Coordination among the Japanese consultant, local NGO/consultancy firm, and government offices
3) District Water Office Staff	<ul style="list-style-type: none"> ➤ Presence at the workshops and trainings ➤ Coordination among local NGO/consultancy firm, community, village, parish, sub-county ➤ Check the contents and progress of community mobilization and sensitization

Actors and Their Roles in the Software Assistance Program

Actors	Roles
	<ul style="list-style-type: none"> activities, HPM training, and software assistance impact study done by local NGO/consultancy firm ➤ Guidance of WSCs in the project villages and monitoring of their activities, O&M fee collection, conditions of sanitation and hygiene in relation to water in project villages ➤ Support of WSC ➤ Coordination of software assistance activities and well construction ➤ Check the situations of HPMs
4) CD Assistant	<ul style="list-style-type: none"> ➤ Presence at the workshops and trainings ➤ Check the contents and progress of community mobilization and sensitization activities, HPM training, and software assistance impact study done by local NGO/consultancy firm ➤ Guidance of WSCs in the project villages and monitoring of their activities, O&M fee collection, conditions of sanitation and hygiene in relation to water in project villages ➤ Support of WSC
5) Health Assistant	<ul style="list-style-type: none"> ➤ Check the contents and progress of community mobilization and sensitization activities and project impact study done by local NGO/consultancy firm ➤ Monitoring of conditions of sanitation and hygiene in project villages ➤ Support of WSC
6) Local NGO or Consultancy Firm	<ul style="list-style-type: none"> ➤ Support of District Water Office and CD Assistants ➤ Make workshop materials, handouts, and necessary forms ➤ Write workshop planning report, manuals, and reports ➤ Facilitation of community mobilization and sensitization workshop (pre-, during/post-) ➤ Monitor WSC activities and conditions of sanitation and hygiene in project villages ➤ Keep contacts with village, parish, sub-county officers and leaders to strengthen the system of support ➤ Coordination of concerned organizations/personnel so that villagers will receive information on well construction progress ➤ Make necessary materials and handouts for HPM training ➤ Facilitation of HPM training ➤ Make planning report and manual for HPM training, and write training report ➤ Conduct software assistance impact study ➤ Write planning report and software assistance impact study report ➤ Write work reports
7) Contractor (construction)	<ul style="list-style-type: none"> ➤ Announce the progress of well construction to villagers ➤ Maintain good relationship with villagers, free of friction, conflicts and misunderstanding
8) WSC Executives	<ul style="list-style-type: none"> ➤ Collection and management of O&M fee ➤ Engage in operation and maintenance and promote better sanitation and hygiene as representatives of villagers ➤ Hold WSC meetings to discuss matters on WSC ➤ Hold meeting to report conditions of O&M fee management and handpumps to villagers ➤ Coordination and communication with village, parish, and sub-county officers/leaders
9) HPM	<ul style="list-style-type: none"> ➤ Repair and maintenance of handpumps ➤ Report the conditions of handpumps to WSCs ➤ Report to District Water Office when a handpump requires a major repair
10) Villagers (Handpump Users)	<ul style="list-style-type: none"> ➤ Awareness as handpump owners ➤ Correct usage of handpump ➤ Payment of O&M fee ➤ Participation in workshops and meetings ➤ Understanding of relationship between safe water and health ➤ Effort to improve health, sanitation and hygiene ➤ Labor contribution for feeder road maintenance, construction of fence, and construction of drainage pit

Outputs of software assistance program activities are as follows:

Software Assistance Program Activities and their Outputs

Activity	Outputs	Content
Community Mobilization and Sensitization Workshops	Pre-construction WS manual for villagers	Project Outline
		Handout/material on community-based O&M
		Handout/material on different kinds of water facilities
		Handout/material on water and health, sanitation and hygiene
		Handout/material on community sensitization
		Handout/material on O&M plan
		Handout/material on monitoring
	Pre-construction WS manual for WSC	Handout/material on WSC
		Handout/material on WSC management
		Form for O&M fee collection
		Accounting Form for O&M fee
		Form for WSC meetings (for caretakers) Handpump monitoring form
		Monitoring forms
	WS planning report	Workshop procedures, methods, etc.
	WS report	Report of workshop results
HPM Training	Training manual	Handout/material on HPM's work and roles
		Handout/material on handpump structure , repair and maintenance
		Form for handpump repair/maintenance
	Planning report for HPM training	Training procedures, methods, etc.
	HPM report	Report of training results
Software Assistance Impact Study	Software Assistance Impact Study Planning Report	Study procedures, methods, etc.
	Software Assistance Impact Study Report	Report of study results

8) Detailed Plan of Program Operation

As shown in Fig. 2.2.4, this software assistance needs 28 months. One local consultant under the supervision of the local consultant leader and the sub-leader facilitate the pre-construction community mobilization and sensitization workshop. The during/ post-construction workshop is facilitated by a local consultant.

As the well construction will take place in 49 villages in Term 1, and 71 villages in Term 2, community mobilization and sensitization activities are done in both phases. Durations of the pre-construction workshop and the HPM training are 3.5 months and 2 weeks respectively for both phases. The during/post-construction workshop lasts for 9.0 months in Term 1 and 13.5 months in Term 2. Two local consultants will be trainers for the HPM training. The software assistance impact study is done by a specialist on project assessment, monitoring or evaluation (a local consultant). He/She is to spend a total of two months planning, collecting data, analyzing data and writing up a report.

(8) Implementation Schedule

<Construction Period>

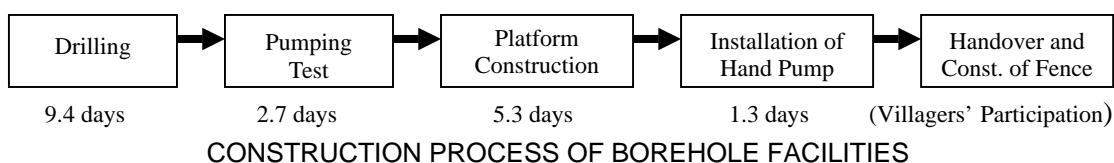
Workable Day

In Uganda, paid vacation of 1.5 days per month is provided by employment law, but the working days are generally 6 days per week because ordinary working time per week is limited to 48 hours. The usual annual workable days are set as 304 days considering nine days of annual national holidays and Sunday. However, the revised annual workable days are set as 273 days considering 31 days as non-working days that have the probability of overlap concerning holidays and 37 days with more than 10 mm of daily precipitation due to bad weather.

Period for Well Construction and Site Numbers

Well construction is conducted by contract works of Japanese contractor selected according to the guideline of Japanese Grant Aid System. Well construction was conducted by direct works of Japanese contractor and local sub-contractor in the 1st. Phase project; however, the well construction will be conducted by local drilling firm for the purpose of cost reduction in the project. Platform construction and installation of hand pump will also be conducted by local contractor.

Implementation schedule is to be conducted by organizing teams each work item as shown in the below figure.



Construction speed of local drilling firm is considerably less than Japanese contractor; however, it is possible that local contractor will keep construction quality of grant aid project and complete the works within the period of well constructions due to proper execution of progress and quality management of construction by Japanese contractor. The period of work for construction of each item requires is shown in the above figure. It is set as expectation of execution under proper guidance of the Japanese contractor.

Project is divided into two execution phases. Well construction works will be executed at 49 villages in Masaka district in the first year and 71 villages in Mukono and Kayunga districts in the second year. The first year is estimated as about 7 months using two sets of drilling machines and the second year is estimated as about 10 months using three sets of drilling machines.

The proposed villages will be 120 sites; however, the proposed construction sites will become 171 sites ($120 \text{ sites} / 0.7 = 171 \text{ sites}$) because success rate is estimated as 70 %. The standard depth of well drilling is 70 m. If it is judged that enough water cannot come from a borehole, it will be backfilled as an unsuccessful well. Total length of drilling is estimated as 11,970 m ($70 \text{ m} \times 171 \text{ sites}$). The criteria of a success well as mentioned above are secured yield amount of 12 liters

per minute, specific capacity of 1 liter per minute per meter and no problem of water quality. However, if it is confirmed that yield amount of 12 liters is not secured but 6 liters is secured, and villagers strongly request for using such wells, borehole finishing will be done and the well will be handed over to the Ugandan side. Ugandan side is responsible for the construction of appurtenant facilities such as platform, installation of hand pump, etc. While in the 1st Phase project, such well is counted as 0.5 of (or half) successful well, it is treated as unsuccessful wells in the Project.

In principal, the payment for the unit rate contract system will be executed by the conducted drilling length including drilling length of unsuccessful wells for the purpose of cost reduction in the project by being able to reduce the risk cost of unsuccessful wells from the drilling cost offered by the contractor because it avoids the need to secure a guaranteed number of successful wells from the contractor. Accordingly, either the number of wells may not reach the proposed number of wells in the project or reserve wells may be constructed.

If 120 sites of successful boreholes are completed before the accumulated drilling depth reaches 11,970 m, borehole construction of surplus drilling depth will be executed at the sites in the villages having high priority.

When wells have the success of pumping test and water quality analysis, construction of platform and installation of hand pump will be executed and the well handed over to WSC. After that, soak pit and protection fence will be constructed by villagers' participation.

<Implementation Schedule>

Implementation of the project is to be performed by phasing over two years, and the required period of detailed design, software assistance, construction works and procurement of equipment and materials are as shown in Fig. 2.2.5.

2.3 Obligations of Recipient Country

The obligations required for the Government of Uganda for the project implementation are as follows:

- 1) Provision of necessary data and materials for this Project
- 2) Security at the project sites
- 3) Payment of commissions for Banking Arrangements (B/A) and Authorization to Pay (A/P)
- 4) Quick loading and unloading, and customs clearance procedures for the equipment and materials to be procured
- 5) To take action of exemption from taxation for the equipment and materials to be brought in Uganda by the Japanese personnel and taxes of subcontracts for the procurement of the equipment and materials, and the execution of services based on the approved contract
- 6) Appropriate use and maintenance of procured equipment and materials, and constructed facilities in this Project
- 7) Priority use of necessary related equipment and materials for implementation in this Project of the equipment and materials procured in the 1st Phase Project
- 8) Share of the following costs that will not be appropriated from the grant aid:

Cost Sholdered by Government of Uganda

Item	Remarks
(1) Salary and allowance etc. for CDA and DWD officers who participate in software assistance	Term 1: 4 Water Officers and 19 CDAs for 19 Months Term 2: 8 Water Officers and 27 CDAs for 20 Months
(2) Procurement of Bicycles for HPMs and CDAs	92 Nos.
(3) Making sure of land acquisition including well construction land for deep well water supply facilities	Coordination and confirmation between villagers
(4) Making sure of land acquisition and facilities for keeping equipment for the disposition of equipment and materials	Land and building of DWD and District Water Office
(5) Development of access roads to well construction roads	By participation of the beneficiaries
(6) Provision of common labor for well construction and finishing well facilities including appurtenant facilities	By participation of the beneficiaries
(7) Construction of protective fences and drainage pit	By participation of the beneficiaries

2.4 Project Operation Plan

2.4.1 Operation and Maintenance of Water Supply Facilities

Uganda's National Water Policy (1999) promotes a comprehensive approach to water resource management with an emphasis on social mobilization and sensitization of water users. This approach is a participatory one as well. The policy calls water users as "active informed partners," instead of "passive and uninformed recipients/ beneficiaries". Pillars of the participation include construction of water facilities based on a request by villagers (Demand Responsive Approach) and sustainable O&M of water facilities by Water and Sanitation Committee (community management).

(1) Sector Handbook and Participatory Approach

In order to operationalize basic ideas in the policy and to put the new approach into actions, UNICEF and the Ministry of Gender, Labor and Social Development compiled "Rural Water Supply and Sanitation Handbook for Extension Workers" (2002), so-called "Sector Handbook" intended for extension workers in sub-counties such as health assistants and community development assistants. Being founded on a principle that participation leads to empowerment, the handbook emphasizes the importance of the sense of ownership of water facilities shared by community members. All the water facilities in Uganda are to be managed in accordance with the handbook. Although the handbook admits that taking a participatory approach requires more time than the old approach centered on facility construction, it explains this new approach as "an investment in long-term sustainability of water facilities". Hence, taking up this new approach is a well-planned attempt to deal with the problem of the high rate of non-functioning water facility in Uganda, which currently remains at 30%.

Mobilization and sensitization activities start well before and continue even after facility construction. In the handbook, the activities are divided into the following 4 phases:

Mobilization and Sensitization Activities

Phase	Activities
① Advocacy/ Promotion	Information on water, hygiene, and sanitation including access to funds and health improvement is provided to community members through posters, handouts, radio, dramas, etc. Community meetings and household visits are also constructed.
② Bottom Up Response	Based on information analysis, communities announces their demand. Participatory needs assessment, decision making on a kind of water facility to be constructed, siting of water and health facilities, establishment of WSC, signing of MOU between WSC and sub-county, etc. are

Mobilization and Sensitization Activities

Phase	Activities
	also done.
③ Construction	Based on understanding by community members, facility construction takes place. Community members participate in the construction. Preparation for O&M also takes place.
④ Post Construction	Capacity development of communities continue even after construction. Community members engage in O&M and construct sanitation facilities. Participatory monitoring and follow-up, facilitation on sanitation and hygiene, promotion of participation of the socially vulnerable including women, children, the handicapped, etc continues throughout this phase.

(2) Water and Sanitation Committee

Similarly, roles and posts of WSC are explained as follows:

Water and Sanitation Committee

Role	Membership
<ul style="list-style-type: none"> ➤ Promote improved sanitation and hygiene behavior ➤ Mobilize the community for sanitation and hygiene improvement ➤ Maintain an up to date record (list) of water users ➤ Mobilize users to pay for maintenance costs and properly look after water source fund ➤ Regularly visit and monitor the performance of water facility ➤ Ensure preventive maintenance ➤ Contact a mechanic in case of need of repairs and remunerate the mechanic ➤ Purchase any materials needed for repairs 	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Chairperson (1) Treasurer (1) Secretary (1) Committee member (1) Caretakers (2) </div> <hr style="border-top: 1px dashed black;"/> <ul style="list-style-type: none"> ➤ At least 3 of the above members must be women ➤ One of the caretakers must be a woman ➤ At least one of Chairperson, Treasurer and Secretary must be a woman

(3) Actors of Operation and Maintenance of Water Supply Facilities

The government organizations assisting operation and maintenance of water supply facilities and the persons directly relating to repair and inspection of hand pump are shown below, and three ministries such as Ministry of Water, Land and Environment, Ministry of Gender, Labour and Social Development and Ministry of Health are related.

Actors of O&M

Local Government	Ministry of Water, Land and Environment (DWD)	Ministry of Gender, Labor & Social Development	Ministry of Health
District	<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: 150px;">District Water Officer</div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; text-align: center;">Assistant Water Officer (Sanitation)</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Assistant Water Officer (Mobilization)</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Assistant Water Officer (Water Supply)</div> </div>	<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: 100px;">Community Development Officer: (CDO)</div>	<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: 100px;">Health Officer (HO)</div>
County	belonging to District Water <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; text-align: center;">County Water Officer</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">County Water Officer</div> </div> (One officer in each county)		
Sub-County	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> <div style="border: 1px dashed black; padding: 5px; text-align: center;">Hand Pump Mechanic</div> <div style="border: 1px dashed black; padding: 5px; text-align: center;">Hand Pump Mechanic</div> <div style="border: 1px dashed black; padding: 5px; text-align: center;">Spare Part Dealer</div> </div> (Private Sector) (Private Sector) (Private Sector)	<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: 100px;">Community Development Assistant: (CDA)</div>	<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: 100px;">Health Assistant (HA)</div>

The Sector Handbook introduces actors involved in the network of community-based O&M, and defines their roles as follows:

Actors and Their Roles

Actors	Roles and Responsibilities
Community	<ul style="list-style-type: none"> ➤ Prioritization of the needs for assistance through a democratic approach ➤ Establishment of WSC ➤ Siting water points within technically feasible limits ➤ Raising local share of capital contribution ➤ Responsible for O&M of water systems ➤ Selecting and designating water source caretakers ➤ Assist with the repairs and maintenance of the water sources ➤ Own and control water and sanitation facilities in a hygienic manner
Local Community Group	<ul style="list-style-type: none"> ➤ Help in mobilization and organization of the communities
Local Government (Sub-Counties, Counties and Districts)	<ul style="list-style-type: none"> ➤ Prioritization of communities ➤ Mobilize and sensitize communities ➤ Selection of technicians and handpump mechanics ➤ Advise communities regarding community involvement in management of water and sanitation facilities, health education and environmental health activities ➤ Enact/make bye-laws to facilitate the implementation and operation of the water supply and sanitation facilities and resolve conflicts ➤ Support the organizational framework for planning, implementation, monitoring and evaluation of the RWSS sub-projects ➤ Partly finance water supply and sanitation development
Local Administrative Authorities	<ul style="list-style-type: none"> ➤ Technical responsibility for the program implementation through the Water and Health staff at District and Sub-District levels ➤ Train and supervise the staff below them and provide back up support ➤ Conduct water quality tests, supervise contractors and carry out monitoring and evaluation
Central Government Ministries	<ul style="list-style-type: none"> ➤ In charge of setting policies/guidelines and regulatory framework ➤ Providing advisory support to districts in water sector and in the hygiene and sanitation sector respectively ➤ Provide funding for water and sanitation development
NGOs and Agencies	<ul style="list-style-type: none"> ➤ Solicit and manage funds for water and sanitation activities ➤ Mobilization and training of communities and construction of water facilities ➤ Financial support and development of promotional materials ➤ Carry out socio-technical feasibility ➤ Site water sources/carry out hydrogeological investigations ➤ Carry out designs of water supply and sanitation systems ➤ Carry out construction of water supply and sanitation facilities
The Private Sector	<ul style="list-style-type: none"> ➤ Providing the necessary goods and services under the program ➤ Carry out mobilization, training and production of promotional materials ➤ Carry out socio-technical feasibility ➤ Site water sources/carry out hydro-geological investigations ➤ Carry out designs of water supply and sanitation systems ➤ Carry out construction of water supply and sanitation facilities ➤ Assist District and Sub-District staff in case of special technical problems and offer advice in trouble shooting ➤ Supply of goods, e.g. training materials, pumps, pipes, etc.

The Study of Operation and Maintenance of Rural Water Facilities in Uganda (2001) published by DWD reports that most of the systems/networks of O&M in Uganda were set up by donor projects' initiative, and existed temporarily as the systems fell apart when projects were terminated. To attain sustainability of O&M, the study recommends that a system of O&M be established and managed by the government's initiative, creating a stable institutional framework for participatory O&M.

Among the people/organizations, District Water Offices play a major role for back-up support to WSC to attain sustainability of hand pumps of this project. Because the transition to political decentralization is still underway and the main focus of the rural water supply department shifted from hardware construction to community-based water supply system with more emphasis on software including extension activities, the District Water Offices are compelled to undergo various changes. Specifically speaking, because community-based O&M as well as DRA do not have a long history in Uganda, and OP5 went into effect in July 2003, officers at the District Water Offices do not have sufficient experience or capacity to be the leading figures in the system of O&M.

To solve the above issue, in the software assistance of this Project, the extension activities to villagers and WSCs are to be conducted together with practice and training of the staff of District Water Office. Such activities are done to improve the capacity of villagers and to reinforce the participatory O&M system including assistance to WSCs by District Water Offices.

(4) Establishment of TSU and Roles

Technical Support Unit (TSU) was established in the DWD in 2001 with support from various international donors such as DANIDA, SIDA, etc. TSU is to engage in capacity building of the District Water Offices and other related offices in order to ensure Uganda's political/administrative decentralization through training of trainers (TOT). As increasing capacity of the officers and related personnel is to weaken the reason for TSU's existence, TSU is going to operate temporarily for 3 to 5 years.

Functions of TSU

<u>Planning support to districts</u> <ul style="list-style-type: none"> - Preparation of district water and sanitation plans - Procurement planning and management - <u>Development of management and information system for enhanced monitoring and feedback</u> - <u>Maintenance planning and management</u> 	<u>Support and strengthen quality assurance</u> <ul style="list-style-type: none"> - Compliance to national policies and guidelines - Adherence to standards and specification - Transparent tendering and procurement management - Recruitment and/or training of appropriate staff in terms of quality and quantity
<u>Coordination of capacity building and inter-district cooperation</u> <ul style="list-style-type: none"> - Needs assessment define capacity gap - Facilitation of training planning - Promotion of inter-district learning - Facilitation on inter-sectoral district coordination - <u>Advice on private sector interface and private sector capacity building</u> - <u>Advice on NGO/CBO interface and coordination</u> 	<u>Specialized technical assistance</u> <ul style="list-style-type: none"> - Introduction and promotion of low cost and cost effective appropriate technologies - Designing of rural water schemes - Siting and construction supervision - Facilitation of training - Mapping and documentation of water resources - <u>Support for operation and maintenance</u>

Note: items related to O&M are underlined.

As the above table shows, capacity building of the staff of District Water Offices for sustainable operation and management is within the scope of TSU's activities. TSU's core staff are specialists on 1) water and sanitation, 2) public health, and 3) community development, and this shows strong determination of the DWD to establish a sustainable community-based O&M

system through community mobilization/sensitization and a back-up support system. As mentioned earlier, community mobilization and sensitization activities in this software assistance program are to offer chances for practical experience/training to local government staff. Offering such chances will not interfere with TSU, but is in line with capacity development that TSU aims for. To put it differently, such practical experience/training will lead to long-term and well-organized capacity building by TSU even after project completion.

There are eight TSU area offices in Uganda, and each office is responsible for the capacity building of District Water Offices. The extension activities of TSU are commissioned to eight local NGOs or consultancy firms. TSU5 (located in Kampala) is in charge of Mukono and Kayunga districts and TSU7 (located in Masaka) is in charge of Masaka district and are managed by the local consultant of Carl Bro.

(5) Monitoring and Support System

Monitoring and support are crucial to success and sustainability of participatory O&M. Monitoring in participatory water supply projects is done to examine and ensure the rate of achievement of project objectives. The Sector Handbook introduces “follow up checklists” on which items that need to be monitored by extension workers are shown as follows:

Items to be Monitored

WSC	Community	Water Facility
<ul style="list-style-type: none"> ◆ Records and book-keeping of WSC ◆ Up-dated lists of facility users ◆ Up-dated lists on household visits indicating hygiene and sanitation facilities ◆ Records on O&M ◆ Community meetings held and decisions taken ◆ Leaders promoting water and sanitation through active participation evidenced by minutes ◆ Community members aware of financial position of WSC accounting ◆ Community members pleased with WSC 	<ul style="list-style-type: none"> ◆ Community members conversant with policies ◆ Community members participate in decision making ◆ Motivation reflected in participation in community meetings ◆ Awareness of hygiene and sanitation reflected in adoption of facilities ◆ Coordination with government organizations 	<ul style="list-style-type: none"> ◆ Average breakdown time during rainy and dry seasons ◆ Conditions of hand pump ◆ Caretakers records on flow per minute ◆ Proportion of households paying for their water use and money available for O&M ◆ Attendance of HPM ◆ Records on O&M and spare parts purchased ◆ Spare parts bought from private sector and private technicians contracted
Hygiene and Sanitation		Gender (Women)
<ul style="list-style-type: none"> ◆ Latrines and their cleanliness ◆ Latrine: odor and flies ◆ Surface water around Latrine ◆ Existence of hand washing facilities ◆ Storage of water in the home ◆ Maintenance of a safe water chain ◆ Clean homesteads free from excreta and rubbish ◆ Rubbish pits or rubbish spread in gardens as manure ◆ Bath shelters ◆ Proper drainage from bath shelters ◆ Drying racks for household utensils 		<ul style="list-style-type: none"> ◆ Women invited to community meeting on water and sanitation; 50% men and 50% women ◆ Women present in meeting ◆ Prioritization carried out separately for men and for women if there are different priorities among men and women ◆ Women elected to WSC ◆ Women holding executive positions in WSC ◆ Women participating actively in WSC discussions ◆ Community women participate in choice of technology for both water and sanitation facilities including discussion of cost-options, community contributions, etc.

Items to be Monitored

	<ul style="list-style-type: none"> ◆ Women trained as Caretakers ◆ Women trained as Technicians (mechanics) ◆ Women participate in construction ◆ Women participate in official opening of the facilities
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In the Project, monitoring is done on the responsibility of the Government of Uganda. Monitoring will clarify program progress, achievement of program objectives, effectiveness and impact of program activities. It is necessary to have not only the facilitators for mobilization and sensitization but also persons relating to the operation and maintenance such as villagers, WSC members, government staff, HPMs involve in monitoring.

WSCs are not independent of one another, but are part of an O&M network in which local government organizations also participate. Focuses of this software assistance program are not only on O&M done by community organizations, but also on back-up support to WSC by government officers, because such support is an integral part of the sustainable O&M network. Back-up support to WSC gives water users and WSC executives confidence and motivation (psychological support), and makes WSC activities financially and technically easier (physical support).

(6) Sustainability of Operation and Maintenance of Facilities

As the political decentralization and the SWAp of the water sector become more firmly established, the District Water Offices are likely to have more autonomy in administrative and financial matters. There has been a speculation that the overall amount of district water budget and the ratio of O&M budget to the district budget will increase. If this is to take place, the back-up support to WSCs by the District Water Office will improve.

O&M activities by hand pump users/WSC are financially supported by O&M fees paid by hand pump users. The amount of O&M fee in this project is to be set in a way that will cover not only spare parts, but also the costs for hand pump renewal (hand pump body) and set up work. Details of O&M activities and fee payment will be determined in the workshops. The factors examined so far are likely to assure capacity building and financial resources of both the District Water Offices and hand pump users for O&M. Unless so-called “killer assumption” of this project such as reorganization of local government structure and restructuring of the District Water Offices will take place, it is possible to have long-term community-based O&M in this project, but the following items have to be considered.

- filling up of vacant CDAs and HPMs, and their capacity building by TSU
- Coordination among Ministry of Water, Land and Environment, Ministry of Gender, Labour and Social Development and Ministry of Health relating to assistance in O&M of the water supply facilities
- Continuous monitoring by the Ugandan side after the facility construction

As it will be explained in the following chapter, O&M fees in this project can range from 100 to 400 Ugandan Shillings (UGS) per month per household depending on whether the fee should

include all or partial cost for handpump renewal. Considering the average monthly household income of 156,000 UGS in the project areas, hand pump users will be able to pay the fees within the above range.

2.4.2 Operation and Maintenance of Procured Equipment

In the project, the maintenance and operation of the procured equipment and materials is to be executed as shown in the following table and the additional staff for operation of equipment is not required.

Operation and Maintenance of Equipment to be Procured

No.	Item	Qty	Management System of Equipment	Delivered Site
1. Equipment of Investigation				
1.1	Electric Prospective Survey and Electrical Logging Equipment	1 set	DWD Hydrogeology engineers (4 persons) to use this equipment and execute the maintenance and operation. These hydrogeology engineers will have a basic knowledge of electric prospecting survey and can utilize it without problem with an English manual.	Rural Water Supply Section, DWD
1.2	Portable Water Quality Analysis Kit	3 sets	Water supply officers of district water office are to be assigned for utilization and management. There is no staff for handling the water quality analysis kit in the district water office at present; however, the expert for water quality will be dispatched from water quality analysis laboratory in DWD department of management of water resources, and problem should not occur in the use of equipment because water supply officers will take lecture and training about handling of equipment and completion of the results of water quality analysis.	Mukono, Masaka and Kayunga District Water Offices
1.3	Water Level Measurement Tool	3 sets		
1.4	Vehicle for Supervision	2 cars	DWD transportation section to control maintenance and operation for DWD vehicles. Repair and inspection of vehicles are to be executed by the contract factory. The procured vehicles will be handled the same way.	Rural Water Supply Section, DWD
2. Equipment of Activity for Education and Facilitation				
2.1	Laptop Computer	1 kit	Counterpart in this project will use and maintain the computer	Rural Water Supply Section, DWD
2.2	Color Printer for Laptop Computer	1 kit		
2.3	GPS	3 sets	District water supply officer will use these equipment for confirmation of location of wells and activity of facilitation about maintenance and operation of hand pump. Water supply officers will also execute the management of utilization under the responsibility of each district water office. Repair and inspection of motorcycles are to be handled by local factory.	Mukono, Masaka and Kayunga District Water Offices
2.4	Hand Pump Cutout Model	3 sets		
2.5	Digital Camera	3 sets		
2.6	Motorcycle	3 sets		
2.7	Hand Pump Repair Tools	46 sets	Hand pump repair tools used by HPM are lent by District Water Offices, and they takes responsibility on maintenance and operation of such tools.	

As described in the next chapter, the major expenses will be for operation and maintenance of supervision vehicles and motorcycles covering fuel charge, repair and inspection expenses in the contract workshop. The supervision vehicles (two cars) are to be procured as substitute for the existing vehicles procured in the 1st Phase project. Therefore, it is not necessary to assign the

new maintenance staff in particular and it is possible to maintain under the existing maintenance system. There is no technical problem to maintain the motorcycles (three sets) in district water office in the same way as maintenance of motorcycles owned by each district water office; hence, it only fuel charge for utilization is needed. Therefore, maintenance and operation of the procured equipment in the project will be operated by maintenance and operation of the present system without problem.

2.5 Project Cost

2.5.1 Project Cost

(1) Expense for Japanese side

Total project cost of Japanese side required for the execution of project by Japanese Grant Aid is about 627 million Yen based on responsibility of Government of Japan and Uganda mentioned before. These breakdown is shown in the following table.

Project Costs Borne by the Japanese Side

Masaka District 49 sites (49 wells)		Project Cost: About 627 Million Yen	
Item of Expenditure		Project Cost (million Yen)	
Facilities	Well Construction, Pumping Test, Water Quality Analysis, Electrical Logging, Installation of Handpump, Construction of Platform	173.6	196.9
Equipment	Geophysical Survey Equipment, Electrical Logging Equipment, Portable Water Quality Analysis Kits, Water Level Measure Tool, Vehicle of Supervision, Laptop Computer, Printer, GPS, Handpump Cutout Model, Digital Camera, Motorcycle, Repair Tools for Handpump	23.3	
Detailed Design • Supervision • Technical Assistance		84.4	
Project Cost (Sub-total): About 281 Million Yen			
Mukono District 33 sites (33 wells)		Project Cost (million Yen)	
Item of Expenditure		Project Cost (million Yen)	
Facilities	Well Construction, Pumping Test, Water Quality Analysis, Electrical Logging, Installation of Handpump, Construction of Platform	114.3	114.3
Equipment	-	0	
Detailed Design • Supervision • Technical Assistance		46.6	
Project Cost (Sub-total): About 161 Million Yen			

Kayunga District 38 sites (38 wells)

Item of Expenditure		Project Cost (million Yen)	
Facilities	Well Construction, Pumping Test, Water Quality Analysis, Electrical Logging, Installation of Handpump, Construction of Platform	131.7	131.7
Equipment	-	0	
Detailed Design • Supervision • Technical Assistance			53.6

Project Cost (Sub-total): About 185 Million Yen

This cost estimate is provisional and will be further examined by the Government of Japan for the approval of the Grant.

(2) Expense of Ugandan Side

As the project cost borne by the Government of Uganda is shown in the following table, there is not much because almost all responsible matters are executed by the arrangement between beneficiaries and participation of villagers. However, it is necessary for the Ugandan side to assign CDAs and Water Officers for the software assistance in order to assure the sustainability of the facilities to be constructed, and the expenses necessary for these assignment have to be born by the Ugandan side.

Project Costs Borne by the Government of Uganda

(Unit: million UGS)

Item		Expense	Remarks
(1)	Salary of CDA staff for participation in software assistance and water supply officer	420	Phase 1: water supply officer 4 persons and CDA 19 persons, 19 months Phase 2: water supply officer 8 persons and CDA 27 persons, 20 months
(2)	Procurement of bicycles for HPMs and CDAs	8	92 nos.
(3)	Land acquisition of well facilities (including land of construction)	-	Arrangement and confirmation between villagers
(4)	Securing of land and facilities for equipment and materials	-	Land and building of DWD and District Water Office
(5)	Development of access roads to well construction sites	-	By beneficiaries' participation
(6)	Well drilling works and finishing well (including appurtenant facilities)	-	Offering labor of villagers for construction of platform and installation of hand pump
(7)	Construction of protection fence and leak pit	-	By beneficiaries participation
Total		428	-

According to the Ugandan tax system, equipment and materials procured by grant aid are exempted from tax on value added (VAT) and import customs, etc.

(3) Conditions of Cost Estimate

<Time of Cost Estimate>

The project cost estimate is based on price and exchange rates as of March 2003.

<Exchange Rates>

Exchange rates applied in the project cost estimate are as shown below.

- 1 US\$ = 121.80 Yen

- 1 US\$ = 1,852.81 UGS

2.5.2 Maintenance Cost for Operation and Maintenance

(1) Field Survey Equipment

Annual expenses necessary for the operation and maintenance of the procured equipment are estimated as follows:

Annual Maintenance Cost

No.	Item	Quantity	Station	Amount ¥	Remarks
1. Equipment for Field Survey					
1.1	Electric Resistivity and Borehole Logging Equipment	1 sets	DWD	100,000	Spare rechargeable batteries
1.2	Portable Water Analysis kit	3 kits	Dist. Office	100,000	Regents
1.3	Water Level Meter	3 kits	Dist. Office	1,440	Spare dry cells
1.4	Vehicles for Supervisory Works	2 units	DWD	1,376,000	Fuel, Lubricants
2. Equipment for administrative training and facilitation					
2.1	Laptop Computer	1 set	DWD	1,440	Floppy diskettes
2.2	Color Printer	1 set	DWD	10,800	Ink cartridge
2.3	GPS	3 set	Dist. Office	960	Spare dry cells
2.4	Section cutout model of the hand pump	3 kits	Dist. Office	0	
2.7	Digital Still Camera	3 units	Dist. Office	600	Spare dry cells
2.8	Motorcycle	3 kits	Dist. Office	218,450	Fuel, Lubricants
2.9	Maintenance Tools	46 units	Dist. Office	0	

As shown in the above table annual expenses necessary for DWD in the central level is 1,488,240 Yen (22,754,000 UGS) while that of district office level is 107,150 Yen (1,638,000 UGS).

In the Water and Sanitation Sector, Medium Term Budget Framework Paper (FY2003/04 to FY2005/06 issued by MWLE), the fixed budget and subsidy for Districts such as Mukono, Kayunga, Masaka are indicated and shown in the table below. It indicates that the expense and maintenance costs would be bearable.

DWD Central and District Level Budget

		(B. UGS)		
Description		2003/04	2004/05	2005/06
DWD fixed budget		0.820	0.895	0.982
Subsidy	Mukono	0.885	0.941	1.140
	Kayunga	0.269	0.286	0.346
	Masaka	0.753	0.799	0.941

(2) Tubewell Facilities with Hand Pump

Although U2/U3 type hand pumps are standardized as VLOM, are widely used in Uganda and have a good reputation because of higher durability under appropriate maintenance works as well as past experience, it is necessary to replace some consumable periodically. Daily maintenance works including this are entrusted by communities to HPM. Management of maintenance funds including fee collection and reserve by the water committee need to be carried out properly, or daily maintenance such as periodic replacement with parts procurement and minor repair works become impossible. In case of rather complicated repair works and rehabilitation of entire facilities, district office and/ or DWD will be responsible for them under cost burden of communities.

Daily visual check and cleaning will be performed by communities while HPM will perform basic repair works such as periodic inspection of the hand pump and replacement of consumable parts. In case of rather serious defective cases, district office will take care of them. If the district office can't fix something, DWD will manage it.

Division of Expenses borne for Well with Hand Pump

Description	DWD/Dist. Office	Village Community	Remarks
Daily maintenance, Cleaning		○	
Periodic replacement of consumable pump parts		○	Actual works entrusted to HPM
Unexpected malfunction of hand pump	○	○	In case HPM can't cope with, District Office and/or DWD will manage.
Maintenance of appurtenant facilities		○	
Renewal of old hand pump	○	△	Installation of fence, repairing apron by communities

○responsible for the work and the expenses △responsible for the entire or partial expenses

Total amount for spare parts and consumable for U2/U3 hand pumps is as follows:

Cost of Spare Parts of Hand Pump (10 Years)

Items	Unit	Q'ty per Year	Unit Price (US\$)	Quantity	Cost (US\$)
Spare for Pump head					
Hexagonal bolt, nut, washer	Nos	5	0.70	50	35.00
Chain bolts, nut M10*40	Nos	0.5	0.84	5	4.20
Handle axle	Nos	0.5	6.20	5	31.00
Bearings 6205Z	Nos	1	5.50	10	55.00
Chain with coupling	Nos	0.5	3.88	5	19.40
Spare for Cylinder					
Pump bucket	Nos	4	0.30	40	12.00
Rubber seating lower valve	Nos	2	0.10	20	2.00
Rubber seating upper valve	Nos	2	0.10	20	2.00
"o"rings (U-3)	Nos	2	0.20	20	4.00
Sealing rings (U-2)	Nos	6	0.25	60	15.00
Spare for connecting rods and rising pipes					
Hexagonal rod coupling	Nos	1	1.53	10	15.30
Seamless socket 1"1/4	Nos	2	1.95	20	39.00
Seamless socket 2"1/2	Nos	2	2.55	20	51.00
Total Amount					284.90

As shown in the above table estimated total cost for replacement parts and consumable is US\$28.5/year. Furthermore, adding maintenance and repair costs for pump main unit and platform can be estimated as follows:

Cost of Pump Spare Parts and Renewal

(Unit: US\$)

Description	10 years	Per Year	Remarks
Consumable Parts	284.90	28.49	

Cost of Pump Spare Parts and Renewal

(Unit: US\$)

Description	10 years	Per Year	Remarks
Renewal of Platform	200.00	20.00	Durability 25 years, Total amount US\$500
Main unit, Handpump	435.00	43.50	
Handpump Installation Works	200.00	20.00	
Maintenance for Protective Fence	0	0	Villagers voluntarily offer labor.
Cleaning for Leak Pit	0	0	
Total amount	1,119.90	111.99	

Total cost per hand pump for maintenance and periodic replacement is US\$112/year, resulting in US\$9.33 (111.99/12) on a monthly basis. Average cost for beneficiary, per capita and household are shown below.

Expense Borne by Community

(1US\$=1,800 UGS)

Description	Monthly: US\$	Monthly: UGS	Remarks
Total expense borne by community	9.33	16,794	
Expense per capita	0.03	55.98	Beneficiary per handpump: 300 persons
Expense per household	0.19	335.88	One household consists of 6 persons

In case that the community bear all the cost required for operation and maintenance including monthly expense per household is approximately 336 UGS.

In case that costs for major rehabilitation works such as renewal of the platform, replacement of the handpump including installation are borne by district or central government, each beneficiary or household has to bear total cost only for consumable spare parts (Total amount in 10 years: US\$285, Annual cost: US\$28.5). Detailed costs per capita and household are 14.22 UGS and 85.32 UGS respectively as shown in the following table.

Expense Borne by Community – Major Part Shared by the Government

(1US\$=1,800UGS)

Description	Monthly: US\$	Monthly: UGS	Remarks
Total expense borne by community	2.37	4,266	
Expense per capita	0.008	14.22	Beneficiary per handpump: 300 persons
Expense per household	0.05	85.32	One household consists of 6 persons

If the major part of construction works is shared 50:50 with the government, this amount shall be US\$41.75 (US\$83.5/2). Total amount to be borne by community is US\$70.24 (41.75+28.49), and annual costs per capita and household are 35.1 UGS and 210.6 UGS respectively as shown below.

Expense Borne by Community – Shared in Fifty-Fifty with the Government

(1US\$=1,800UGS)

Description	Monthly: US\$	Monthly: UGS	Remarks
Total expense borne by community	5.85	10,530	
Expense per capita	0.02	35.1	Beneficiary per handpump: 300 persons
Expense per household	0.12	210.6	One household consists of 6 persons

The above calculation does not include labor cost of HPM, additional cost for unexpected malfunction, administrative rewards for WSC executives. If these items are estimated as approximately 20% of the total cost, monthly burden by each household is as follows:

Monthly Expense Borne by Household

			(Unit: UGS)
Description	Total cost borne by community	Major cost borne by the Government ^{*1)}	Major cost shared in 50-50 ^{*2)}
Total expense	336	85	211
Additional expenses (20%)	403	102	253

Remarks 1*) 2*): The remaining part shall be borne by the government.

Average monthly income per household can be estimated around 156,000 UGS in the middle part of Uganda except Kampala. Approximately 5% of total income regarded as payable amount is 7,800 UGS. The above estimates are much lower than this amount, and thus it is considered possible for villagers to bear this cost even though there are income differentials among them.

Monthly water fee, method of payment such as cash, labor and/or agricultural products and other considerations such as household size, etc., should be determined through community activities such as workshops beforehand as well as the above considerations. As for the extent of contribution by the villagers' payment, the expenses for replacement of spare parts and minor repair are born by the villagers' contribution at present. It is necessary to increase the present extent to that covers the expenses for the replacement of hand pump units and the reconstruction of plat forms in the future. It is, however, more urgent at present to establish the collection system of the villagers' contribution than to bear the expenses for major repairs and replacement of hand pump units for the time being.

Table 2.1.1 Basic Concept of the Project

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
Super Goal (Aim) I Poverty Reduction			No political disruption of Ugandan government
Super Goal (Aim) II Improving the quality of the life of the poor (PEAP Pillar 4)			Development goals and strategies of Uganda remain the same
Super Goal (Aim) III Improving rural water and sanitation situations in Uganda	Rural water supply rate Water-borne disease rate Toilet provision rate	Census Government records/statistics	Strategic focuses (pillars) of poverty reduction remain the same
Project Goal Sustainable improvements in health and living standard of the people in Masaka, Mukono and Kayunga Districts	Water supply rate in Masaka, Mukono and Kayunga districts Water-borne disease rate in Masaka, Mukono and Kayunga districts Toilet provision rate in Masaka, Mukono and Kayunga districts	Government records/statistics	Rural water and sanitation situation in places other than the three districts do not get worse than the current situation (People don't get big damage by disaster, epidemic and infectious disease.)
Project Purpose Providing/Supplying potable water to people in the Project villages in a sustainable manner (Sustainable community management of handpump wells)	Average distance to water facilities Average time spent for fetching water Rural water supply rate Rate of hand pump operation Rate of regular maintenance and repairs Number of active WSC Recognition of improvement of health condition by deep well with handpump	Government records/statistics Base-line survey Monitoring survey Project effect survey	Rural water and sanitation situation in the places in the three districts other than project communities do not get worse than the current situation (People don't get big damage by disaster, epidemic and infectious disease.)
Outputs 1. Water facilities constructed 2. Stronger back-up support to WSC by local government 3a. Improved health and hygiene of people in the project communities 3b. Understanding of value of safe water and handpump 4. Social Equity / Diversity (women, minorities, the socially vulnerable) 5a. Community management (O&M) of handpumps 5b. Understanding importance of WSC 6. Improved maintenance and repair of handpumps	1. approx. 120 handpump wells in operation 2. monitoring frequencies No. of visits to communities / handpumps by local and extension officers, No. of repairing well by government agency, No. of contact between administrative agency and WSC 3. rate of sickness (water-borne disease), Toilet provision rate and increased rate of clean jelly can willingness to take good care of well facility Recognition of improvement of health condition by deep well with handpump 4. rate of women and the socially vulnerable among WSC executive members, and other higher posts / rate of women and the socially vulnerable in workshops-meetings related to the project / sense of meaningful involvement in community management shared by women and the socially vulnerable 5. amount of water fee collected rate of payment of water fee number of participants in WSC meetings spare parts availability number of handpumps repaired/ sense of ownership; handpump as community property / understanding roles and responsibility of water users 6. number of project handpumps repaired	Government records WSC records Monitoring records Handpump monitoring records Software assistance effect survey	Adequate supply of spare parts Government continue to support community management Geophysical conditions in the project areas remain the same
Activities 1. Construction of water supply facilities (approx. 120 handpump wells) 2. WSC capacity building of extension officers and local-level DWD officers 3. Promotion of rural sanitation and hygiene in relation to potable water 4. Promotion of awareness toward women and the socially vulnerable in relation to rural water 5. Capacity building of WSC (Community sensitization /mobilization) 6. Capacity building of handpump mechanics	Inputs Japan Personnel / Firms Japanese Consultants Japanese Contractors Local NGO (under subcontract) Local Subcontractors Equipment requested Survey Equipment Potable water quality testing kits Electrical resistivity meters Electrical logging Equipment 4WD vehicles Educational Equipment GPS, Computer, Printer, Digital camera, Motorbicycle, Repair tools Cost: US\$5.2 Million	Uganda Personnel Government personnel who acts as counterparts of Japanese personnel - construction supervisors - DWD officers - extension officers Equipment Existing government vehicles and construction equipment Cost Salary and allowance such as per diem, travel expenses, accommodation fee, etc. of government officers assigned to the project Cost of operation and maintenance of equipment	Officers and WSC executives who went through capacity building remain at the same posts. Contracts between HPM and community remain in effect. Participants of workshop of capacity building don't change their job. <u>Pre-Conditions</u> Area community accept participation to the Project. District water office actively participate in the project on understanding.

Approaches: important considerations

- Consistency with Uganda government policies
 - Poverty Eradication Action Plan (PEAP)
 - Mid Term Expenditure Framework
 - Sector goal, sector strategies, etc.
 - Sector ceiling (Value for Money, Project cost in relation to investment plan, Well construction cost, Cost reduction/efficiency, etc.)
 - Monitoring
 - Critical requirements (OP5)
 - Signed MOU
 - Meaningful Involvement of Women
 - Sanitation and Hygiene Promotion
 - Community Contributions
 - Settlement of Land Ownership Conflict
 - O&M Plan
- Donor coordination
 - Information exchange
 - PR / promotion
- Community participation for sustainability
 - Sustainable O&M by handpump users (WSC, water fee collection, community contribution, etc.)
 - Understanding importance of WSC and roles of handpump users
 - Management / organizational capacity (book keeping, record keeping, etc.)
 - Spare parts supply chain
 - Participation in site selection, construction, monitoring, etc.
 - Community ownership through meaningful involvement of handpump users
 - willingness / motivation to keep handpumps working
- Integrated approach toward water including sanitation and hygiene
 - understanding importance of safe water
 - understanding the value of handpump as a source of safe water
- Awareness/Support toward the socially vulnerable: Women, Children, Minorities, AIDS victims, the extremely poor
- Back-up support system by local government for community management of handpumps (Role of gov't for sustainable O&M)
- Incorporation of existing social cohesion and strength of the communities
- Learning and incorporating locally existing skills, knowledge, experiences, etc.
 - learning lessons from water supply projects in Uganda
 - hiring of local NGO, consultants,

Table 2.2.1 Selection of Villages for Borehole Construction

No.	Village	County	Subcounty	Elev.	Pop.	Natural Cond.	Socio-economic Cond.	Excl. Village
Masaka District								
Ma 1	Bukango B	Bukomansimbi	Bigasa	1,239	600	A	A	
Ma 2	Kasambya	Bukomansimbi	Kitanda	1,250	700	A	A	
Ma 3	Kigangazzi P/S	Bukomansimbi	Bigasa	1,239	560	A	A	
Ma 4	Kyawamala	Bukomansimbi	Bigasa	1,245	900	A	A	
Ma 5	Mijunwa	Bukomansimbi	Bigasa	1,208	1,060	B	A	
Ma 6	Mbirizi P/S	Bukomansimbi	Bigasa	1,299	455	B	B	
Ma 7	Kisala	Bukomansimbi	Bigasa	1,300	380	C	A	x
Ma 8	Kigaba	Bukomansimbi	Butenga	1,206	400	B	A	
Ma 9	Kyankole A	Bukomansimbi	Butenga	1,276	450	B	A	
Ma 10	Kagando	Bukomansimbi	Butenga	1,280	710	B	A	
Ma 11	Kamanda	Bukomansimbi	Kibinge	1,225	640	C	A	x
Ma 12	Katoma	Bukomansimbi	Kibinge	1,217	440	C	A	x
Ma 13	Kassebwavu P/S	Bukomansimbi	Kibinge	1,247	1,000	C	B	x
Ma 14	Kagogo H/C	Bukomansimbi	Kibinge	1,248	1,025	B	A	
Ma 15	Buwembo	Bukomansimbi	Kitanda	1,280	490	A	A	
Ma 16	Kyankonko	Bukomansimbi	Kitanda	1,272	590	A	A	
Ma 17	Lukaawa P/S	Bukomansimbi	Kitanda	1,316	520	B	B	
Ma 18	Kirinda	Bukomansimbi	Kitanda	1,237	750	A	A	
Ma 19	Kyakajwiga P/S	Bukomansimbi	Kitanda	1,209	640	B	A	
Ma 20	Miteteero	Bukomansimbi	Kitanda	1,258	480	A	A	
Ma 21	Kaligondo T/C	Bukoto East	Buwunga	1,308	780	C	A	x
Ma 22	Kitwa	Bukoto East	Buwunga	1,291	600	B	B	
Ma 23	Bbuuliro P/S	Bukoto East	Kyanamukaka	1,134	627	B	A	
Ma 24	Kyesiga P/S	Bukoto East	Kyanamukaka	1,228	888	B	A	
Ma 25	Katwe T/C	Bukoto East	Kyanamukaka	1,250	380	A	A	
Ma 26	Nsangamo	Bukoto East	Mukungwe	1,287	1,485	B	B	
Ma 27	Kyetume	Bukoto West	Kisekka	1,281	535	B	B	
Ma 28	Kyamakata	Bukoto West	Kisekka	1,248	620	B	A	
Ma 29	Kibaale	Bukoto West	Kisekka	1,246	728	A	A	
Ma 30	Bunyere	Bukoto West	Kisekka	1,270	780	A	A	
Ma 31	Kalegero	Bukoto West	Kisekka	1,305	620	C	A	x
Ma 32	Mpembwe	Bukoto West	Kkingo	1,270	400	B	A	
Ma 33	Bigando	Bukoto West	Kkingo	1,313	400	B	A	
Ma 34	Ngondati	Bukoto West	Kkingo	1,258	775	B	B	
Ma 35	Busibo B	Bukoto West	Kyazanga	1,313	455	B	A	
Ma 36	Lyakibilizi	Bukoto West	Kyazanga	1,342	720	A	A	
Ma 37	Lubaale	Bukoto West	kyazanga	1,269	520	B	A	
Ma 38	Kyampisi	Bukoto West	Lwengo	1,318	340	C	A	x
Ma 39	Kyetume	Bukoto West	Lwengo	1,288	535	B	B	
Ma 40	Kiryankuyege	Bukoto West	Lwengo	1,316	390	C	A	x
Ma 41	Lutoma	Bukoto West	Lwengo	1,308	600	C	A	x
Ma 42	Gwanika	Bukoto West	Lwengo	1,290	400	B	B	
Ma 43	Kakolongo	Bukoto West	Malongo	1,307	2,400	B	A	
Ma 44	Lwemiyaga	Bukoto West	Malongo	1,422	850	C	A	x
Ma 45	Kyannangazi	Bukoto West	Ndagwe	1,312	905	B	C	x
Ma 46	Kabambira	Bukoto West	Ndagwe	1,303	120	B	A	
Ma 47	Kabimba	Bukoto West	Ndagwe	1,284	400	A	A	
Ma 48	Bukulula	Bukoto West	Ndagwe	1,278	700	B	A	
Ma 49	Kisalila	Bukoto West	Ndagwe	1,291	754	B	C	x
Ma 50	Kyantale	Bukoto West	Ndagwe	1,272	275	A	A	

Table 2.2.1 Selection of Villages for Borehole Construction

No.	Village	County	Subcounty	Elev.	Pop.	Natural Cond.	Socio-economic Cond.	Excl. Village
Ma 51	Kijwala	Bukoto West	Ndagwe	1,248	400	B	A	
Ma 52	Kitokolo	Kalungu	Bukulula	1,270	490	C	A	x
Ma 53	Kisalamatu	Kalungu	Bukulula	1,246	220	B	A	
Ma 54	Bulingo P/S	Kalungu	Bukulula	1,166	1,000	B	A	
Ma 55	Kalangala P/S	Kalungu	Bukulula	1,165	500	B	A	
Ma 56	Kireterwa	Kalungu	Kalungu	1,262	400	C	A	x
Ma 57	Kagasa	Kalungu	Kalungu	1,296	768	B	B	
Ma 58	Kabungo A	Kalungu	Kalungu	1,290	250	A	B	
Ma 59	Kyamulibwa P/S	Kalungu	Kyamulibwa	1,253	1,300	B	A	
Ma 60	Kamuwunga P/S	Kalungu	Lukaya T/C	1,148	1,120	A	A	
Ma 61	Kityaba	Kalungu	Lwabenge	1,206	560	A	A	
Ma 62	Sserinya	Kalungu	Lwabenge	1,202	340	B	A	
Ma 63	Kiteredde	Kalungu	Lwabenge	1,190	355	A	A	
Mukono District								
Mu 1	Kikoma P/S	Buikwe	Buikwe	1,279	1,500	B	A	
Mu 2	Nakikunyu	Buikwe	Buikwe	1,322	1,200	B	A	
Mu 3	Kasokoso P/S	Buikwe	Kawolo	1,191	490	A	B	
Mu 4	Lugala Kituuti	Buikwe	Kawolo	1,209	698	C	B	x
Mu 5	Lukalu	Buikwe	Najja	1,344	250	C	A	x
Mu 6	Makindu H/C	Buikwe	Najja	1,220	600	A	B	
Mu 7	Buvunya	Buikwe	Najjembe	1,521	920	B	A	
Mu 8	Kikube P/S	Buikwe	Najjembe	1,489	1,250	A	A	
Mu 9	Baskerville	Buikwe	Ngogwe	1,214	150	A	A	
Mu 10	Bubiro P/S	Buikwe	Ngogwe	1,333	338	C	B	x
Mu 11	Bukamunye	Buikwe	Nyenga	1,169	1,692	B	A	
Mu 12	Kikondo	Buikwe	Nyenga	1,183	850	B	A	
Mu 13	Tongolo I P/S	Buikwe	Nyenga	1,170	700	B	A	
Mu 14	Gaba	Buikwe	Ssi	1,324	200	C	A	x
Mu 15	Kisigula Center	Buikwe	Ssi	1,322	110	C	A	x
Mu 16	Malindi-B	Buikwe	Wakisi	1,150	1,300	A	A	
Mu 17	Owino Wakikoola A	Buikwe	Wakisi	1,152	700	B	A	
Mu 18	Wakisi Market S/C Htrs	Buikwe	Wakisi	1,159	2,400	B	A	
Mu 19	Kasokoso	Mukono	Goma	1,174	210	B	A	
Mu 20	Nakagere	Mukono	Goma	1,163	373	C	A	x
Mu 21	Mbalala Lower side	Mukono	Nama	1,125	700	B	A	
Mu 22	Ajjiija	Buikwe	Buikwe	1,255	2,000	C	A	x
Mu 23	Kitayunnja-B	Nakifuma	Ntunda	1,085	1,200	B	A	
Mu 24	Kasozi (B)	Mukono	Kyampisi	1,173	1,700	A	A	
Mu 25	Kibuye/Kiyunga	Mukono	Kyampisi	1,202	400	B	A	
Mu 26	Katente B	Mukono	Nakisunga	1,219	700	A	A	
Mu 27	Kirondo	Mukono	Nakisunga	1,217	390	B	A	
Mu 28	Ntakafunvu	Mukono	Nakisunga	1,210	280	B	A	
Mu 29	Namawojolo Sch. Side	Mukono	Nama	1,163	820	B	B	
Mu 30	Kisoga	Mukono	Ntenjeru-Kojja	1,202	1,200	A	A	
Mu 31	Mpunge	Mukono	Ntenjeru-Kojja	1,145	2,205	A	A	
Mu 32	Nsanja	Mukono	Ntenjeru-Kojja	1,220	720	C	A	x
Mu 33	Kakira	Nakifuma	Kasawo	1,105	1,400	A	A	
Mu 34	Kigayaza P/S	Nakifuma	Kasawo	1,129	1,000	A	A	
Mu 35	Mubanda P/S	Nakifuma	Kasawo	1,107	1,500	C	A	x
Mu 36	Kawongo	Nakifuma	Kimenyedde	1,138	1,500	B	B	
Mu 37	Kawuku	Nakifuma	Kimenyedde	1,137	2,000	C	A	x
Mu 38	Bamusuuta B	Nakifuma	Nabbaale	1,143	810	B	A	

Table 2.2.1 Selection of Villages for Borehole Construction

No.	Village	County	Subcounty	Elev.	Pop.	Natural Cond.	Socio-economic Cond.	Excl. Village
Mu 39	Makukuba	Nakifuma	Nabbaale	1,120	2,000	C	A	x
Mu 40	Nakiwate	Nakifuma	Nabbaale	1,162	1,193	C	A	x
Mu 41	Galabi	Nakifuma	Nagojje	1,155	620	A	A	
Mu 42	Mayangayanga	Nakifuma	Nagojje	1,172	400	B	A	
Mu 43	Ntonto	Nakifuma	Ntunda	1,106	590	B	A	
Mu 44	Katuuso	Nakifuma	Seeta-Namuganga	1,099	470	C	B	x
Mu 45	Namuganga S.S.S.	Nakifuma	Seeta-Namuganga	1,102	450	B	A	
Mu 46	Ntonto	Nakifuma	Seeta-Namuganga	1,054	400	B	A	
Kayunga District								
Ky 1	Gayaza	Bbaale	Bbaale	1,079	647	A	A	
Ky 2	Namirembe	Bbaale	Bbaale	1,072	656	B	B	
Ky 3	Gweero	Bbaale	Galiraya	1,086	556	A	A	
Ky 4	Kiryala	Bbaale	Galiraya	1,062	421	A	A	
Ky 5	Namalere	Bbaale	Galiraya	1,058	790	B	A	
Ky 6	Kiwenda	Bbaale	Galiraya	1,067	625	C	A	x
Ky 7	Nkutu	Bbaale	Galiraya	1,090	408	B	A	
Ky 8	Kaato	Bbaale	Kayonza	1,080	713	B	A	
Ky 9	Makukulu	Bbaale	Kayonza	1,083	598	A	A	
Ky 10	Nawansama	Bbaale	Kayonza	1,077	507	C	A	x
Ky 11	Bulawula-A	Bbaale	Wabwoko	1,099	539	B	A	
Ky 12	Bulawula-B	Bbaale	Wabwoko	1,106	488	B	A	
Ky 13	Kitatya C	Bbaale	Wabwoko	1,095	1,017	A	A	
Ky 14	Kitimbwa	Bbaale	Wabwoko	1,090	936	B	A	
Ky 15	Kyetume	Bbaale	Wabwoko	1,100	1,993	B	A	
Ky 16	Mansa (B)	Bbaale	Wabwoko	1,103	964	B	B	
Ky 17	Nakivubo-A	Bbaale	Wabwoko	1,077	862	B	A	
Ky 18	Namabuga	Bbaale	Wabwoko	1,083	618	B	A	
Ky 19	Namulaba	Bbaale	Wabwoko	1,103	1,050	C	A	x
Ky 20	Wabwoko	Bbaale	Wabwoko	1,079	974	B	A	
Ky 21	Bugadu-B	Ntenjeru	Busaana	1,123	1,608	B	A	
Ky 22	Kayonjo	Ntenjeru	Busaana	1,108	1,244	B	A	
Ky 23	Kitala	Ntenjeru	Busaana	1,101	749	B	B	
Ky 24	Namusala	Ntenjeru	Busaana	1,114	1,027	B	A	
Ky 25	Kitabazi	Ntenjeru	Kangulumira	1,080	597	A	B	
Ky 26	Kisaba-Moyonga	Ntenjeru	Kayunga T.C.	1,082	700	B	A	
Ky 27	Ndeeba	Ntenjeru	Kayunga T.C.	1,079	360	B	B	
Ky 28	Ntenjeru W	Ntenjeru	Kayunga T.C.	1,084	410	B	A	
Ky 29	Bunyumya	Ntenjeru	Kayunga	1,113	780	B	A	
Ky 30	Kaazi	Ntenjeru	Kayunga	1,098	1,120	B	A	
Ky 31	Katikamu	Ntenjeru	Kayunga	1,082	689	B	A	
Ky 32	Kisobmwa	Ntenjeru	Kayunga	1,103	482	B	A	
Ky 33	Kyanya	Ntenjeru	Kayunga	1,058	842	B	A	
Ky 34	Nakaseeta	Ntenjeru	Kayunga	1,110	1,033	A	A	
Ky 35	Nazigo	Ntenjeru	Nazigo	1,160	1,562	A	A	
Ky 36	Kirindi	Ntenjeru	Nazigo	1,078	800	B	A	
Ky 37	Kiteredde	Ntenjeru	Nazigo	1,086	700	A	A	
Ky 38	Kizika	Ntenjeru	Nazigo	1,154	1,277	B	A	
Ky 39	Nakatooke	Ntenjeru	Nazigo	1,084	1,000	A	A	
Ky 40	Namirembe	Ntenjeru	Nazigo	1,111	1,004	A	A	
Ky 41	Gombolola	Ntenjeru	Nazigo	1,121	442	B	A	