MINISTRY OF WATER AND ENVIRONMENT
REPUBLIC OF UGANDA

THE PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR PROVISION OF IMPROVED WATER SOURCE FOR RETURNED IDP IN ACHOLI SUB-REGION
IN
THE REPUBLIC OF UGANDA

OCTOBER 2012

JAPAN INTERNATIONAL COOPERATION AGENCY

TOKYO ENGINEERING CONSULTANTS CO., LTD.
OYO INTERNATIONAL CORPORATION

SUMMARY

1. Country Profile

The Republic of Uganda (hereinafter referred to as “Uganda”) is the inland country with the population of 32.7 million (in 2009) located in north of the African continent. The land area is measured to be only 197,000 km^2 out of the whole area of 241,000 km^2, because the water surface areas of lakes such as Lake Victoria accounts for much.

After the independence frequent civil wars led to economic turmoil until late 1980s, while after 1987 Uganda came to be one of the highest-growth countries in the Sub-Saharan African countries with its macro-economy stabled by promoting strong structural adjustments in the supports of World Bank and IMF (International Monetary Fund). Uganda recorded the average annual growth rate of 6% in 1990s and kept the rate of 5 - 7% in the recent years. The government of Uganda announced the National Development Plan (hereinafter referred to as “NDP”) on April 2010 aiming at economic growth and job creation, and put it into practice from fiscal year 2010/2011. The Uganda economy has been keeping its stability since 2008, regardless of increasing inflation ratio due to the rise in international foods and oil prices as well as the influence of international economic recession.

The sum of GNI (Gross National Income) of Uganda amounts to US$16.55 billion (in 2011, World Bank), and the GNI per capita US$500 (in 2011, World Bank). The GNI composition of industrial structure is; primary: 21.8%, secondary: 26.1% and tertiary: 52.1%. Major export items are coffee, tea, oil and oil products, fish and fish products, nonmetallic minerals, iron ore and cigarette, and major import items are oil and oil products, vehicle, telephone and recorder, iron and steel, and medicine.

2. Background, Progression and Outline of the Project

The northern Uganda where the Acholi Sub-region is located is considered as lesser area in development of various infrastructures due to the civil war having lasted over 20 years since 1980s.

The peoples who lived in these areas had to evacuate into the IDP (Internally Displaced Person) camps established at the districts capitals, etc. away from their villages and to stay in the camps long time under the assistances of the government and various donors.

After the war ended in 2007, the IDPs started to return to their villages from the camps, and most of the IDPs have returned so far to the villages where they lived in before the civil war.

During the civil war, various social infrastructures such as water supply facilities, etc. were constructed intensively in the IDP camps, while no infrastructure was provided for the villages where no villager lives, and the existing ones were left non-functional and abandoned. The poor situations and the shortage of the infrastructures necessary for IDPs' re-settlement are considered to be the serious constraints in the area.

The objective of Peace, Recovery and Development Plan (hereinafter referred to as "PRDP") was prepared for the mitigation of regional disparities of the northern area including the Acholi

Sub-region of which poverty ratio is higher comparing with other areas in Uganda. The PRDP presents a particular support program of improvement of water supply facilities for the return and settlement of IDPs. This program intends to increase the rural water supply coverage to 77 % by 2015. However, it is not easy because the budget allocated by the government is not sufficient, and the amount of aids is being decreased as IDPs return.

Under such a situation, in 2010, the government of Uganda requested to the government of Japan for the grant for construction of the water supply facilities for improving the water supply situation in rural areas where IDPs returned.

3. Summary of the Survey Results and Contents of the Project

(1) Preparatory Survey

Based on the documents dated July 2011, Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the survey team to Uganda from August 11 to September 12 and from October 8 to December 17, 2011. The team conducted a study of appropriate project components, outline design and project cost estimation based on the site survey results and the analysis in Japan. In September 2012, JICA dispatched the team to Uganda for explanation of the draft outline design. The team explained and discussed the draft final report of the outline design with the organizations concerned, specifically, the Government of the Directorate of Water Development, the Ministry of Water and Environment, Republic of Uganda. As a result, the outline design of the project was agreed upon by the above organizations of Uganda. This final report was prepared based on the survey, analysis and discussions mentioned above.

(2) Overall Plan and Project Objectives

As stated in the proceeding section, the NDP and PRDP take the improvement of water supply facilities as one of the most important issues aiming at increasing the water supply coverage in rural areas up to 77% by 2015.

Overall goal of the project is to improve the living environment by supplying safety water in order to promote the settlement of IDPs in the seven (7) districts of Acholi Sub-region; Amur, Nwoya, Gulu, Lamwo, Kitgum, Pader and Agago districts. The project will contribute to the achievement of the goal of NDP and PRDP, too.

(3) Basic Policy

For the construction of boreholes with hand pump, about 100 target villages are to be selected from 280 requested villages based on population, water supply coverage, social conditions such as status of community activities and hydrogeological conditions. The number of boreholes allocated in each district is to be determined according to the population.

For the construction of piped water supply facilities, it is a basic policy to select up to eight (8) RGCs in order of priority by surveying and reviewing on population, water supply coverage, status of community activities, operation status of water sources, access conditions, availability of commercial electricity supply services, number of existing boreholes and potential yield of groundwater. The RGCs are selected allocating them with one (1) RGC for one (1) district

(4) Overall Plan

1) Facility Plan

i) Target Villages and RGCs

Based on the basic policy mentioned above, 116 target villages for the construction of boreholes with hand pump and six (6) target RGCs for the construction of piped water supply facilities were selected.

Since no suitable RGC were selected in in Amur and Lamwo districts, eight (8) target villages were added instead for the construction of boreholes with hand pump in each district. As a result, the number of target villages for the construction of boreholes with hand pump comes to 116 villages.

The number of villages and RCGs selected for the districts is summarized in the following table.

Number of Selected Villages by District

Districts	Rural Population (2011)	Share of Population in Sub-region (%)	Requested Villages	Number of Villages allocate by Population	Addition to 2 Districts	Total Allocation (Target Villages)
1. Gulu	229,227	18.4	70	16	0	16
2. Amuru	173,712	13.9	35	14	8	22
3. Nwoya	52,489	4.2	35	9	0	9
4. Kitgum	177,135	14.2	37	15	0	15
5. Lamwo	163,180	13.1	39	14	8	22
6. Pader	190,214	15.2	39	15	0	15
7. Agago	261,915	21.0	39	17	0	17
Total	1,247,872	100.0	294	100	16	116

Selected RGC and Population Served

Districts	RGC	Design Population Served	Water Demand (m3/day)	Number of Source Wells
Nwoya	Koch Goma	2,100	42	2
Gulu	Unyama	3,600	72	2
	Awere	1,700	34	2
Kitgum	Kitgum Matidi	2,800	56	2
Pader	Corner Kilak	2,000	40	3
Agago	Adilang	3,800	76	4
Total		16,000	-	15

ii) Target Year and Population Served

The target year of the project is set at 2017 three (3) years after the completion of the project. The population served and water supply coverage after project implementation is shown in the following table. The population served by one (1) deep borehole with hand pump is set at 300 considering the Ugandan standard.

District-wise Population Served after Project Implementation

District	2011 (Present)			Target Villages for Boreholes with Hand Pump;	Population Served by New Boreholes with Hand Pump	Population Served Increased by Piped Water Supply Facilities	Increase of Population Served after Project Implementation	Served Population Increased after Project Implementation	Future Coverage after Project Implementation
	Served Population	Rural Population	Coverage of Rural Water Supply (%)						
Amuru	83,373	173,712	48.0	22	6,600	0	6,600	89,973	51.8
Nwoya	37,571	52,489	71.6	9	2,700	900	3,600	41,171	78.4
Gulu	157,783	229,227	68.8	16	4,800	3,500	8,300	166,083	72.5
Lamwo	108,915	163,180	66.7	22	6,600	0	6,600	115,515	70.8
Kitgum	115,586	177,135	65.3	15	4,500	2,550	7,050	122,636	69.2
Pader	94,436	190,214	49.6	15	4,500	1,100	5,600	100,036	52.6
Agago	137,604	261,915	52.5	17	5,100	1,400	6,500	144,104	55.0
TOTAL Acholi area	735,268	1,247,872	58.9	116	34,800	9,450	44,250	779,518	62.5

iii) Facility Outline

a. Borehole with Hand Pump

Item	Contents	
1. Number of Borehole with Hand Pump	・ 116 locations	
2. Borehole Structure	・ Average drilling depth:	73.75m
	・ Casing:	5” PVC pipes x 18 pcs x 2.85m
	・ Screen:	5” PVC pipes with 4% openings x 8 pcs x 2.85m
3. Hand Pump	・ Quantity:	116 sets
	・ Specification:	U-2 Type, PVC riser pipes, stainless steel rod
	・ Installation Level:	35.9m deep, uPVC riser pipes of 12pcs(=36m)
4. Superstructure of Well	・ Apron:	Concrete circular-shape type of 1.8m in dia.
	・ Drainage:	Soak pit (W1.0m x L1.0m x D1.5m), Discharge channel of 6.0m long
5. Success rate of Drilling	・ 70%	

b. Piped Water Supply Facilities

Item	Contents	
1. Number of Facilities	・ 6 places	
2. Design Standard	・ Design Standard of Uganda (Water Supply Design Manual)	
3. Source Well	・ Existing boreholes and test boreholes	
	・ Well pump type:	submersible motor pump
	・ Riser pipes:	stainless steel pipe of 50mm in diameter
4. Power Source	・ Solar power generation type	
	・ Design water supply duration:	12 hrs. (7:00 to 19:00)
	・ Expected generation time:	6 hrs. in daytime
	・ Pump motor type:	DC driven motor without inverter
	・ Antitheft facility of solar panels:	Security fence, guard house
5. Elevated Tank	・ Type:	Steel circular tank
	・ Structure:	Steel truss structure
	・ Incidental facilities:	Level meter, drain pipe, overflow pipe, flow meter, discharge channel, lightening fixture
6. Public Tap	・ Type:	2 taps (13L/tap)
	・ Incidental facilities:	Flow meter, septic tank
7. Pipeline	・ Transmission pipeline:	HDPE pipes (50mm in nominal dia.)
	・ Distribution pipeline/Service Pipes:	HDPE pipes (30-100mm in nominal dia.)

Note) Disinfection facility is not installed because it is instructed to the users that disinfection such as adding chlorine powder into the facilities should be done simultaneously with periodical washing of the facilities.

2) Procurement Plan

The procurement of a truck-mounted service rig and toolkits for hand-pump repair are planned, and the features of the equipment and the toolkits to be procured and their users are shown below.

Equipment	Contents	Allocation
1. Truck-mounted service rig	・ Service Rig, 3 tons of hydraulic crane and manual operated winch on truck chassis: 1 set ・ Winch, 2tons manual: 1 set ・ Double tube pipes for well development with engine compressor: 1 set a. Inner tube: 1.0 inch x length, 2.75m: 141m b. Outer tube: 2.5 inch x length, 2.75m: 141m ・ AC Engine welder with accessory kit: 1 set ・ Training of Request Service Rig: 1 set	Rural Water Supply and Sanitation Department, Directorate Water Development, Ministry of Water and Environment
2. Tool kit for hand-pump repair	・ Tools (22pcs): 72 sets ・ Fishing tool (3pcs): 72 sets	72 Sub-Countries of 7 Districts in Acholi Sub-region

3) Technical Assistance Plan

The technical assistance is to be implemented for villagers of target 116 villages and six (6) RGSs of the project in order to facilitate the capacity building for the sustainable operation and maintenance of the facilities. The supplemental training of the HPMs (Hand Pump Mechanics) in the target areas is also performed focusing on the handling of the PVC riser pipes to be introduced in the project.

4. Implementation Schedule and Project Cost

It is estimated to take about 10 months for detailed design and the tender process, and about 14 months for the construction work. The project cost is estimated in JPY 974 million (JPY 972 million borne by Japanese side, JPY 1.7 million borne by Uganda side).

5. Project Evaluation

The feasibility and effectiveness of the project are recognized to be high as shown below.

(1) Relevance

Most IDPs already returned after completion of the civil war continued over 20 years, while deteriorated conditions of the current infrastructure are obstacles against the settlement of IDPs because almost no maintenance works have been carried out on them.

The poverty ratio of the northern district is estimated at 46% (in 2010), which is significantly lower than that of the average of the whole Uganda of 24%. For this reason, the government of Uganda has commenced the reconstruction development aiming the improvement of water supply coverage up to 77% by the year of 2015 in the water supply sector.

The purpose of the project is to contribute to improve the IDPs' living environment by the construction of the water supply facilities indispensable to IDPs' settlement and thereby raising the water supply coverage. This purpose coincides with that of the reconstruction development in the northern area.

With water supply facilities in particular, the project is required to be implemented as early as possible because of no alternative safe water source. Additionally, the project will be able to contribute to the achievement of NDP.

On the other hand, since many assistance projects were and have been implemented under the Japanese contribution for reconstruction in the northern areas of Uganda, this project is also considered as the one for improving the water supply condition thereof.

(2) Effectiveness

1) Quantitative Effects

When 116 deep boreholes with hand pump and six (6) piped water supply facilities are constructed under the project, the served population and water supply coverage of seven (7) districts of Acholi Sub-region; Amur, Nwoya, Gulu, Lamwo, Kitgum, Pader and Agago districts, increased as shown in the following table.

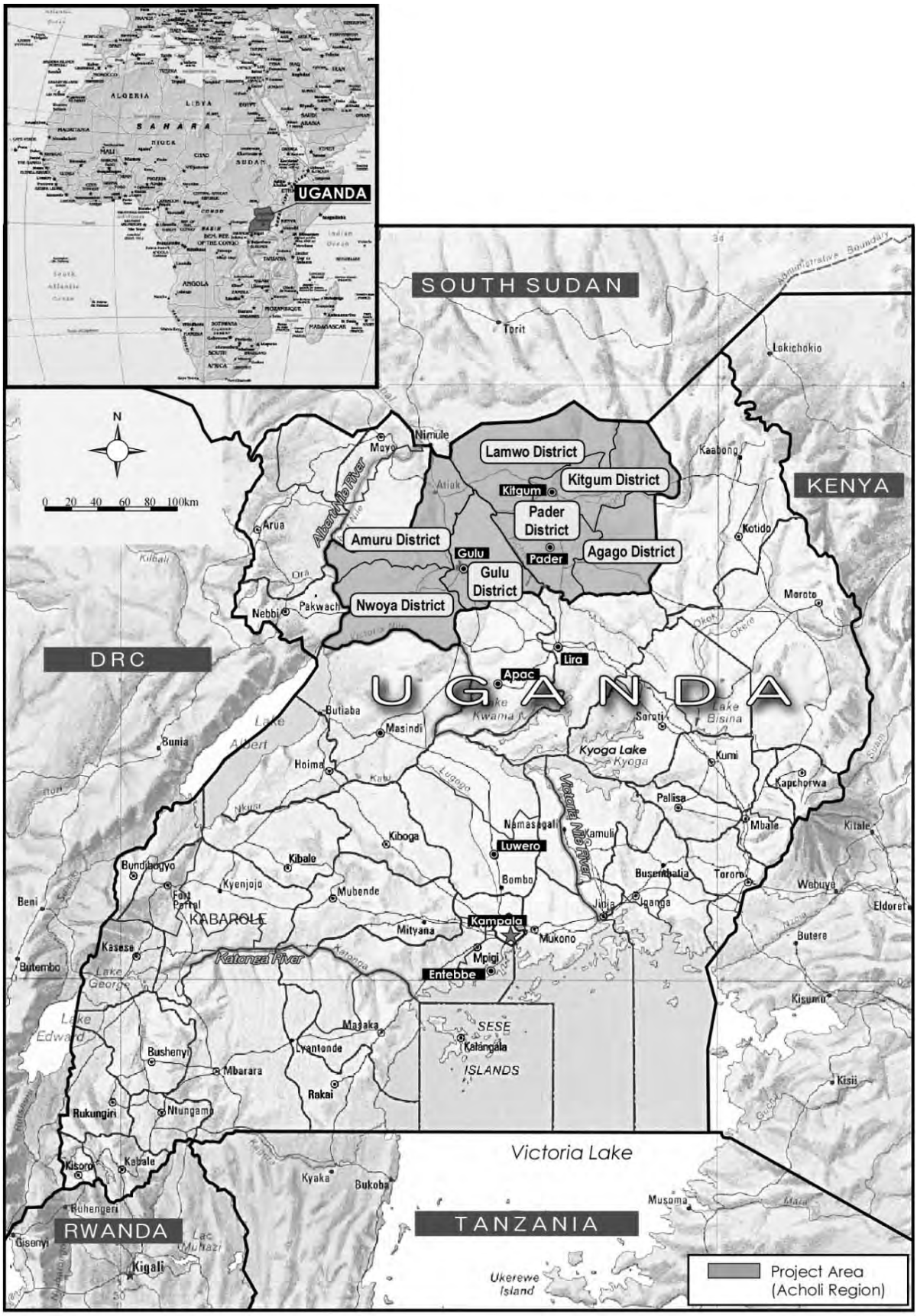
Effective Index of the Project

Effective Index	Base Year (2011)	Target Year (2017) 3 years after completion
Served population	735,268	779,518
Water Supply Coverage	58.9%	62.5%

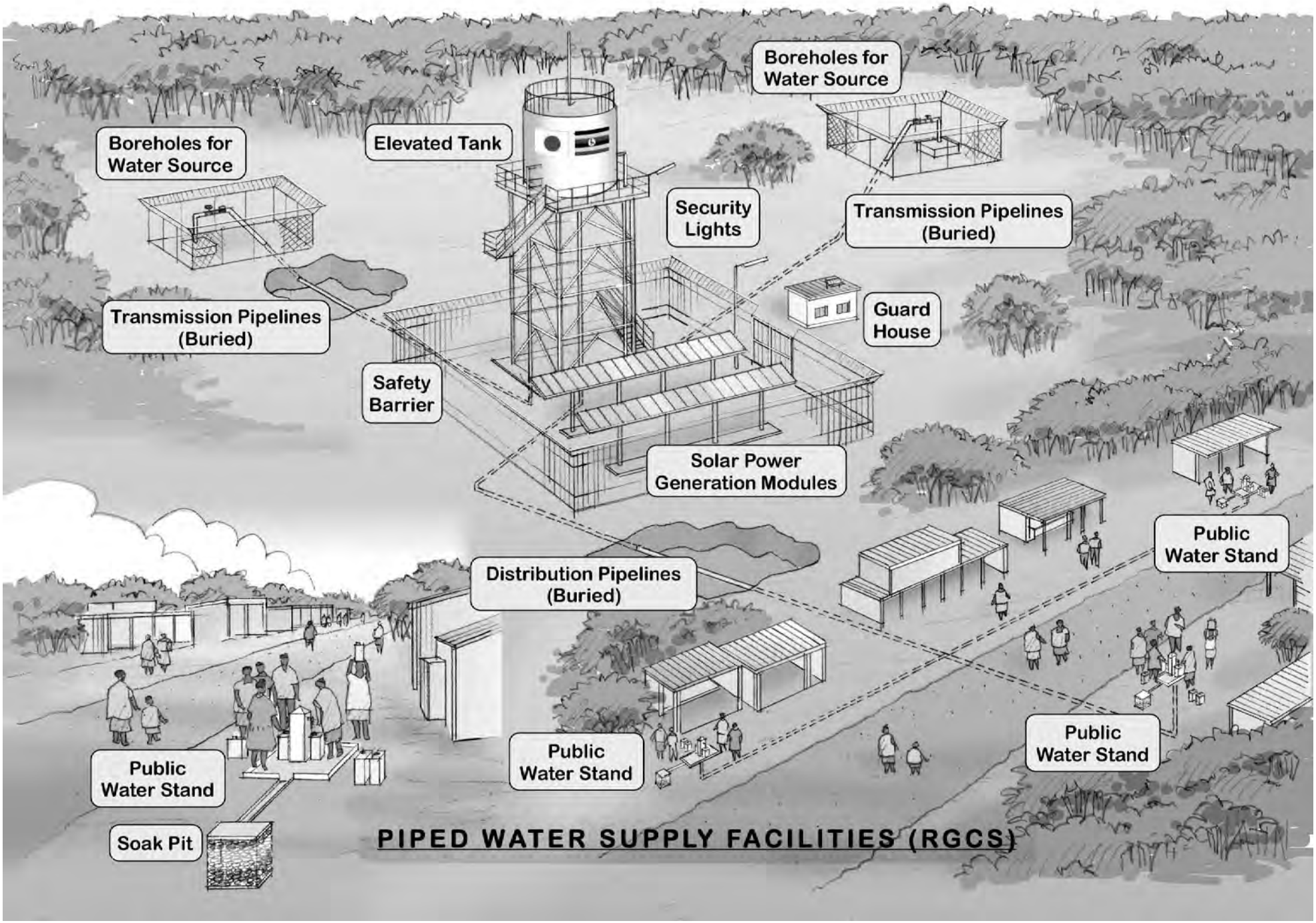
2) Qualitative Effects

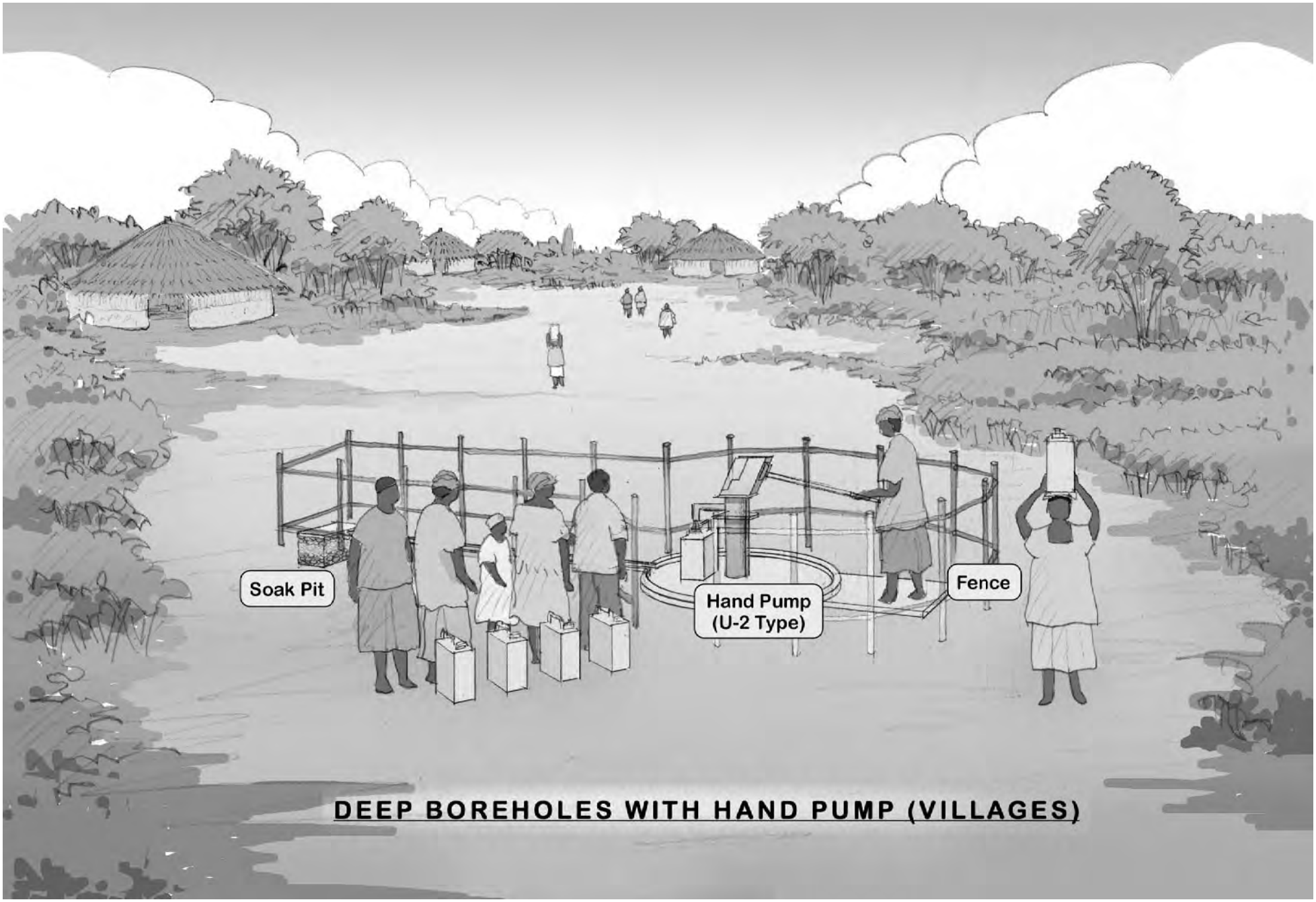
The qualitative effects of the project are listed below.

i) To reduce the morbidity risk of water associated disease
ii) To reduce the time and labor load for women and children to deliver water
iii) To improve the abilities of HPMs to repair hand pumps



LOCATION MAP


Boreholes for Water Source
Boreholes for Water Source
Elevated Tank
Security Lights
Transmission Pipelines (Buried)
Transmission Pipelines (Buried)
Guard House
Safety Barrier
Solar Power Generation Modules
Public Water Stand
Distribution Pipelines (Buried)
Public Water Stand
Public Water Stand
Public Water Stand
Soak Pit
PIPED WATER SUPPLY FACILITIES (RGCS)



DEEP BOREHOLES WITH HAND PUMP (VILLAGES)

PHOTOGRAPHS

Abandoned pump house for piped water supply system. Domestic animals are fed in the house. (Corner Kilak RGC)

Existing borehole with hand pump - handle operation is rather hard for children due to low water level. (Kochi Goma RGC)

Many villagers gather at the borehole and make long line for fetching water. (Unyama RGC)

Existing piped water supply system operated with solar power generation utilizing a borehole facility for hand pump. (Kitgum Matidi RGC)

A regular bus is stacked in the muddy road obstracting road traffic. (Near Patongo)

Existing ecosan toileit - Solid and liquid wastes are collected separately. (Agago RGC)

Broken engine and pump for the existing piped water supply system. A pump operator stays in the pump house. (Awere RGC)

The workshop held in Gulu for explaining the results of the 1st field survey. CAOs and water officers of the district local governments attended.

Geophysical survey (Bibia village in Amuru district)

Topographic survey (Corner Kilak RGC

Team member in charge of operation and maintenance plan. (Kitgum Matidi RGC)

Rapid water quality test - Temperature 26.0°C, pH 6.33, EC 21.8mS/m, F 0mg/L, HNO_3 0mg/L, HNO_2 0.02mg/L, Fe 0.3mg/L - suitable for drinking. (Unyama RGC)

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RETURNED IDP IN ACHOLI SUB-REGION

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Abbreviations

A/P:	Authorization to Pay
ASTM:	American Society for Testing and Materials
B/A:	Banking Arrangement
BS:	British Standards
CAO:	Chief Administrative Officer
CDA:	Community Development Assistant
CDO:	Community Development Officer
DIN:	Deutsche Industrie Normen
DRA:	Demand Responsive Approach
DWD:	Directorate of Water Development
DWO:	District Water Office
DWRM:	Directorate of Water Resource Management
E/N:	Exchange of Note
G/A:	Grant Agreement
GNI:	Gross National Income
GPS:	Global Positioning System
HA:	Health Assistant
HDPE:	High Density Polyethylene
HO:	Health Officer
H/O:	Hand-Out
HPM:	Hand Pump Mechanic
HPMA:	Hand Pump Mechanic Association
IDP:	Internally Displaced Person
IMF:	International Money Fund
ISO:	International Organization for Standardization
JICA:	Japan International Cooperation Agency
JPY:	Japanese Yen
MOU:	Memorandum of Understanding
MOWE:	Ministry of Water and Environment
NDP:	National Development Plan
NF:	Norme Française (French Standard)
NGO:	Non-Governmental Organization
OD:	Outside Diameter
OECD-DAC:	Organization for Economic Cooperation and Development, Development Assistance Committee
OPM:	Office of Prime Minister
PRDP:	Peace, Recovery and Development Plan
PVC:	Polyvinyl Chloride
RGC:	Rural Growth Centre

TOT:	Training of Trainers
TSU:	Technical Support Unit
TWC:	Tap Water Committee
UGX:	Ugandan Shillings
UNHCR:	United Nations High Commissioner for Refugees
UNICEF:	United Nations Children's Fund
USAID:	United States Agency for International Development
USD:	United States Dollar

CHAPTER 1 BACKGROUND OF THE PROJECT

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The northern Uganda where the Acholi Sub-region is located is considered as lesser area in development of various infrastructures due to the civil war having lasted over 20 years since 1980s. The peoples who lived in these areas had to evacuate into the camps established at the districts capitals, etc. away from their villages (those evacuated peoples are referred to as the Internally Displaced Person: IDP), and to stay in the camps long time under the assistances of the government and various donors. After the war ended in 2007, the IDPs started to return to their villages from the camps, and most of the IDPs have returned so far to the villages where they lived in before the civil war.

During the civil war, various social infrastructures such as water supply facilities, etc. were constructed intensively in the IDP camps, while no infrastructure was provided for the villages where no villager lives, and the existing ones were left non-functional and abandoned. The poor situations and the shortage of the infrastructures necessary for IDPs' re-settlement are considered to be the most serious constraint in the area.

In this context, the provision of water supply facilities is considered as the sector program for the assistance to facilitate "the return and settlement of IDPs" in Peace, Recovery and Development Plan (hereinafter referred to as "PRDP"). The objective of PRDP was prepared for the mitigation of regional disparities of the northern area including the Acholi Sub-region of which poverty ratio is higher comparing with other areas in Uganda.

On the other hand, National Development Plan, 2010/11 - 2014/15 (hereinafter referred to as "NDP") sets the target to increase the present national average of the rural water supply coverage of 64 % (2010) to 77 % by 2015. The Strategic Sector Investment Plan for Water and Sanitation Sector, 2009 also aim to increase the rural water supply coverage to 77 % by 2015 and to 100 % by 2035.

Under such situation, in 2010, the Government of Uganda requested to the Government of Japan for the grant of construction of the water supply facility aiming at improving the water supply situation in rural areas where IDPs returned.

In the original request submitted in 2010, i) the construction of 709 deep boreholes with hand pump and 13 piped water supply facilities, ii) the technical assistance to the district water offices and communities, and iii) the procurement of vehicles, tool sets for repairing hand pumps, computers, GPSs, etc. for district water offices, in order to provide the improved water supply facilities in the Asholi Sub-region consisting of seven (7) districts such as the Pader, Amuru, Nwoya, Gulu, Kitgum, Lamwo and Agago districts. As a result of the review by the Government of Uganda, the contents of the request of July 2011 were substantially revised as shown below.

[Revised Request]

i) Construction of deep boreholes with hand pump (280 nos.) and piped water supply facilities (16 nos.)

ii) Computers, GPSs, Vehicles, Motor Bikes for district water offices
iii) Technical assistance for district water offices and village communities

CHAPTER 2 CONTENTS OF THE PROJECT

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2.1 Basic Concept of the Project

2.1.1 Objectives of the Project

This project aims to increase the population served and to improve the coverage of safe water supply in the seven (7) districts of the Acholi Sub-region as shown in Table 2.1.1 in order to enable the IDPs to stay in their provincial villages and to ensure the safe water access for improving their living standard, expecting the following effects.

i) Water supply facilities are improved for ensuring safe water access in the target villages.
ii) Peoples in the target villages are trained on the operation and maintenance of their water supply facilities for improving functionality of water supply facilities.
iii) Health conditions of the target villages are improved.

Table 2.1.1 Population Served and Coverage of Target Seven (7) Districts

District	Rural Population (2011)	Served Population	Coverage (%)	Population Increase by Project	Pop. Served after Project Implementation	Coverage after Project Implementation (%)
Amuru	173,712	83,373	48.0	6,600	89,973	51.8
Nwoya	52,489	37,571	71.6	3,600	41,171	78.4
Gulu	229,227	157,783	68.8	8,300	166,083	72.5
Lamwo	163,180	108,915	66.7	6,600	115,515	70.8
Kitgum	177,135	115,586	65.3	7,050	122,636	69.2
Pader	190,214	94,436	49.6	5,600	100,036	52.6
Agago	261,915	137,604	52.5	6,500	144,104	55.0
Total	1,247,872	735,268	58.9	44,250	779,518	62.5

2.1.2 General Feature of the Project

In the original request submitted in 2010, i) the construction of 709 deep boreholes with hand pump and 13 piped water supply facilities, ii) the technical assistance to the district water offices and communities, and iii) the procurement of vehicles, tool sets for repairing hand pumps, computers, GPSs, etc. for district water offices, in order to provide the improved water supply facilities in the Asholi Sub-region consisting of seven districts such as the Pader, Amuru, Nwoya, Gulu, Kitgum, Lamwo and Agago districts. As a result of the review by the Government of Uganda, the contents of the request of July 2011 were substantially changed.

Based on the reviewed request, the contents of the request has been updated through the field surveys as shown in Table 2.1.2 reaching the final outline design presented in the rightest column of the table.

Table 2.1.2 Contents of Outline Design

Description	Reviewed Request	First Field Survey (Minutes of Discussions Signed on Aug. 23, 2011)	Second Field Survey (Minutes of Discussions Signed on Oct. 19, 2011)	Outline Design
Facility Construction	- Deep Boreholes: 280 nos. - Piped Water Supply Facilities: 16 nos.	- Deep Boreholes: 100 nos. (100 target villages and 30 alternative villages were selected from 294 villages including 14 villages	- Deep Boreholes: 116 nos. (Alternative Village:: 36 nos.) (116 target villages and 36 alternative villages were selected	- ditto -

Table 2.1.2 Contents of Outline Design

Description	Reviewed Request	First Field Survey (Minutes of Discussions Signed on Aug. 23, 2011)	Second Field Survey (Minutes of Discussions Signed on Oct. 19, 2011)	Outline Design
		transferred from the project for peace keeping.) - Piped Water Supply Facilities: 8 nos. (8 RGCs were selected from 16 requested RGCs.)	from 152 villages selected in the 1st Field Survey) - Piped Water Supply Facilities: 6 nos. (6 RGCs were selected in the First Field Survey)	
Procurement	- Computers, GPSs, Vehicles, Motor Bikes for district Water Offices	- Vehicles for the District Water Offices without any Vehicle for Monitoring - Hand Pump Repair Tools for HPMs: Number not yet determi - Truck Mounted Service Rig with Welding Machine, Air Compressor: 1 no.	- Vehicles for the Water Offices of Nwoya, Agago and Lamwo Districts:3 nos. - Vehicle for Social Science Section of Rural Water Supply Dept.: 1 no. - Hand Pump Repair Tools for HPMs:(2 sets for each sub-county office) - Truck Mounted Service Rig with Welding Machine, Air Compressor the Acholi Sub-region:1 no.	- Hand Pump Repair Tools for HPMs:(1 set for each sub-county office): 73 sets - Truck Mounted Service Rig with Welding Machine, and Air Compressor for the Acholi Sub-region: 1 no.
Technical Assistance	- Technical Assistance for District Water Offices and Village Communities	- Technical Assistance for District Water Offices and Village Communities	- Target Villages for Deep Borehore:152 nos. including 36 Alternative Villages - RGCs for Piped Water Supply Facilities: 6 nos.	- ditto -

The general features of the project are presented in Table 2.1.3.

Table 2.1.3 General Feature of the Project

Narrative Summary	Indicators	Means of verification	Important Assumptions
Overall Goal - Provide safe water in a proper distance and improve living standard to eneble the returners to live in their provincial villages.	- Settled populatin in the villages - Time and frequency for water fetching	- Population censuss - Activity report of district water offices	- Continuation of construction of water supply facilities exploiting groundwater
Project Objective - Improve the coverage in the target seven (7) districts.	- Coverage - Population served	- Activity report of district water offices	- Continmuation of water supply project
Output - Improve the water supply facilities and access to safe water in the target villages. - Villagers in the target villages are trained in operation and maintenance of the water supply facilities and the functionality of the water supply facilities are improved. - Improve the health condition of the peoples in the target villages.	- Access to safe waterin the target villages - Situation of operation and maintenance activities - Prevalence of water born diseases	- Record in district water offices - Activity report of WSC - Records of district and sub-county health offices	- WSCs are established and operation and maintenance activities are continued.
Activities Japanese Side [Facilities] - Construction of 116 deep	Inputs Japanese Side - Fund for construction of	Ugandan Side - Land for facilities to be	- Policy of water supply projcet is not changed.

Table 2.1.3 General Feature of the Project

Narrative Summary	Indicators	Means of verification	Important Assumptions
boreholes with hand pump - Construction of piped water supply facilities in 6 RGCs. [Procurement of Equipment and Materials] - Procurement of operation and maintenance equipment and tools such as service rig and hand pump repair tools [Training on Operation and Maintenance of Facilities] - Training of villagers for operation and maintenance of water supply facilities - Activities to reinforce district water offices Ugandan Side - Securement of the land for water supply facilities. - Operation and maintenance of the constructed facilities	facilities and procurement of equipment and materials - Staff for implementation of the project	constructed - Establishment of WSC - Operation and maintenance fund and staff - Staff of district water offices - Access from main road to drilling sites	Precondition - Necessary water source is secured in the target areas. - Safe and stable water supply is needed.

2.2 Outline Design of the Japanese Assistance

2.2.1 Design Policy

The outline design for the project is carried out based on the following conditions.

(1) Basic Policy

i) Target villages for the construction of boreholes with hand pump are selected as stated below.
- 280 target villages for the construction of boreholes with hand pump listed in the request of the Government of Uganda dated July 2011 are surveyed in terms of population, coverage, activities of village organization, access and available yield. Based on the survey results the villages are prioritized, and 100 villages which are put high priority are selected for the implementation.
- 14 villages transferred for coordination with the Project for Rebuilding Community for Promoting Return and Re-settlement of Internally Displaced Persons in Acholi Sub-region of Northern Uganda are added to those originally requested 280 villages for selection.
- The number of villages to be selected for each district is set in accordance with the ratio of district population.
- The selection is made in two (2) steps; 130 villages are selected based on the results of the socio-economic survey in the first step, and 100 villages are selected based on the results of detailed survey in the second step.

ii) Target RGCs for the construction of piped water supply facilities are selected as stated below.
- 16 target RGCs for the construction of piped water supply facilities listed in the request of the Government of Uganda dated July 2011 are surveyed in terms of population, coverage, activities of village organization, functionality of water sources, road condition, electricity supply, number of existing deep boreholes, and available yield.

Based on the survey results the RGCs are prioritized, and eight (8) RGCs which are put high priority are selected for the implementation. The selected eight (8) RGCs consist of two (2) RGCs for Gulu district of which population is rather large, and one (1) RGC for each of the other district.

- The target year of the project is set for 2017 when a few years will have passed after the completion of the project.

(2) Policy for Natural and Environmental Conditions

i) The Acholi area has low groundwater potential mostly, because the bedrock called "Gneissic-Granulite Complex" is distributed in whole area. Therefore, the safe yield of drilled borehole was not set to high, and the pumping rate would be set as a practical rate from the capacity of hand pump and the demand. Success rate of borehole drilling would be kept to 70% or more by selecting the place which has a relatively good hydrogeological condition.

ii) Generally, iron is detected at a frequency of 3% statistically exceeding allowable concentration in Uganda, though it is difficult to identify the concentrated area. In case that such high iron concentration would be confirmed at the borehole with hand pump, the borehole is treated as failure. Iron removal device is not suitable for villagers because it becomes too complicated to perform operation and maintenance.

iii) The average sunshine hours of Gulu is 7.9, but about six (6) hours are considered as those available for the design output of generation. Therefore, effective system of generation has to be designed in case the solar power generation system is adopted.

iv) In case that the existing boreholes are utilized for water source in the piped water supply facilities, it is required to ensure the safe water source by removal of dropped objects from the boreholes, cleaning by air lifting, aquifer test and water quality analyses prior to installing the submersible motor pump in the borehole.

v) Since thunderstorms occur frequently in Acholi Sub-region during the rainy season, it is required to provide countermeasures to avoid the disasters of thunderstorms to the constructed facilities such as lightening arrester, etc.

(3) Policy for Socio-economic Condition

i) Most of the peoples of the Acholi Sub-region were displaced in the IDP camps during the long lasting civil war, and their social infrastructures such as water supply facilities were constructed under humanitarian aid resulting in the lives leaning on such assistance. The expenses necessary for operation and maintenance of water supply facilities were managed by NGOs and donors of other countries, and the awareness of villagers on water charge collection is considered poor, which is considered as constraints to collect the operation and maintenance fees. Therefore, in the construction of water supply facilities it is required to provide the villagers with training and education activities to cause the awareness revolution of villagers toward the sustainable operation and maintenance of the facilities. Monitoring of the situation of villagers activities are also required to be conducted in the post construction stages at least during the project implementation period.

ii) In the construction of deep borehole with hand pump, the fences surrounding the borehole facilities are provided by the villagers in order to facilitate the belongings of villagers to

borehole facilities and participation of villagers.

iii) In case the solar power generation system is adopted for the power source system of lifting pumps, security measures have to be provided against theft of solar power generation modules and ancillary equipment, such as safe location of solar module installation, and provision of security guards, lights and fences.

iv) The security conditions of Acholi Sub-region has been improved since the civil war was ended, but still not safe. Therefore, the construction has to be implemented considering that only three (3) towns of Gulu, Kitgum and Pader are allowed to stay for Japanese staff due to the security reason. Even in the activities for technical assistance, it is necessary to return to such allowed towns before 19:00.

(4) Policy for Construction and Procurement Conditions

i) As mentioned in the item (5), local contractors are utilized in the construction of borehole facilities and piped water supply facilities as much as possible. The structure of the facilities, the materials to be used and the methods to be applied are those possible for the local contractors to manage in order to reduce the construction costs.

ii) In the procurement of vehicles, it is required to confirm that the procured vehicles are used for the purposes as planned, not for the purposes not planned, and if proper use is not secured it has to be rejected.

(5) Policy for Local Contractor

i) Since there are many local drilling and construction contractors of which technical skills and abilities are considered on a certain level, these local contractors have to be utilized in the construction of the facilities in order to reduce the construction costs.

ii) The materials to be used for the construction are required to be the products of the makers and manufacturers who have their factory and sales agents in Uganda in consideration of cost reduction, easiness in supply of spare parts in the operation and maintenance of the facilities, and sustainability of the facilities.

(6) Policy for Operation and Maintenance

i) In Uganda, the operation and maintenance of the deep boreholes with hand pump are responsibility of the WSC to be established consisting of the members who are selected among the users of the village where such boreholes are constructed. The boreholes to be constructed under this project are also operated and maintained by WSC as same as those in the other areas in Uganda. As for the collection of water fees, the uniform rate system per household is applied as same as that for other neighboring villages because it is necessary to assign water charge collector at the borehole site in case of the commodity system, though it depends on the decision among users.

ii) The operation and maintenance of the piped water supply facilities are responsibility of the Water Board to be established under the sub-county office. Sub-committees are established for each public tap for water fee collection and operation and maintenance of lateral facilities, and the management of the facilities is conducted in the coordination between the Water Board and the Sub-committees.

iii) Since the District Water Offices of the district local governments are responsible for

instruction and assistance of the Water Boards and WSCs, DWD has to instruct them to secure their monitoring on the operation and maintenance of the water supply facilities to be constructed under this project.

iv) To improve the sustainability of the facilities, the technical assistance to assist the villagers, WSCs and Water Boards in establishing operation and maintenance system as mentioned in the above items i) and ii).

(7) Policy for Grade of Facilities and Equipment, Etc.

i) Water supply facilities are planned based on the standards and guidelines of Uganda, and 20 liter/day/capita of unit consumption and 300 of population served by one (1) borehole or one (1) public tap are basically considered.

ii) The served areas of piped water supply facilities are set for the areas of which population density is rather higher including public facilities such as schools, hospitals, etc., but nor for whole RGC areas, and the served population is set based on the delineated service area.

iii) The most suitable power generation system for securing the sustainability of village level operation and maintenance of the piped water supply facilities is determined comparing the easiness and costs of construction and operation and maintenance among diesel generation, solar power generation and commercial electricity supply.

iv) In case that the solar power generation system is applied, the security measures such as guard house, security light, security fences have to be provided. Quality, durability and strength of the security facilities are to be provided under the responsibility of Japanese side in order to secure the security performance.

v) The elevated tanks are of steel including support frames to shorten the installation period at site as well as the construction period.

vi) The piped water supply system consists of water source facilities, transmission pipelines, an elevated tank, distribution pipelines and public taps. The dimensions of the facilities meet the demand of the population estimated for 2017, but the structures of facilities are designed so as to provide the yard tap connections by Ugandan side in future.

vii) The depth, diameter, and depth to base rock of the borehole, the success rate of drilling, and the minimum yield required for successful borehole relating to the plan of drilling sites and design of borehole structure are determined based on the results of geophysical survey, the records of similar project and the data and records of the existing boreholes in the target areas as practical as possible.

viii) U-2 type of hand pump is applied because it is popular in Uganda as a standard type and spare parts are available predominantly.

ix) The materials predominantly applied in Uganda are used for the construction of boreholes, and the environmental protection and groundwater conservation are also considered.

x) Since the local drilling and construction contractors are utilized as sub-contractors in this project, the construction method and the facility structures have to be those applied in local construction popularly.

xi) The construction materials to be adopted for the construction of facilities are of the quality to meet the Ugandan standard or the international standards such as BS, DIN, ISO, ASTM, etc.

xii) The water supply facilities have to be planned and designed based on the Ugandan standard

as much as possible.

(8) Policy for Construction and Procurement Methods and Implementation Period

i) Considering the urgency of this project, the project is planned to be completed in one (1) fiscal year in the implementation schedule.

ii) Since the rainy and dry seasons are clearly distinguished in the project area, it is necessary to determine the construction schedule considering the lower efficiency during the rainy season.

iii) The target villages and RGCs are scattered widely in the Acholi Sub-region, and it takes about five (5) hr to move from Gulu, the administrative and commercial center of the sub-region, to the farthest village. On the other hand, the project has to be completed in one (1) fiscal year. Therefore, considering the security conditions in the sub-region, the project area is divided into three (3) sections for construction, in each of which the construction works proceed simultaneously with the base camp of either Gulu, Kitgum or Pader where stay of Japanese staff is allowed in order to complete whole of the construction works and the necessary activities in such limited period safely.

iv) The technical assistance to secure the sustainability of operation and maintenance of the facilities to be constructed is planned to be conducted. The location of deep boreholes with hand pump has to be determined in the course of such activities to be carried out in the technical assistance considering the intensions of the villages to use it, and then the geotechnical surveys are to be carried out in the detailed survey to determine two (2) borehole sites a village including the alternative ones.

2.2.2 Basic Plan

(1) Facility Plan

1) Rural Water Supply Plan

i) Selection of Target Villages and RGCs

a. Target Villages for Boreholes with Hand Pump

280 villages are requested for the construction of boreholes with hand pump, and 100 villages are selected from 294 villages adding 14 villages transferred from the Project for Rebuilding Community for Promoting Return and Re-settlement of Internally Displaced Persons in Acholi Sub-region of Northern Uganda. The selection is carried out with two (2) steps. In the first step of selection, 130 villages are selected evaluating the villages in terms mainly of the social parameters based on the results of socio-economic condition survey. In the second step of selection, 100 target villages are selected evaluating in terms mainly of hydrogeological parameters based on the field survey.

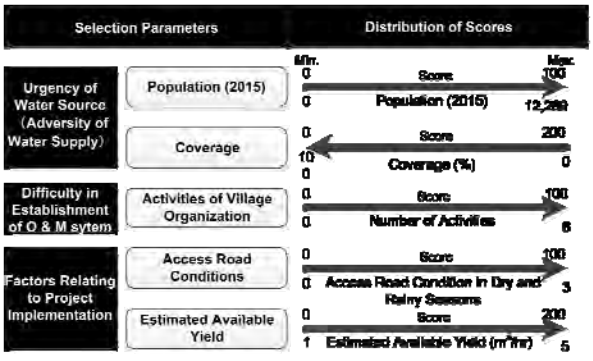


Fig. 2.2.1 Parameters for Selection of Villages for 1st Step

In the first step of selection, i) adversity of water supply (population and coverage), ii) difficulty in establishing operation and maintenance system (activity of village organization), and iii) factor relating to the project implementation (access road conditions and available yield) are considered and evaluated. Villages are prioritized by scores of these parameters.

130 target villages are selected in accordance with the number of villages allocated to each district considering the priorities of each village. However, as described in the next section, in two (2) districts of Aumur and Lamwo no RGC is found to be selected although one (1) RGC is planned to be selected. 11 villages are additionally selected for each district of Amuru and Lamwo in order to keep the increase of served population as expected for RGCs excluded from the target list. Therefore, the number of villages to be selected are 152 (=130 villages + 11 villages x 2 districts). The parameter for selection and the number of selected villages for the first step of selection are shown in Fig. 2.2.1 and Table 2.2.1, and the score and the priority of each village are summarized in Table 2.2.2 attached to the end of this chapter.

Table 2.2.1 Number of Villages to be Selected

District	Rural Population(2011)	Share of Population in sub-region (%)	Requested Villages	First Step Selection			Second Step Selection		
				Number of Villages allocate by Population	Addition to 2 Districts	Total Allocation	Number of Villages allocate by Population	Addition to 2 Districts	Total Allocation (Target Villages)
1. Gulu	229,227	18.4	70	21	0	21	16	0	16
2. Amuru	173,712	13.9	35	18	11	29	14	8	22
3. Nwoya	52,489	4.2	35	12	0	12	9	0	9
4. Kitgum	177,135	14.2	37	19	0	19	15	0	15
5. Lamwo	163,180	13.1	39	18	11	29	14	8	22
6. Pader	190,214	15.2	39	19	0	19	15	0	15
7. Agago	261,915	21.0	39	23	0	23	17	0	17
Total	1,247,872	100.0	294	130	22	152	100	16	116

In the second step of selection, the villages are evaluated considering mainly of hydrological conditions (borehole depths, depths of base rock, static water levels, available yields, access conditions) based on the results of field surveys. 116 villages are selected in accordance with the number of villages allocated to each district considering the priorities of each village. The 36 villages (= 152 villages - 116 villages) excluded from the target villages are reserved as alternative villages. The numbers of the villages selected in the second step of selection are summarized in Table 2.2.1, and the score and the priority of each village are summarized in Table 2.2.3 attached to the end of this chapter. The locations of each village are indicated in Fig. 2.2.2 - Fig. 2.2.8 attached to the end of this chapter.

b. Target RGCs for Piped Water Supply Facilities

16 RGCs are requested for the construction of piped water supply facilities. Among those requested, there are RGCs furnished with various water supply facilities and achieving rather high coverage. Since one of the objectives of this project is to increase served populations and improve coverage, nine (9) RGCs of which coverage exceeds 77 % in 2015 based on the population estimated for 2015 are excluded considering that the National Development Plan aims to achieve the coverage of 77 % by 2015. As a result, two (2) districts; Nwoya and Amuru have no RGC selected for the implementation, and then 11 villages for borehole construction are added to each district to secure the increase of served population.

The remaining seven (7) RGCs are evaluated from the viewpoints of social and hydrogeological conditions. The parameters for evaluation are i) the adversity of water supply (population and coverage), ii) the difficulty in establishment of operation and maintenance system (activities of village organization, and functionality of existing water sources), iii) the factors relating to project implementation (road conditions, commercial electricity supply, number of existing boreholes, available yield), and their weight scores are shown in Fig. 2.2.9.

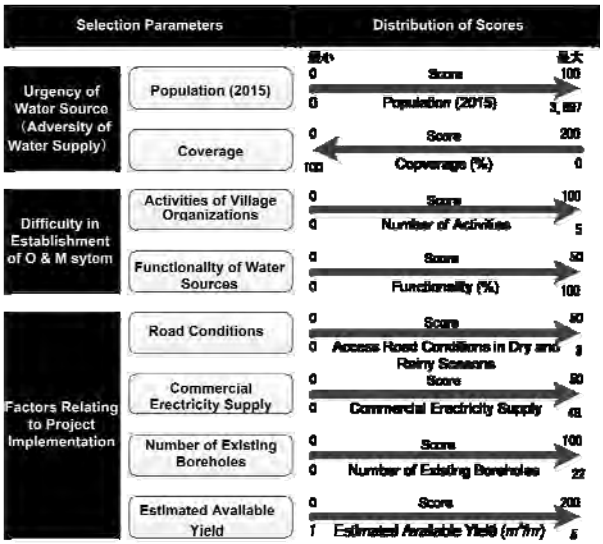


Fig. 2.2.9 Parameters for Selection of RGCs

The parameters for selection, scoring and the RGCs selected are presented in Table 2.2.4 attached to the end of this chapter. The locations of RGCs are indicated in Fig. 2.2.2 - Fig. 2.2.8 attached to the end of this chapter.

ii) Target Year and Population

The target year for the plan and design of the piped water supply facilities is set at 2017. The service areas of each RGC are delineated for the administrative and commercial center having rather high population density in order to realize the effective water supply. The present and future population and population served are summarized in Table 2.2.5.

Table 2.2.5 Present and Future Population and Population Served in RGC

District	RGC	Population in Service Area (2011)	Population in Service Area (2017)	Present Population Served	Present Coverage (%)	Population Served Increased by Piped Water Supply Facilities	Future Population Served (2017)	Future Coverage (2017) (%)
Amuru	-	-	-	-	-	-	-	-
Nwoya	Koch Goma	1,800	2,100	1,200	67	900	2,100	100
Gulu	Unyama	3,085	3,600	1,200	39	2,400	3,600	100
	Awere	1,421	1,700	600	42	1,100	1,700	100
Lamwo	-	-	-	-	-	-	-	-
Kitgum	Kitgum Matidi	2,225	2,800	250	11	2,550	2,800	100
Pader	Corner Kilak	1,224	2,000	900	74	1,100	2,000	100
Agago	Adilang	3,015	3,800	2,400	80	1,400	3,800	100
Total for Acholi Sub-region	-	12,770	16,000	6,550		9,450	16,000	

The population served by one (1) deep borehole with hand pump is set at 300 considering the Ugandan standard. The increase of population served by new deep boreholes with hand pump is summarized in Table 2.2.6.

Table 2.2.6 District-wise Population Served after Project Implementation

District	2011 (Present)			Target Villages for Boreholes with Hand Pump;	Population Served by New Boreholes with Hand Pump	Population Served Increased by Piped Water Supply Facilities	Increase of Population Served after Project Implementation	Served Population Increased after Project Implementation	Future Coverage after Project Implementation
	Served Population	Rural Population	Coverage of Rural Water Supply (%)						
Amuru	83,373	173,712	48.0	22	6,600	0	6,600	89,973	51.8
Nwoya	37,571	52,489	71.6	9	2,700	900	3,600	41,171	78.4
Gulu	157,783	229,227	68.8	16	4,800	3,500	8,300	166,083	72.5
	108,915	163,180	66.7	22	6,600	0	6,600	115,515	70.8
Lamwo	115,586	177,135	65.3	15	4,500	2,550	7,050	122,636	69.2
Kitgum	94,436	190,214	49.6	15	4,500	1,100	5,600	100,036	52.6
Pader	137,604	261,915	52.5	17	5,100	1,400	6,500	144,104	55.0
Agago	735,268	1,247,872	58.9	116	34,800	9,450	44,250	779,518	62.5

The served populations of boreholes with hand pump and piped water supply facilities are increased for 34,800 and 9,450, respectively, totaling 44,250, and the present population served of 735,268 is increased to 780,000 for whole of the Acholi Sub-region.

iii) Consumption per Capita

The consumption per capita of the rural water supply is set at 20 liter/day/capita considering the Ugandan standard. The water demands of each RGC are tabulated below.

Table 2.2.7 Future Population Served and Water Demands in RGC

Districts	RGC	Future Population Served (2017)	Water Demands(m^3/day) (2017)
Amuru	-	-	-
Nwoya	Koch Goma	2,100	42
Gulu	Unyama	3,600	72
	Awere	1,700	34
Lamwo	-	-	-
Kitgum	Kitgum Matidi	2,800	56
Pader	Corner Kilak	2,000	40
Agago	Adilang	3,800	76
Total for Acholi Sub-region		16,000	320

2) Water Supply Facility Plan

i) Deep Boreholes with Hand Pump

a. Borehole for Point Water Source

a.1 Water Quality

Water quality distribution was summarized by district according to the National Ground Water Data Base (NGWDB) which is managed by Directorate of Water Resource Management, Ministry of Water and Environment. Table 2.2.8 shows the result. Water quality standards for rural drinking water supply are set as Maximum Allowable Concentration (MAC) temporarily. Water quality in the target area has almost no problem according to the result. However, 3% of all boreholes are exceeding the iron concentration standard, and 0.5% are exceeding fluoride standard. Salinity which is estimated by Total Dissolved Solid (TDS) is not exceeding the standard. 6% of all boreholes are exceeding the turbidity standard. It seemed the high turbidity wells are using shallow groundwater which is easy to be contaminated from surface soil. Deeper groundwater is considered to be less turbidity.

Generally, iron and fluoride is found in the area of granite in spots, but it is difficult to identify the contaminated area. The result shows the trend of higher opportunity of exceeding iron standard in Gulu, Amuru and Kitgum districts. Statistically 3.5% of drilled boreholes can be considered to be detected exceeding iron or fluoride standards in whole target area.

Table 2.2.8 Water Quality in Each District

	Turbidity (NTU) MAC: 30 NTU			Total Dissolved Solid (mg/L) MAC: 1500mg/L			Fluoride (F) (mg/L) MAC: 4 mg/L			Iron (Fe) (mg/L) MAC: 2mg/L			Nitrate (NO_3) (mg/L) MAC: 50 mg/L		
District	No.	Ave.	Over MAC	No.	Ave.	Over MAC	No.	Ave.	Over MAC	No.	Ave.	Over MAC	No.	Ave.	Over MAC
Gulu	154	9.2	12	174	168.7	0	163	1.0	2	190	0.34	8	156	0.3	0
Amuru	62	20.8	9	55	157.7	0	55	0.2	0	76	0.57	5	65	0.1	0
Nwoya	49	11.7	5	53	207.7	0	51	0.2	0	61	0.28	2	50	0.1	0
Kitgum	125	7.3	6	150	319.6	0	134	0.5	1	162	0.51	7	120	0.1	0
Lamwo	105	3.6	3	120	289.6	0	109	0.3	0	127	0.27	4	100	0.8	0
Pader	197	4.6	6	222	214.4	0	204	0.4	1	217	0.14	2	166	0.2	0
Agago	140	8.9	7	153	229.3	0	144	0.2	0	163	0.11	1	130	0.1	0
Total	832	8.1	48	927	231.3	0	860	0.5	4	996	0.29	29	787	0.3	0

Ave.: Average, MAC: Maximum Allowable Concentration
Data Source: National GroundWater DataBase

a.2 Criteria for Successful Borehole

Fig. 2.2.10 shows the histogram of the increments of $0.5m^3$/hr. yield which summarized from NGWDB. Although the average of total yield is calculated as $2.3m^3$/hr, the peak of frequencies can be seen around $1.0m^3$/hr. The inset at the upper right in the graph shows the magnified histogram from 0 to $2.0m^3$/hr with the increments of $0.1m^3$/hr. In the Acholi area, over 100 boreholes are in the range from 0.6 to $0.7m^3$/hr, and especially there are 142 boreholes between 0.6 and $0.72m^3$/hr. Though the yield $0.72m^3$/hr is applied for the criteria for successful borehole in Uganda usually, this range, 0.6 or 0.72 m^3/hr, is very critical in Acholi area. When it assumed that the consumption per capita for the rural water supply set as 20 liters/day/capita and that a borehole can cover 300 persons, 10 hour operating time is required. In fact, many wells are operating more than 12 hours in this area. Therefore, $0.6m^3$/hr is considered to be suitable for the criteria of successful borehole.

a.3 Success Rate of Borehole Drilling

Most of all target villages are in “Gneissic-Granulite Complex (GC)” or “Intrusive Granite (G)”area as shown in Fig. 2,2,11. Hydrogeological characteristics of these geologies are almost same, and the groundwater exists in the fissure of the rocks mainly. Distribution of “Alluvium (P12)” is limited along big rivers, and the layer thickness is thin, then bedrock (GC) appears under the alluvium sand. Therefore, since the distribution of this target area is almost uniformity, success rate of borehole drilling is assumed to set uniform value for whole target area.

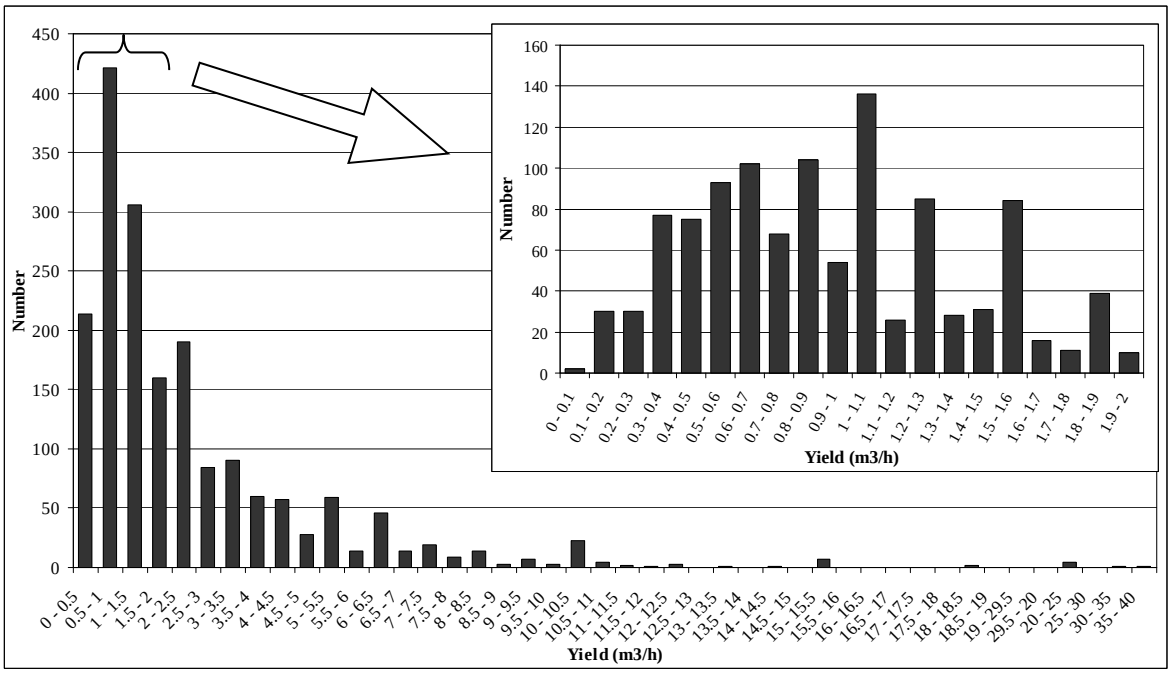
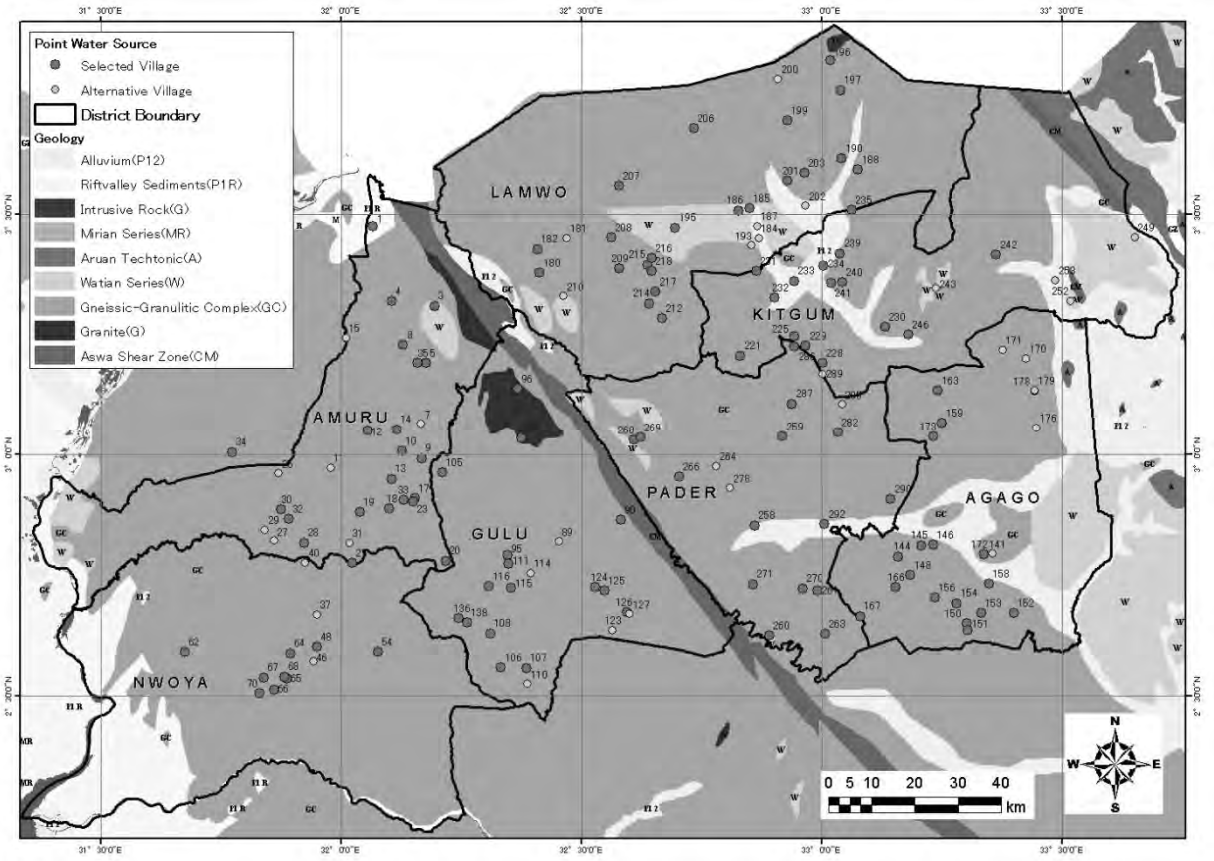


Fig. 2.2.10 Histogram of Borehole Yield



(Data source: National Groundwater Database)

Fig. 2.2.11 Distribution of Proposed Drilling Sites and Geology

Success rate can be defined as the percentage of successful borehole which satisfies the criteria out of total drilled boreholes. Since the total number of boreholes which was recorded in NGWDB is 2,158, and the number of boreholes which was recorded the yield 0.6m^3/hr or more is 1,541, the success rate by yield can be estimated 71.4%. Regarding to water quality, since the occurrence ratio of iron and fluoride is 3.5% mentioned in Section a.1, the success rate by water quality can be estimated 96.5%. Therefore, the combined success rate of the entire quantity and quality of water would be 68.9%. Thus, by rounding it up, the success rate of 70% is used for planning of borehole with hand pump in this project.

a.4 Measurement of Failure Borehole

Drilling is up to two (2) boreholes in one (1) village. If both of two (2) boreholes are below the criteria, the village would be considered to be area with low groundwater potential. In this case, drilling team would be shifted to the alternative village, and does the same drilling work.

a.5 Number of Drillings

With the success rate 70%, out of 116 priority villages, number of villages which would be succeeded by the first drilling is 81. At the remaining 35 villages, 24 villages would be succeeded by the second drilling. Out of 116 priority villages, 105 villages are succeeded along the way. Then, drilling team should shift to 11 alternative villages. As shown in Table 2.2.9, total number of drilling would be 169, and total number of alternative villages would be 13. Already 36 villages are prepared as alternative villages, and there is a possibility to be shortage of 11 alternative villages in actual construction. Therefore, adding five (5) villages as spare, a total of 18 villages are set as alternative village. In the detailed design stage, geophysical survey and operation and maintenance guidance for villagers shall be conducted at 134 villages.

Table 2.2.9 Estimated Number of Drilling

Trial	Drilling	Success
Priority village (First)	116	81
(Second)	35	24
Alternatove (First)	11	7
(Second)	4	2
2nd Alternative (First)	2	1
(Second)	1	1
Total	169	116

a.6 Water Level and Installation Depth for Pump

Result of resistivity survey conducted to the drilling depth and bedrock depth. Static water level was estimated from NGWDB which was aggregated for each sub-county. Dynamic water level was calculated by subtracting 15.3m which was obtained from averaged drawdown at 1.0m^3/hr yield in NGWDB from static water level. Installation depth of pump was set at five (5) m deeper than the dynamic water level. These results are shown in Table 2.2.10. Average value of drilling depth, bedrock depth, static water level and installation depth of pump are 71.2m 21.1m, 15.6m and 35.9m, respectively.

b. Borehole facility

b.1 Standard Structure of Boreholes

Standard structure of the forehole is shown in Fig. 2.2.12. Main specification of the borehole is expressed below. Average drilling depth is 74m, groundwater will be taken from weathered or fissure zone deeper than 15m.

- drilling diameter:
  11 inches or more (shallower than 6m)
  8.5 inches or more (in weathered zone)
  7.5 inches or more (in bedrock)
- Inner diameter of casing: 5 inches
- Length of screen is estimated 30% of total casing length
- Gravel packing and clay packing are required
- Filling by mortar cement shallower than 6m for prevention of contamination

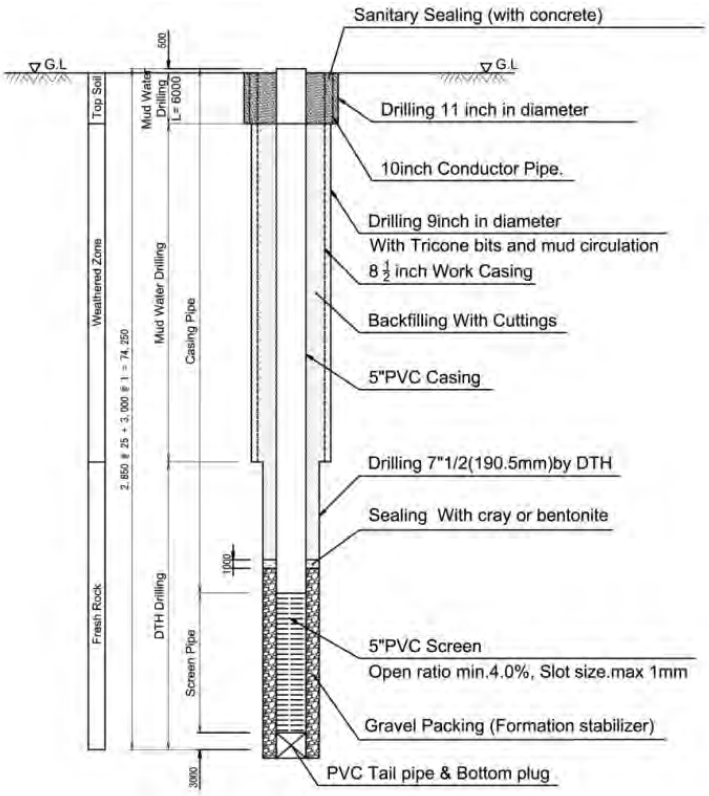


Fig. 2.2.12 Standard Structure of Boreholes

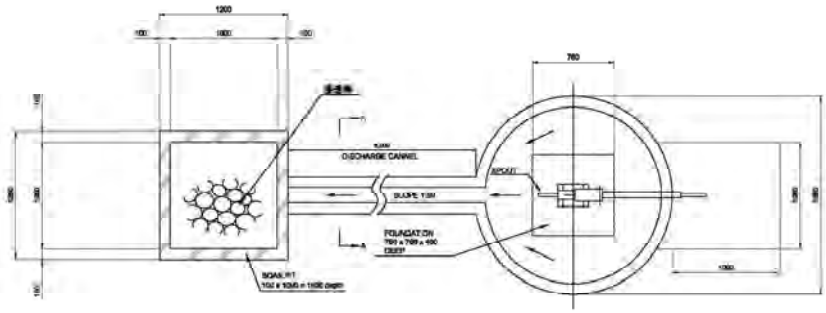
b.2 Superstructure of Borehole Facilities

Superstructure of borehole facility is followed with the standard structure presented by the Ministry of Water and Environment as shown in Fig. 2.2.13. It is constituted by platform (diameter 1.8m, depth 10cm) and drainage (length 6m, depth 10cm, gradient 1:50).

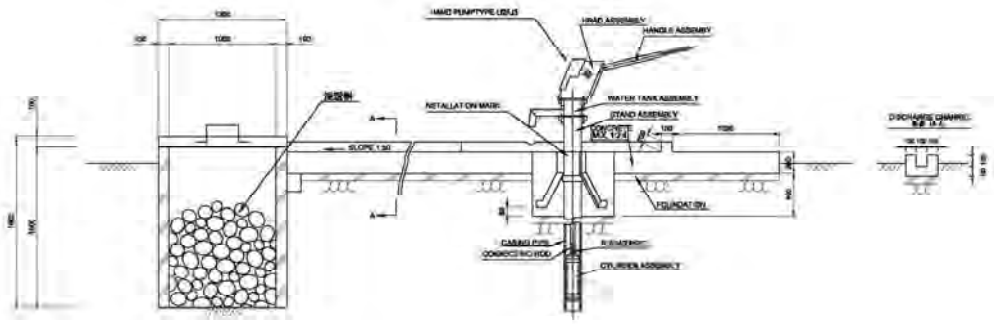
Soak pit shall be away from borehole more than six (6) m. Drainage ditch shall have enough gradient which drainage water can be discharged quickly. This is to prevent the occurrence of mosquito and to protect the surrounding environment.

b.3 Hand Pump

The U-2 type hand pump which was improved in Uganda based on Indian Mark-II has was selected. It is adopted widely in Uganda with reasonable price, and is easy to procure spare parts in Uganda. Riser pipes will be made of uPVC, and plunger rod be made of stainless steel. These materials are acid resistance. To protect uPVC riser pipe, centralizer shall be used for setting the pipes at center of borehole.



Plan View



Cross Section

Fig. 2.2.13 Superstructure of Borehole Facilities

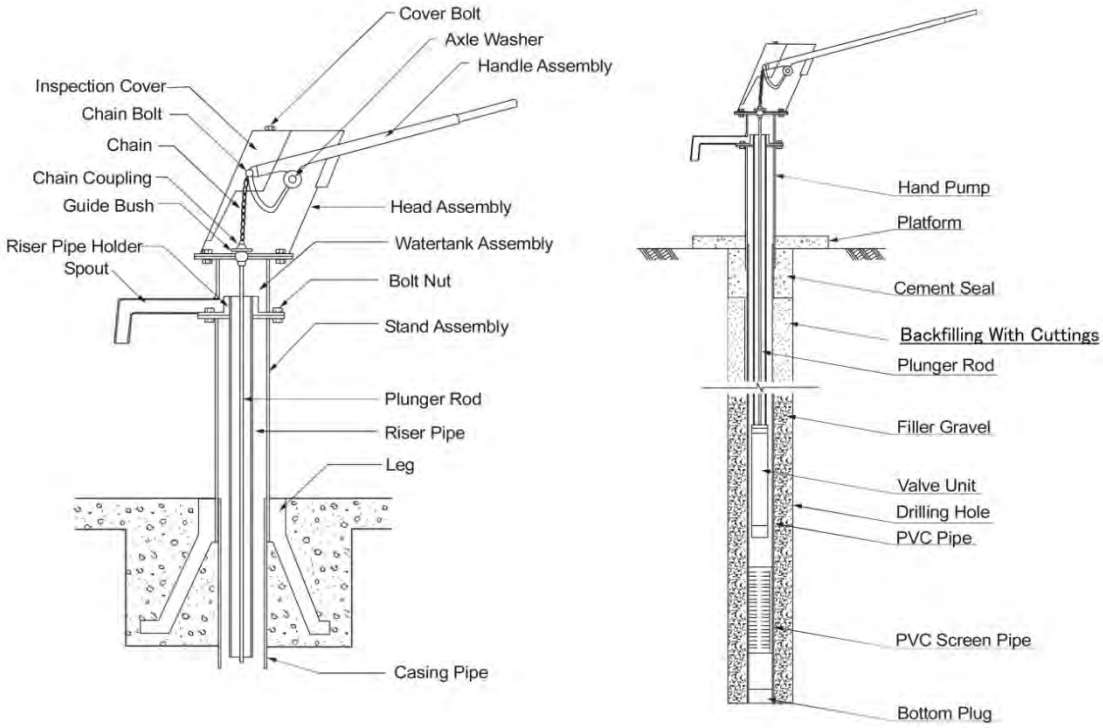


Fig. 2.2.14 Hand Pump Structure (U-2 Type)

ii) Piped Water Supply Facility

a. Borehole

a.1 Selection of Borehole and Pumping Capacity

The boreholes for the intakes of the piped water supply facilities are selected among the test boreholes of which yields are considered sufficient as a result of the aquifer tests as well as those existing of which sufficiency of yields are confirmed through aquifer tests. The planned service population and water demands of the target RGCs and the total exploitable yield (six (6) hr of operation) of the selected borehole are summarized in the following table together with the number of selected boreholes for each RGC.

Table2.2.11 Proposed Demand and Boreholes for Piped Water Supply Facilities

RGC	Planned Service Population (2017)	Water Demand (m^3/day)	Exploitable Yield (m^3/day)	The Number of Boreholes (Max. Yield)	
				Test Boreholes drilled in Study	Existing Boreholes
Unyama	3,600	72.0	108.0	1 borehole ($72.0m^3$/day)	1 borehole (36.0 m^3/day)
Awere	1,700	34.0	57.6	-	2 boreholes (30.6 m^3/day+27.0 m^3/day)
Koch Goma	2,100	42.0	18.0	1 borehole (10.8 m^3/day)	1 borehole (7.2 m^3/day)
Kitgum Matidi	2,800	56.0	82.8	1 borehole (28.8 m^3/day)	1 borehole (54.0 m^3/day)
Corner Kilak	2,000	40.0	41.4	1 borehole (9.0 m^3/day)	2 boreholes (21.6 m^3/hour+10.8 m^3/day)
Adilang	3,800	76.0	68.4	2 boreholes (7.2 m^3/day+14.4 m^3/day)	2 boreholes (18.0 m^3/hour+28.8 m^3/day)
TOTAL	16,000	320.0	-	6 boreholes	9 boreholes

The total number of boreholes selected for the piped water supply facilities in 6 RGCs is calculated to be 15, and nine (9) out of 15 boreholes are the existing ones to be utilized and the remaining six (6) boreholes are those drilled in the study. The utilization of the above existing boreholes was confirmed with district water offices, responsible staff in sub-county offices and respective communities, and the responsible persons in the Ministry of Water and Environment in the course of the field survey.

As shown in Table 2.2.11, the yields of boreholes of the piped water system satisfy only approximately 40% and 90% water demands in two (2) RGCs such as Koch Goma in Nwoya district and Adilang in Agago district. There are many boreholes with hand pump in these RGC areas, and it is then considered to satisfy 100 % of coverage in these RGCs if the yields these existing boreholes with hand pump are included. In the facility planning of these two (2) RGCs, the number of public taps is determined as the required number based on potential service population, but the capacities of main facilities such as main distribution pipelines and elevated tanks are planned to meet 100% supply coverage, since it is considered difficult to expand and

enlarge according to the population thereof in future.

a.2 Warranty against Defects of Boreholes

In the implementation stage, the contractor has to install submersible motor pumps, etc. after cleaning and removing dropped objects in the existing boreholes. In case there are any defects in such existing boreholes after completion, the contractor warrants only defects caused by pumping equipment which they installed.

The test boreholes were handed over to Ugandan side after the confirmation of yields and water qualities, etc. Therefore, Ugandan side is considered responsible for their maintenance until the construction starts. In addition, in case the existing boreholes are utilized as water source of the project, these boreholes have belonged to the Ugandan side, and then it is considered that the Ugandan side should warrant such defects as may be found in boreholes. It is necessary to clarify with the contractors of this matter at the time of contract during the implementation stage.

b. Components of Piped Water Supply Facilities and Power Source for Intake Borehole

b.1 Piped Water Supply Facilities

The piped water supply facilities consist of water source boreholes, transmission pipelines, elevated tank and distribution pipelines as shown in Fig. 2.2.15, and each component is of those predominantly applied in the Acholi Sub-region..

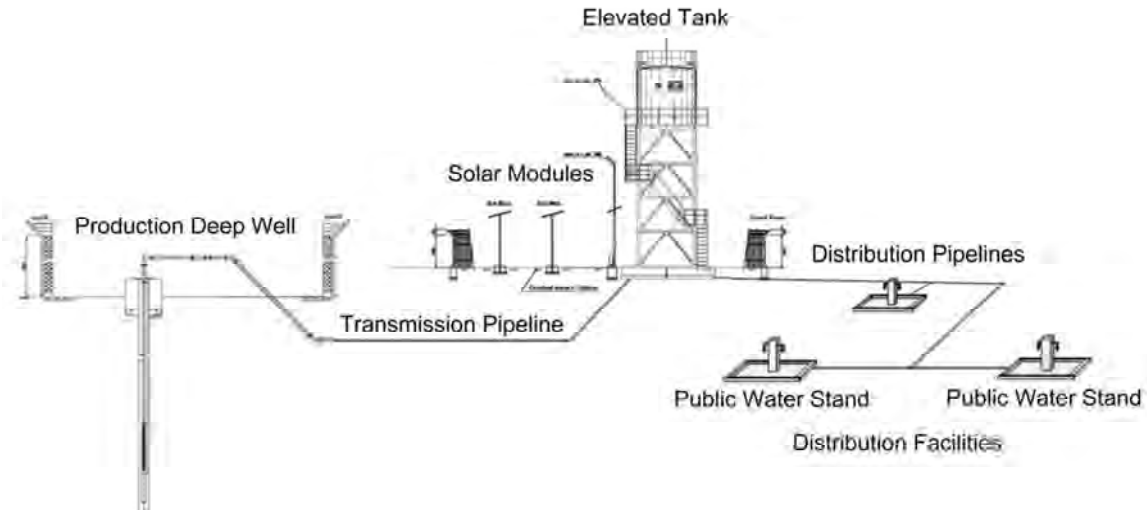


Fig. 2.2.15 Piped Water Supply Facilities

b.2 Comparison of Power Sources

The power sources for submersible motor pump of the existing piped water systems in Acholi area are considered as commercial electricity supply, diesel engine generation and solar power generation. The characteristic of these power sources are shown in Table 2.2.12.

People in Acholi area have been protected carefully by humanitarian aid during the civil war, and they have consumed the supplied water without water charges. Therefore, the willingness to pay was very poor. The humanitarian aid was stopped with the end of civil war, and at the

moment people have to pay the operation cost of their water supply facilities. Most of the facilities have been left unused since then.

As shown in Table 2.2.12, in case of solar power generation type, the construction cost is higher than the others, but operation and maintenance cost is quite affordable. Therefore, the solar power generation type is the most appropriate, in terms of enhancing the sustainability of the facilities in Acholi area. Furthermore, the introduction of solar power generation system is highly recommended as renewable power sources according to energy policy of overall goal, such as NDP. Hence, the system is exempted from tax as promotion measure of introduction of solar power modules. This is why the solar power generation type is adopted as power source for pumping up in the project. The solar power generation types are adopted in nine (9) facilities of the requested 16 RGCs.

Although the submersible motor pump is generally operated by AC power line, the motor pump operated by DC power line is increasingly adopted recent years as the small power source for solar power generation (Approximately 2 to 3 kW), in order to reduce conversion loss (10 to 15%) of inverter equipment. The pumping discharge from boreholes in the project doesn't exceed the pumping capacity of DC motor pump. Therefore, in the submersible motor pump of the project, DC power line system is required to be adopted.

Table 2.2.12 Comparison of Power Sources for Intake Boreholes

Item	Commercial Power Type	Diesel Generation Type	Solar Power Generation Type
Standard Durability	Approximately 10 to 20 years (Power Receiving Equipment, Control Panel)	Approximately 10 years (Diesel Generator)	Approximately 20 years (Solar Power Generation Module)
Antitheft Countermeasure	Antitheft countermeasure is not necessary. Only around borehole, it should be taken.	Antitheft countermeasure of fuel and generator is necessary, for example, safety barrier, crime-prevention light and security guard.	Antitheft countermeasure is necessary, for example, safety barrier, crime-prevention light, security guard and guardhouse. The solar power generation should be installed in the place where the residents can guard all day and all night.
Land for Facility	Land for facility is the smallest because of setting power receiving equipment only.	As it is necessary to build the house of diesel generation around each borehole, the land shall be secured.	Land for facility is the largest, because the installation area of solar power generation module is large.
Technical Problems & Attentions	・As power is received during 24 hours, it is possibility to reduce the number of boreholes because of 24 hours pumping. ・It is necessary to install emergency power generation due to rash of electric outage in planned RGC.	・In Acholi area, the potential groundwater capacity is not so high, so it is necessary to pump up by the pumping capacity from the borehole of piped water system. As power is generated during 24 hours, it is possibility to reduce the number of boreholes because of 24 hours pumping. ・The diesel generation is not affected in case of electrical outage.	・Solar power generation can be operated during only daytime. (6 hours operation is possible in target area.) Therefore, it is possibility to increase the number of boreholes, compared with other types. ・The solar power generation is affected by the climate (Amount and hours of solar radiation)
Construction cost of initial investment of power source	Amount of initial investment is small. (155,865,000UGX (4,676thousand JPY))	Amount of initial investment is small, 1.3 times of commercial power type. (206,816,000UGX	Amount of initial investment of solar power generation type is bigger than any other types, 2.4 times of commercial

Table 2.2.12 Comparison of Power Sources for Intake Boreholes

Item	Commercial Power Type	Diesel Generation Type	Solar Power Generation Type
equipment (in case of RGC that the population is 2,800.)		(6,204thousand JPY))	power type. (378,963,000UGX (11,369thousand JPY))
Maintenance and operation cost (in case of RGC that the population is 2,800.)	・Maintenance and operation cost: 15,133,000UGX/year (454thousand JPY/year) ・It is necessary to install the diesel generation equipment because of no power supply service in Koch Goma, Awere, Kitgum Matidi RGC.	・Maintenance and operation cost: 65,962,000UGX/year (1,979thousand JPY/year) ・It is necessary to maintain, operate and check the fuel injection and regular injection of grease on a daily basis.	・Maintenance and operation cost: 7,350,000UGX/year (221thousand JPY/year) ・Although it is necessary to clean up the solar power generation module on a regular basis, it is maintenance-free basically, no special work for maintenance, operation and check.
Synthetic judgment	× Difficult to implement Reason: At present, there is no power supply service in 3 RGCs. In Acholi entire area, there is not sufficient and stable power supply due to power outage. As the electricity cost is expensive, the financial burden of beneficiaries is heavy. In addition, if the emergency generator is installed as the countermeasure of power outage, the financial burden is heavy furthermore.	× Possible to implement, but financial burden is heavy, and it is high possibility that sustainable operation and maintenance are difficult. Reason: Financial burden is heavy due to fuel charge. The transportation fee of consumable parts is added by regular check. Moreover, it is necessary to take antitheft countermeasure for fuel, generator and spare parts.	○ Recommendable to implement Reason: Although there is the risk of robbery, this is suitable for the present situation of Acholi area, because of low cost of operation and maintenance. In 9 RGCs out of targeted 16 RGCs, this solar power generation types were installed, and in other Acholi area as well. In addition, this type was adopted in the water supply system by grant aid of pease building.

c. Layout Plan of Piped Water Supply Facilities

Facility layout plan is developed as following basic policy.

Elevated Tank: Gravity flow system is adopted between the elevated tank and public taps. Therefore, the elevated tank is to be set at higher position on firm ground. The location of elevated tank is determinded based on the results of the field surveys such as soil mechanical survey and topographic survey.

Solar Power Generation: As previously mentioned, the solar power generation type is adopted as the power source in the project. However, as the solar power generation is easy to suffer the damage of theft, the location of solar power generation should be selected at the neighborhood of the central part of RGC and police station where the villagers can monitor, from the viewpoint of antitheft security.

Public Tap Stand: Two (2) taps are set in a public tap stand as small service facility, and the planned service population per a public tap stand is set as 300

people according to the standard of Uganda. In response to the increase of the number of public taps, the access to public taps has to be shortened and the labor of water transportation by women and children shall be reduced. In addition, the public taps shall be set at the schools and medical related facilities where there are not any existing boreholes nearby.

The layout plan of piped water supply facilities agreed with the Ugandan side are presented in Fig. 2.2.16 to Fig. 2.2.21 attached at the end of this chapter.

d.1 Intake Facility

As shown in Fig. 2.2.22, the intake facility consists in the borehole, pump equipment and safety barrier around the site. The model of pump equipment shall be adopted as submersible pump for borehole. At the existing boreholes, which are utilized in the project, the submersible pump shall be set after washing and removing falling objects. The installation position of the pump shall be set shallower than the top edge of the screen, if circumstances allow. In addition, the DC power line system shall be adopted, because AC-DC inverter is expensive (7% of entire facility cost) and the conversion loss of the inverter is high (Approximately 10%) and the durable period of the inverter is short.

The basic specifications of submersible pump are shown below.

- Model: Submersible pump for borehole
- Diameter of borehole: 5 inch (Internal diameter of casing: 125mm)
- Motor: DC motor (VPC:0/30V～180/300V)
- Power source: DC power source by solar power generation
- Control function: MA electric pole (Protection of idle running)

d.2 Solar Power Generation Facilities

The solar power generation equipment of the project shall be adopted as the module matching the pumping capacity, based on the sunshine duration (annual average 7.9 hr/day) and the amount of solar radiation (4.9 to 6.1 kWh/ m^2*day).

- Solar power generation module
- Cradle for generation module
- Lightning rod
- Power cable (between the submersible pump of borehole and solar power generation equipment)

Electricity shall be transmitted from this solar power generation facility to the submersible pump of each borehole by the cable. In case the location of the solar power generation facility is same as the location of elevated tank, the transmission cable shall be buried along with the water transmission pipeline. In case the location of generation facility is different from the location of elevated tank, the transmission cable shall be buried independently. The transmission cable shall be buried in the conduit pipe (PVC pipe).

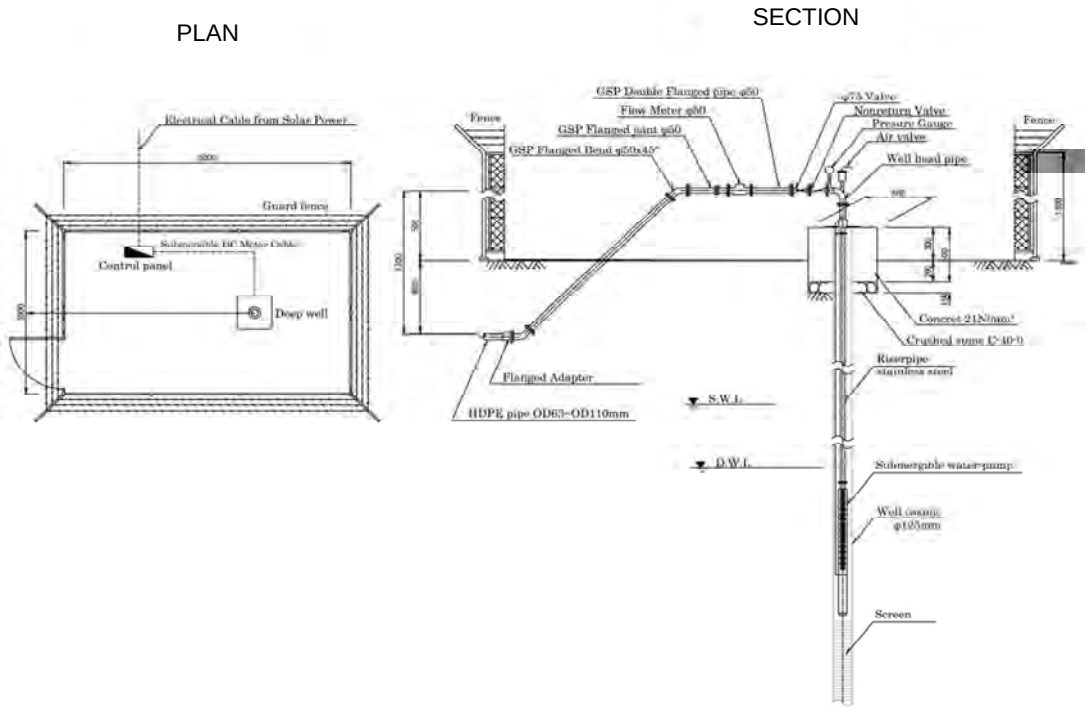


Fig. 2.2.22 General Plan of Intake Facilities

e. Transmission Pipelines

e.1 Alignment of Pipeline

Transmission pipeline is to convey the underground water from borehole to elevated tank. The transmission pipeline is buried under the ground, except rising pipeline to elevated tank. Basically, the pipeline will be buried along roads. The buried depth is 0.85m as the soil covering. At the transverse pipeline to main road, the travelling load has to be considered, and the casing steel pipe is utilized to protect the transmission pipeline. The diameter and length of transmission pipeline in each RGC are shown in Table 2.2.13.

Table 2.2.13 Transmission Pipelines in Each RGC

RGC	No. of Borehole	Transmission Pipeline	
		Diameter (mm)	Length (m)
Koch Goma	2	OD63	1,045.6
Unyama	2	OD90-110	1,643.6
Awere	2	OD63	338.5
Kitgum Matidi	2	OD90	1,712.5
Corner Kilak	3	OD63	1,283.9
Adilang	4	OD63-90	2,529.5
TOTAL	15	-	8,553.6

e.2 Pipeline Material

High-density polyethylene pipe (HDPE, PN10 class) is adopted, it is available in the local market.

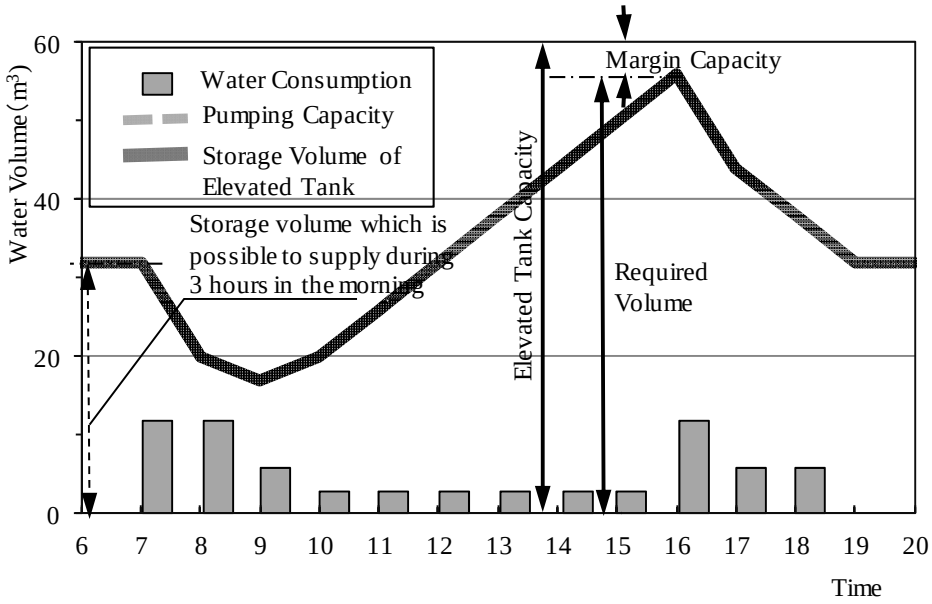
f. Elevated Tank

f.1 Capacity and Installation Height of Elevated Tank

The pump operation hour of borehole is set at seven (7) hours (Approximately 8 am to 3 pm, planned power generation hour: 6 hours), but water needs to be supplied from early morning to evening. Therefore, the amount of supplied water should be secured outside of pump operation hour. In addition, from the viewpoint of stable water supply, the capacity of elevated tank will be set as necessary water volume during morning hour (7 am to 10 am) and evening hour after 4 pm when the solar power generation efficiency decreases. The conceptual diagram of supplied water to water demand is shown in Fig. 2.2.23.

Based on the conceptual diagram, the supplied water during 7am to 10 am, 10 am to 4 pm, 4 pm to 7 pm shall become 42%, 25%, 33% of planned average daily supply. To secure the water volume during morning and evening hours, the necessary storage volume is equivalent to approximately 75% of planned average daily supply. Actual elevated tank capacity shall be selected as regulated volume (every $10m^3$ unit) which is satisfied with the approximately 75% of planned average daily supply.

The gravity flow system shall be adopted in the project, and the installation height of elevated tank is adopted based on head loss to public taps in target RGC supplied area, required water pressure at public taps and the ground elevations at each public tap stand.



Condition:
- Pumpimg Operation Hours by solar power generation: 6 hours (8am to 15pm)
- Supplied Hours to villager: 12 hours (7am to 19pm)
- Water Consumption during the morning and evening peak hours: 2 times as much as the hourly water consumption
- Water Consumption during the noon hour: 0.5 times as much as the hourly water consumption

Fig. 2.2.23 Elevated Tank Capacity and Volume of Stored Water

Table 2.2.14 Principal Features of Elevated Tanks

RGC	(a)Water Demand (m^3/day)	(b)Required Tank Capacity (ax75%m^3)	(c)Planning Tank Capacity (m^3)	Allowance Ratio (c/b)	Tank Height (m)	Tank Diameter (m)	Facility Height (m)
Koch Goma	42	31.5	40	127%	3.7	4.0	8.0
Unyama	72	54.0	60	111%	5.3	4.0	13.2
Awere	34	25.5	30	118%	2.9	4.0	7.0
Adilang	76	57.0	60	105%	5.3	4.0	15.1
Kitgum Matidi	56	42.0	50	119%	4.5	4.0	13.9
Corner Kilak	40	30.0	30	100%	2.9	4.0	9.1

f.2 Types, Structures and Materials to be Adopted

The elevated tank will be set as round shape tank on the steel cradle. The acid-proof coating will be carried out inside the tank, and the paint shall be carried out outside for protection. The steel cradle will be of steel trussed structure.

f.3 Fixtures and Fittings

The fixtures and fittings of elevated tank are shown below.

(1) Water level gauge (Float type): The simplified water level gauge is set in the elevated tank. The operator has to stop the pump before full capacity of elevated tank, judging the storage status of elevated tank by use of the water level gauge.

(2) Overflow pipe: Surplus water is discharged by overflow pipe.

(3) Drain pipe and drainage: Though the overflow pipe, drain pipe and drainage, the surplus water and internal wash water is quickly discharged and transmitted to near natural drainage canal.

(4) Lightning rod: As thunder usually happens in rainy season, the lightning rod is set for security protection of facility.

(5) Steel cradle (trussed structure, stairsteps etc.): On regular cleaning of elevated tank, the disinfection of distribution facility will be carried out, and basically disinfection facility is not set. The above condition was confirmed though the discussion with Ugandan side. In addition, the steel cradle is set in consideration with convenience and safeness on the delivery of the disinfection chemicals for cleaning to elevated tank.

(6) Flow meter: The outlet flow from the elevated tank to distribution pipeline will grasped by flow meter, and the information of operation and maintenance will be gotten in comparison with the measurement result of flow meter at public tap stand.

g. Distribution Facility

g.1 Distribution Pipelines

g.1.1 Alignment of Pipeline

Distribution pipeline is to be connected from the elevated tank to public tap stands. The diameter of the distribution pipeline is set by hydrologic accounting, in order to secure the water pressure (5m) at the public tap stands. As same as the transmission pipeline, the distribution pipeline to public tap stands will be installed under the ground. The diameter and length of the distribution pipeline in each RGC are shown in Table 2.2.15.

Table 2.2.15 Diameter and Distance of Distribution Pipeline

RGC	Distribution Pipeline		No. of Public Tap Stand
	Diameter (mm)	Length (m)	
Koch Goma	OD32-110	1,261.0	3
Unyama	OD32-110	1,664.7	13
Awere	OD32-90	1,018.0	6
Kitgum Matidi	OD32-110	2,361.9	12
Corner Kilak	OD32-110	1,292.8	7
Adilang	OD32-160	2,211.7	12
TOTAL	-	9,810.1	53

g.1.2 Pipeline Materials

As same as the transmission pipeline, high-density polyethylene pipe (HDPE, PN10 class) is adopted, because it is available in the local market. However, vinyl chloride pipe (uPVC) will be adopted in regards to the diameter of more than OD110mm.

g.2 Public Tap Stands

Public tap stands will be set (2 taps, 13 liter/minute/tap) based on planned service population (150 people/tap, 300 people/stand), and water meter is installed. The required water pressure of the public taps is 5.0m based on the design standard of Ministry of Water and Environment. Soak pits (H1.0m*W1.0m*D1.5m) will be set in order to discharge from public tap stands, and it shall take a consideration not to puddle caused by no discharge in terms of the measure to mosquito emergence and surrounding environment.

h. Fixtures and Fittings

Fixtures and fittings to be specifically considered are safety barrier of solar power generation equipment, security light and guardhouse. In the project it shall take a consideration about security.

h.1 Safety Barrier

The safety barrier, guard net and gate will be set in the site of intake facility, elevated tank and solar power generation facility. As the safety barrier of existing water supply facility in Acholi area is not enough for strength and height, the newly-installed safety barrier shall have the anti-theft effectiveness with barrier spike and sufficient height (2.4m).

h.2 Security Lights

The security light (3 lights/facility) will be set as an anti-theft measure in solar power generation facility. LED light (equivalent to 20W) will be adopted as the security light, and the solar power generation module and battery shall be adopted as power source.

h.3 Guardhouse

The guardhouse (5.0m x 3.0m) will be constructed next to the site of the solar power generation equipment outside safety barrier, in order to keep watch on the equipment. The anti-theft measure of the solar power generation facility (especially module) shall be planned to place the security guard at this guardhouse during nighttime.

(2) Procurement Plan

1) Overall Plan

The requested items for procurement were confirmed a service rig, a set of tool kit for repair of hand pump, three (3) vehicles for district water offices as transport measures and one (1) vehicle for the Rural Water Supply and Sanitation Department, Directorate of Water Development, Ministry of Water and Environment. Considering the relevance of the project, the necessity of procurement of repair equipment for borehole is recognized. However, the procurement of vehicle is excluded from the scope of work because it is not possible to guarantee the appropriate utilizing of vehicle for transfer.

2) Repair Equipment for Borehole

i) Truck-mounted Service Rig

a. Requested Contents of Truck-mounted Service Rig

Requested contents of the truck-mounted service rig are described below.

Table 2.2.16 Requested Service Rig

	Specification	Quantity	Notes
1	Medium body cargo truck with crane and lift frame	1 set	
2	Winch	1 set	For getting out of hand pump assembly and submersible water pump equipment
3	Double tube pipes for well development with engine compressor	1 set	
	a Inner tube: 1.0 inch x length, 2.75m	141 m	
	b Outer tube: 2.5 inch x length, 2.75m	141 m	
4	AC Engine welder with accessory kit.	2 sets	Repair hand pump assembly, and connection rod, riser pipe and connection parts of submersible water pump etc.,
5	Training of Request Service Rig	1 set	Training for rig operation (by supplier), Instruction Manual

b. Deployment and Users

Deployed Organization: Rural Water Supply and Sanitation Department, DWD: Actually, the rig equipment shall be assigned in TSU-2 which is technical support organization of national government for Acholi area, and fuel cost expended on transportation of the rig equipment has to be reduced by

half of current situation. In addition, as it was before, the service rig kept by national government has to be stored in Kampala where national government is placed, and then it will be mainly utilized for repair work for borehole in the Central area.

User: Service Rig Team under the direct control of Commissioner in Rural Water Supply and Sanitation Department, DWD. In case of procurement of rig, in order to plan the smooth technical transfer, the current team has to be divided into two and both teams have to employ new members. It will become two (2) teams operation.

c. Necessity of Newly Requested Service Rig

In Acholi area, there are a lot of boreholes which were constructed before and during the stage of emergency humanitarian assistance, however, the most of these boreholes currently have not been operated due to lack of maintenance. Therefore, villagers especially IDPs are suffering from securement of safe water. On the other hand, Acholi area is the poor area for groundwater availability due to hydrogeological condition and it needs enough time and budget to develop new groundwater. To repair and utilize existing boreholes which have not been operated is effective method, in order to solve the problem of water supply in this area. As mentioned above, in case of procurement of newly requested service rig, it is expected to greatly contribute to improveing water supply condition in Acholi area so it is necessary to procure the service rig.

d. Replacement Parts and Consumable Materials

The replacement parts and consumable materials will be procured during one (1) year by the completion of budget allocation of Ugandan side. The list of replacement parts and consumable materials of truck-mounted service rig is shown below.

Table 2.2.17 List of Spare Parts and Consumables of Truck-mounted Service Rig

Replacement Parts and Consumable Materials	Quantity
1. Truck-mounted Service Rig	
1.1 Fuel Filter on Vehicle	8
1.2 Oil Filter on Vehicle	8
1.3 Air Filter on Vehicle	4
1.4 Bulb for front light on Vehicle	4
1.5 Fuse on Vehicle	4
1.6 Wiper Blade on Vehicle	2
1.7 Oil Filter on Crane (Return)	2
1.8 Oil Filter on Crane (Tank)	2
2. Engine Compressor	
2.1 Fuel Filter (Engine)	4
2.2 Oil Filter (Engine)	4
2.3 Air Filter (Engine)	2
2.4 Oil Filter (Compressor)	2
2.5 Air Filter (Compressor)	2
3. Engine Welder Machine	
3.1 Fuel Filter Element	4
3.2 Oil Filter Element	4
3.3 Air Filter Element	2

ii) Toolkit for Repair of Hand Pump

a. Requested Contents of Toolkit for Repair of Hand Pump

The requested contents of toolkit for repair of hand pump are shown below.

Table 2.2.18 Requested Tool Kit for Hand Pump Mechanics

	Tool	Q'ty	Note		Fishing Tool	Q'ty
1	Tool Box with lock (2 cylinder locks)	1	200mmx200mm x900mm	1	U-2 Fishing tool for riser pipes with sockets	1
2	Riser pipe lifter	3		2	U-2 fishing tool for riser pipes without sockets.	1
3	Water tank pipe lifter	1		3	U-2 fishi8ng tool for Connection rods	1
4	Bearing mounting tools	1				
5	Chain coupler supporting tool	1				
6	Connecting rod lifter 'O' type	1				
7	Connecting rod vice	1				
8	Heavy duty riser pipe clamp	1	PVC			
9	Axle punch	1				
10	Connecting rod coupling spanner	2				
11	Crank Spanner M17 x M19	2				
12	Double ended spanner M17 x M19	2				
13	M12 Bottom die with handle	1				
14	Ball pein hammer 2 lbs	1				
15	900mm pipe wrench	2	Record leader			
16	250mm file rough	1				
17	250mm file medium	1				
18	250mm screw driver- Flat	1				
19	Oil can 1/4 liter	1				
20	Putty	1	Grease			
21	Wire brush	1				
22	Hack saw frame with 2 blades	1				

Tool kit has two types; standard tool kit and special tool kit. The standard tool kit is mainly used for periodical inspection and the special tool kit is used for installation and repair of hand pump. However, considering for the actual usage, both tool kits must be used in the many situations and two (2) toolkits are considered as a set of tool kit. In addition, the fishing tool is also included in procurement and the tool is used for fishing up hand pump's parts and tools, which are dropped down into boreholes.

b. Assignment Organization and User

Assignment organization is sub-county office of the target area in the project, and user is hand pump mechanic in each sub-county. In principal, the chief of sub-country has responsibility of management of the procured tools and lend them to hand pump mechanic by his requests.

c. Quantity

A set of tool kit (standard tool kit, special tool kit and fishing tool) will be distributed to sub-counties of each district.

3) Vehicle

i) Vehicle for District Water Office

a. Requested Contents

Nwoya, Pader and Agago district water offices requested to procure the pickup truck, because of poor activities to community caused by no vehicles at present.

Table 2.2.19 Requested Vehicles for District Water Offices

Specification		Quantity	Note
	Pickup Truck	1 vehicle	Nwoya District Water Office
	Pickup Truck	1 vehicle	Pader District Water Office
	Pickup Truck	1 vehicle	Agago District Water Office

b. Reason of Exclude

The present situation of vehicles which district water office holds is shown below, according to the interviews to each office.

Table 2.2.20 Present Conditions of Vehicles of District Water Offices

District Water Office	Type of Vehicle	Quantity	Condition		Main User
			Good Condition	Other	
1. Gulu	Pickup Truck	1		Under repair	District Water Office
	Motor Bicycle	2	2		Sharing with district government
2. Amuru	Pickup Truck	1		Breakdown (1)	
	Motor Bicycle	3	2	Theft (1)	District Water Office
3. Nwoya	Pickup Truck	1		Breakdown (1)	
	Motor Bicycle	1	1		Sharing with district government
4. Kitgum	Pickup Truck	2	2		District Water Office
	Motor Bicycle	5	3	Breakdown (2)	District Water Office
5. Lamwo	Pickup Truck	0			
	Motor Bicycle	0			
6. Pader	Pickup Truck	1	1		Sharing with district government
	Motor Bicycle	0			
7. Agago	Pickup Truck	0			
	Motor Bicycle	0			

According to the present situation of vehicles at each water district office, in case of pick-up truck, most of the trucks except Kitgum district are under repair, and the trucks has not been repaired during at least a few months. In addition, as seeing from the example of motor cycles, it is high possibility to share the trucks with district government, and it is no guarantee to utilize the truck for the activities of district water office and to contribute to the activities of the project. Moreover, it is no guarantee to procure the fuel for the trucks. Therefore, the requested vehicles will not be procured.

ii) Vehicle for Community Mobilization Section, Rural Water Supply and Sanitation Department, Directorate of Water Development, Ministry of Water and Environment

a. Requested Contents

Ministry of Water and Environment additionally requested to procure a pick-up truck (hardtop

type) because of poor activities to rural area caused by no available vehicles at present and the negative influence to the technical assistance in the project.

Table 2.2.21 Vehicle for Community Mobilization Section of Rural Water Supply and Sanitation Department, DWD

Specification		Quantity	Note
	Pickup Truck (Hardtop Type)	1 vehicle	Resident Mobilization Division, Rural Water Supply and Sanitation Department, Directorate of Water Development

b. Reason of Exclude

Present vehicles of Planning and Development Section, Rural Water Supply and Sanitation Department, DWD is shown below, including in the service rig which was provided by Japanese grant aid in 1997.

Table 2.2.22 Vehicles of Rural Water Supply and Sanitation Department, DWD

No.	Type	Name	Year Purchased	Responsible Person
1	Station Wagon	Toyota Land cruiser Prado	2006	Assistant Commissioner
2	Pickup Truck	Mitsubishi L200	2004	Hydro-geologist
3	Pickup Truck	Toyota Hilux	2011	Principal Engineer
4	Pickup Truck	Toyota Hilux	2006	Principal Water Officer (Groundwater)
5	Water Tanker	Mitsubishi Truck	2009	Assistant Commissioner
6	Water Tanker	Mitsubishi Truck	2009	Assistant Commissioner
7	Service Rig	Toyota Diesel UD	1997	Assistant Commissioner

In case of DWD, if the breakdown happened, each vehicle was repaired by themselves unlike district government offices. However, it is possibility to utilize the vehicle for purposes other than the original, and to share with other divisions. In addition, there is issue to procure fuel, and it is no guarantee to treat the project activity on a case-by-case basis. Therefore, the requested vehicles will not be procured.

2.2.3 Outline Design Drawings

The drawings for outline design of boreholes with hand pump and piped water systems are shown in the Attachment.

Table2.2.23 List of Outline Design Drawings

No.	Drawing Title
	General Plan
1.	Location of Target Villages and RGCs
	Borehole with Hand Pump
2.	Typical Structure of Boreholes and Hand Pump Installation
	Piped Water System
3.	Layout Plan (Koch Goma RGC)
4.	Layout Plan (Unyama RGC)
5.	Layout Plan (Awere RGC)
6.	Layout Plan (Kitgum Matidi RGC)
7.	Layout Plan (Corner Kilak RGC)
8.	Layout Plan (Adilang RGC)
9.	Typical Intake Facility
10.	Elevated Tanks
11.	Elevated Tank and Solar Power Generation Facility
12.	Solar Power Generation Facility (Solar Power Generation Module)

No.	Drawing Title
13.	Solar Power Generation Facility (Security Fence and Gate)
14.	Guard House for Solar Power Generation Facility
15.	Pipeline Chambers
16.	Public Taps

2.2.4 Implementation Plan

(1) Implementation Policy

The project is to be implemented in accordance with the conditions stipulated in the Exchange of Notes (E/N) and Grant Agreement (G/A) agreed between Japanese and Ugandan governments. The implementation organization of Ugandan side for the Project is Ministry of Water and Environment (MOWE), however, Directorate Water Development (DWD) under MOWE will be responsible for the implementation of the project. The facilities and equipment will be transferred to each local government after handing over to Ugandan side, and each local government will be responsible for the operation and maintenance of facilities and equipment.

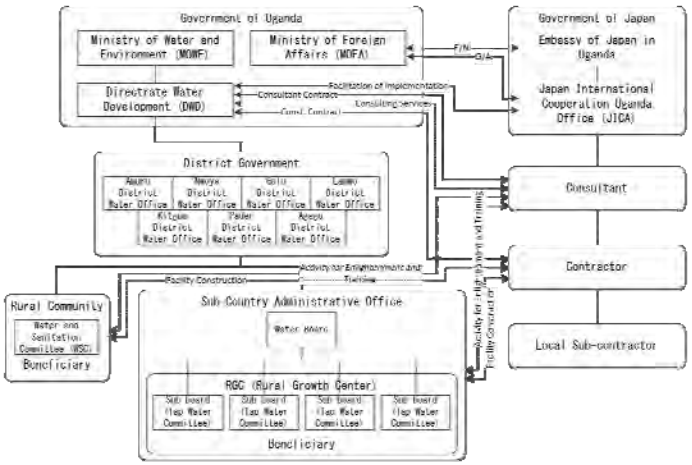


Fig. 2.2.24 Project Implementation Organization

DWD will hire a consulting firm for engineering services such as detailed design, preparation of tender documents, support of tender, construction supervision, procurement management, technical assistance, etc. Japanese construction company will be hired for the implementation of the project and local contractor will be utilized for construction of water supply facilities and drilling boreholes. The organizations related to the project and their relationships are shown in the Fig. 2.2.24.

(2) Implementation Conditions

1) Implementation Schedule in Consideration of Technical Assistance Activities

In determining the site of borehole construction and installation of hand pump etc., it needs to examine not only hydrogeological condition but also villagers' demand for sustainable of borehole facilities. Therefore, the determination of the site of borehole and its construction should be conducted efficiently through technical assistance activities and consistent schedule. In planning of the overall implementation schedule, it needs to arrange the schedule from detailed design to construction stage closely and adopt the villagers' opinion as much as possible for the smooth implementation of the project. During the construction period, actual progress and problems should be informed to villagers so that they will be well aware of construction and water supply facilities based on their opinion and their ownership for facilities will be raised.

2) Implementation of Construction in Consideration of Safety

Although civil war finished, security condition in Acholi area is still poor. The permitted areas where Japanese can stay are limited in three (3) areas such as Gulu, Kitgum and Pader. On the other hand, the construction sites are spread to seven (7) districts in Acholi area, and ,therefore, it is necessary to implement construction supervision based on an appropriate implementation plan for security measures.

(3) Scope of Works

The scope of works of the Japanese and the Ugandan sides is shown in the following table.

Table 2.2.24 Scope of Construction/Procurement of Ugandan and Japanese Governments

Description	Japanese Side	Uganda Side
1. Deep Borehole Facility with Hand Pump		
(1) Land Acquisition for Facilities and Construction Works		○
(2) Preparation of Access Roads to the Sites		○
(3) Drilling Works and Appurtenant Facility Work including Installation of Hand Pump	○	
(4) Installation of Protective Fence*		○
2. Piped Water Supply Facility		
(1) Land Acquisition for Facilities and Construction Works		○
(2) Provision of Wells (Existing and Exploratory Wells)		○
(3) Construction of Water Source Facility, Transmission and Distribution Facility and Service Facility (including protective Fence etc.)	○	
3. Equipment Procurement (Borehole Repair Equipment)		
(1) Securing of Land and Facilities for Keeping Equipment and Materials ready for Disposition		○
(2) Securing of Service Rig Operator		○
(3) Procuring of Well Repair Equipment (Service Rig, Repair Tools for Hand Pump)	○	

Note *: After hand over, construction of fence is conducted by the participation of villagers. (including fence materials)

(4) Consultant Supervision

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

1) Detailed Design

In this phase, the detailed design, tender documents and other documents necessary for the execution of the project will be prepared, and the technical assistance activities for resident mobilization will also be conducted.

2) Tender

The consultant will assist DWD in tendering procedure of the project. After the authentication by JICA, the contract will become effective as the contract for grant aid.

3) Supervision of Construction and Procurement

Consultant will assist DWD in completing the project within the schedule prescribed in the Grant Agreement (G/A), by providing contractor with instruction and supervision which is focused on the schedule and quality management, for example, meeting with contractor before

the commencement of the construction works, witness of factory inspection and equipment shipment, construction works, equipment installation, test operations and completion inspection. The consultant will continuously execute the activity related to the technical assistance during and after the construction, and make an effort to secure the sustainability of the operation and maintenance by villagers.

(5) Quality Control Plan

The consultant dispatches the staff as a resident supervision engineer, prepares construction supervision guideline based on quality control plan, and implements quality control, progress control and safety control. The main items of quality control for site construction are described below.

- Foundation work: Plate bearing test, etc.
- Compaction work: Material test and Density test, etc.
- Concreting work: Material test (sand, gravel and cement), Mixing test, Strength test and Slump test
- Reinforcement: Tensile test and Bending test (Factory shipment certificate)
- Transmission and distribution pipelines: Hydraulic pressure test
- Drilling of deep well: Measurement of drilled depth, length and position of casing and screen pipes, Pumping test, etc.

In addition to the above, the consultant will check and measure a performance in each stage, in conjunction with the construction progress. As for the commissioning, the consultant will manage time schedule to implement handing over after checking facilities' function.

As for the other construction machinery, the consultant will instruct the contractor to implement performance test for submersible motor pump and solar power generation equipment before factory shipment under consultant's witness. In the installation of equipment, the consultant will prepare the installation supervision guideline as well as civil engineering and architecture, and implement the required test based on its guideline. In the time of completion of installation, the consultant will implement performance test, check if the quality of equipment is secured and conduct commissioning. The above specifications related to quality control should comply with the international specifications, such as JIS and ISO etc.

(6) Procurement Plan

In principle, most of the required equipment is to be procured in Uganda or in Japan. In order to secure quality and delivery period, and additionally to enhance price competitiveness, OECD-DAC member countries and South Africa and Kenya and South Africa is considered as the third county for the procurement in Japan and in Uganda, respectively. The scheduled procurement country for main equipment is listed below.

Table 2.2.25 Country of Procurement for Major Equipment and Materials

No.	Items	Japan	Third Countries	Uganda
1.	Procurement Equipment			
1.1	Service Rig (including accessory)	○	○	
1.2	Repair Tools for Hand Pump			○
2.	Equipment for Facility Construction			
2.1	Submersible Motor Pump/Solar Generation Module	○	○	
2.2	Casing/Screen Pipe		○	○
2.3	Hand Pump (including accessory)		○	○
2.4	Cement, Reinforcing Bar		○	○
2.5	Gravel, Aggregate			○
2.6	PVC pipe		○	○
2.7	HDPE pipe		○	○
2.8	Galvanized Steel Pipe		○	○
2.9	Elevated Tank		○	○
2.10	Steel Stock for Elevated Tank Cradle		○	○

In the case of procurement from Japan, the equipment will be transported by sea from Japan to Mombassa, and then transported by land (route A109, 1,003 km) from Mombassa to Uganda's border in Busia. It is about 177 km from Busia to Kampala and the total distance is 1,180 km. It will take about 20 to 30 days including the customs clearance handling. In case of procurement from Japan, there are two customs clearances: in Mombassa, in Busia or Kampala. In case of procurement from Kenya, Uganda and Tanzania, there is no international customs clearance; however, there is a value-added tax in Uganda. It is necessary to submit a proforma invoice for duty exemption in advance. The procured equipment will be transported to DWD office in the capital Kampala or each district water office in Acholi area. The distance between Kampala and Gulu is 347km.

(7) Initial Instruction and Operation Training

In commissioning by the contractor and equipment supplier, the required items for the instruction of operation are shown below, and the instruction will be implemented based on the operation and repair manual in English.

Table 2.2.26 Outline of Initial Instruction and Operation Training

Item	Facility/Equipment	Training Contents
1. Procurement Equipment (instruction to operators on taking-over)	Service Rig	- Repair and Check of Truck - Instruction and Check of Generator and Welder - Instruction and Check of Air Compressor - Instruction and Check of Lifting Device - Instruction and Check of Crane
2. Facility (instruction to operators and care-takers on the completion of construction at each site)	Submersible Motor Pump and Solar Power Generation	- Operating Method and Check of Submersible Motor Pump - Instruction of Reading of pressure gauge and water meter - Check of Solar Power Generation - Check of Electrical Service Wire
	Distribution Network and Public Tap	- Instruction of Valve and Leakage Confirmation - Instruction of Reading of Water Meter
	Elevated Tank	- Instruction of Reading of Water Level Gauge and Water Meter - Instruction of Leakage Confirmation - Operation of Valve
	Hand Pump	- Dailly Check etc. - Direction of Hand Pump Structure - Regular Replacement of Parts

(8) Technical Assistance Plan

1) Background of Technical Assistance Plan

a. Functional Recovery of Communities for Sustainable Operation and Maintenance of the Facilities

Civil conflict continued more than twenty years in Northern Uganda including Acholi Sub-region and it made the development of the area more remarkably delay than the other parts of Uganda. People of Northern Uganda had been displaced from their home into camps which were installed around sub-county seats and so on for IDPs, and were forced to live under the wings of Ugandan government and aid agencies during the period of the conflict.

With relative peace beginning in 2007, IDPs started to return to villages and as of now about 90% or more people have returned to their original villages according to the statistics by UNHCR and others.

During the civil conflict, many donors intensively constructed social infrastructures as basic needs such as water supply facilities and latrines near IDP camps. On the other hand, almost no construction of social infrastructures has been done in their original villages because of their absences.

With post conflict IDPs returned to their original villages, the constructed water supply facilities were becoming unnecessary at IDP camps. At the same time the water supply facilities in their original villages were left without the operation and maintenance during their absences so that many of them have been broken.

In spite of their success of returning to their original villages, pre-existing relationship among community members has changed due to long life in the IDP camps. Therefore capability of a community function (for example, cohesiveness, decision-making and leadership), which other communities in other areas of Uganda usually have, has been still on the way to reproduction in Acholi Sub-region. As a result, it is necessary for sustainable use of water supply facilities to recover functional capability of communities.

b. Critical Requirements of Construction of Rural Water Supply Facilities and Their Self Governing Operation and Maintenance

Among requested 16 RGCs, 11 RGCs have 28 existing piped water supply facilities in all. These facilities were constructed during the civil war as a part of humanitarian relief, and greater parts of their operation cost were defrayed by donors so that many of IDPs have had no experience of paying water user fee and operation cost.

According to hearings conducted in the field survey, many of the facilities stopped their operation after 2009 when the supports of donors finished. Only five (5) water supply facilities are operating. All these operating facilities have had solar power generation systems for working their submersible motor pumps. A water supply facility must have own WSC, however, many old WSCs have stopped their activities due to dispersion of committee members during the civil conflict. Even if the WSC was working, the monthly water user fee collections tend to stagnate, and when the facility broken down, WSC would try to collect some contributions from users for

the repair temporarily. When the repair and maintenance cost is high, for example, in case of repair of pumps and water supply and distribution facilities, WSCs can not treat them and finally those facilities are going to be abandoned in most cases.

The situations of target villages where boreholes with hand pump will be installed are similar to the situation of RGCs mentioned above. People in the target villages do not have experience with operation and maintenance of water supply facilities and even with payment of water user fee.

On the other hand, developments activities in Uganda are demand driven, and are carried out through its system of decentralization that aims to bring politics closer to its citizens. The water sector in Uganda has been taking a bottom-up, participatory approach, not taking a top down approach. In the bottom up approach people are requested first to look at their lives, understand the situations, realize their problems, decide how to solve the problems, and plan their activities accordingly. This bottom-up process is called Demand Responsive Approach (DRA), a pillar of water facility management in Uganda.

In addition, the central government of Uganda obliges communities to fulfill following requirements prior to construction of water supply facilities. The aims are to promote sensitization and ownership of expectant water users, and to keep higher sustainability of facilities to be constructed.

Table 2.2.27 Summary of Critical Requirements

Items		Contents
1	Memorandum of Understanding (MOU) signed before the go-ahead is given for construction	- MOUs that stipulate the nature of cooperation, obligations and responsibilities of signatory parties - Signed between (1) GoU and Districts, (2) Districts and Sub-counties, (3) communities and Sub-counties/Districts, and (4) clients.
2	Meaningful Involvement of Women	Before construction goes ahead the community mobilization and empowerment should have reached the following minimum requirements for the meaningful involvement of women. - The election of women to positions of: WSC Chair and WSC Treasurer is strongly encouraged to ensure empowerment of women in RWSS decision-making and management processes within community structures. - At least half of caretakers (water point attendants) and hand pump mechanics selected by communities shall be women in case of boreholes with hand pumps. . - Skills training shall be targeted to these women in particular, plus their appointed/elected male colleagues, so all can perform their jobs as required. - The entire community shall be involved in discussions involving 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 in the process. - All communications/information to communities shall target both women and men.
3	Hygiene Promotion and Sanitation	The provision of water offers an excellent opportunity to stimulate improved household latrine coverage and general household hygiene practices through community participation and empowerment. - All households of community leaders shall have latrines that are safe, clean and used. - During the mobilization phase, household latrine coverage shall be increased by at least 30 percent (this in addition to the above requirement for all community leaders; the requirement of safe, clean and used also applies).

Table 2.2.27 Summary of Critical Requirements

Items		Contents
		- How the community intends to increase coverage and usage to a 95 percent level within four years after installation of its water supply facility shall be included as one aspect of the 8-Year Operation and Maintenance Plan.
4	Community Contributions	The contribution varies according to necessary works as shown in below. - New source: 180,000 UGS - Rehabilitation of existing source: 45,000 in cash
5	Settlement of Land and Ownership Conflicts	Communities being assisted shall be required to satisfactorily prove (e.g. with written agreements) that all potential foreseeable land access and ownership issues have been resolved beforehand.
6	Operation and Maintenance Plan	Prior to commencement of any construction, there must be an approved operation and maintenance plan for at least 8 years. The plan should deal explicitly with: - Method by that community covers operation and maintenance cost. - Lifespan of spare parts - Possibilities to obtain spare parts and its cost. - Cost for operation and maintenance - Cost for replacement of facility - Back up support and service by District - Countermeasures against the following areas of concern that have been raised at community level; Lack of commitment by some WSC members to attend meetings, Disagreements on allowances for WSC members/ pump mechanics, Users' refusal to pay for operation and maintenance and problems in collecting funds, Access and management of hand pump mechanics/plumbers, Users' refusal to participate in cleaning of source, Unavailability of extension staff, Tools, spare parts and materials for repairs

This project also requests communities to fulfill above 6 critical requirements as prerequisites prior to implementing construction of water supply facilities. When RGSs/Villages can not fulfill these critical requirements, the RGCs/Villages will be excluded from targets sites of this project in principle. Therefore, technical assistance is necessary for target RGCs/Villages to fulfill the critical requirements.

Communities in Acholi Sub-region are delay in reconstructing its basic capability of community functions as described previously. In addition, IDPs had received the full benefit of humanitarian relief including supply of safe water with free of charge during their long life in IDP camps. Therefore, deep activities of awareness-raising and gaining basic skills for operation and maintenance are necessary to make them fulfill the critical requirements and implement community-based operation and maintenance. Consequently, it is important for the technical assistance in the project to take these situations into consideration and implement more finely-tuned activities than that in the other region.

c. Actors Responsible to the Project in Local Government

Community members and WSCs play the major role in ensuring sustainability of water supply facilities those will be constructed in the project.

While local governments, especially District Water Offices, play a supporting role by offering various kinds of assistances 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 water supply facilities.

The main actors for supporting these activities above mentioned in the Local Government are as

follows:

Table 2.2.28 Actors in Local Government for Supporting Operation and Maintenance

	MOWE (DWD)	MOGLSD	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)
County	County Water Officer (In charge of County but belongs to District Water Office: 1 Officer in each County)		
Sub-county	(Private Sectors) Hand pump Mechanic (HPM) System Operator Spare Parts Dealer	Community Development Assistant (CDA)	Health Assistant (HA)

Local Governments in Uganda are facing delay of employments of necessary human resources at present due to rapid progress of the decentralization and so on. Most of local governments including District Water Offices are basically under the same situation. As a result, many District Water Officers tend to have been running multiple posts and duties. Districts Water Offices have their branch offices in sub-counties; however, there are substantially no technical specialists of water resources development. Real activities to facilitate community members and support WSCs are to be carried out by CDAs and HAs. In implementing these 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. These facilitation and supporting activities are essential for the successful implementation of the project, however, the implementation seems to be difficult especially for fledgling District Water Offices. Therefore, it is also essential for securing sustainability of water supply facilities to assist supporting activities of District Water Offices for WSCs in line with strengthening of operation and maintenance activities of WSCs.

d. Donor Harmonization

Uganda has been ahead in harmonization among donors. In water sector, many donors such as World Bank, Canada, Denmark and NGOs have intensively implement projects and expand various activities so that Meetings for donor harmonization have been held on a periodic basis to aim information exchanges and coordination of enforcement strategies among donors. In Acholi Sub-region, donors such as UNHCR, UDSAID, and UNICEF have been conducting their assistance programs. UNHCR and USAID have especially respected the policies and strategies of Uganda, and they have been conducting assistant activities which have aimed at keeping higher sustainability of operation and maintenance of water supply facilities and

helping communities to fulfill the critical requirements

Therefore, it is necessary for the project to ensure that contents of mobilization and sensitization activities for community members and concerned parties should not vary widely from other donor's activities, and to conduct assistant activities which are in line with the policies and strategies of the water sector in Uganda. Among others, consideration of equality and equity are necessary for treatment of the critical requirements for the construction of water supply facilities and setting up of amount of the contribution to reduce differences among projects of various donors.

e. Current Situation of HPM

The water sector in Uganda has a strategy to deploy two HPMs in one sub-county or maximum number of boreholes with hand pumps to be assigned a single HPM will be fifty units. In case of the project area, there are more numbers of HPMs than the numbers requested above as shown in Table 4.1.6. In addition, DWOs are planning to establish "Hand pump Mechanic Associations (HPMAs)" with the support of MOWE, UNICEF and other donors. The associations are a kind of private organizations, and will be registered at the district level as a Community Based Organization. Each HPM become a member of a HPMA (registered HPM) with paying membership fee. All the registered HPMs will form part of the District HPMA. A representative of HPMs (Senior HPM) at sub-county level will be selected among themselves. And a HPMA will be led by a single HPM selected from among the Senior HPMs. HPMAs aim at organizing HPMs who are so far solely doing repair and inspection of hand pumps as a sideline, giving education and skill upgrading to HPMs with lack skills, lifting their social status and increasing their incomes.

Given these circumstances, it will be no problem for HPMs to do minor repairs and inspections routinely. On the other hand, opportunities to meet treatment and repair of PVC riser pipes are generally very few for HPMs. As a result, there are higher opportunities to happen some accidents when HPMs do these unaccustomed works, and these inappropriate repairs and inspections may result in breakdown of boreholes with hand pumps.

2) Necessity of Technical Assistance (Issues)

Practical issues of the project are followings:

i) In Uganda, a water supply facility is a property of a community under the policy of decentralization. It obliges user of water supply facility (members of community/RGC) to implement operation and maintenance by themselves, and WSC should play a leading role in daily operation and maintenance under the policy. However, independent-minded activities of WSCs have not yet developed even in RGCs which have existing water supply facilities. To solve this issue, it is necessary for RGCs to rebuild/establish WSC with strong leadership for conducting operation and maintenance of piped water supply facilities and move ahead on the activities aggressively. On the other hand, there are no existing WSCs in target villages for new boreholes with hand pumps. Therefore, it is also necessary to establishment WSCs to promote operation and maintenance for the facilities to be constructed under the project.

ii) Government of Uganda has established the six critical requirements against construction of water supply facilities to strengthen sustainability of constructed facilities and operation and maintenance activities. However the experiences of humanitarian relief during the civil conflict have made many members of target RGCs/villages understood “the Ugandan Government is responsible for safe water supply to us”. And they have little understanding of the importance on linkage between safe water and their health. As a result, there is higher possibility to meet troubles in operation and maintenance activities such as collection of water user fee so that their sensitization activities are necessary. In addition, there is another possibility for them to continue usage of unsafe water even after construction of facilities under the project due to collection of water user fee.

iii) The project has prepared solar power generation system for piped water supply facility as countermeasure against the issue ii) above mentioned due to low cost of the operation and maintenance. Application of this water supply system makes it possible to adopt flat rate system for water user fee collection which can also apply to a borehole with hand pump system. The operation and maintenance system requests establishment of organization of operation and maintenance for each facilities to ensure collection of water user fee by concerned community and bring up ownership of water supply facility.

iv) Other donors have respected the policies and strategies of Uganda, and they have been conducting assistant activities which have aimed at keeping higher sustainability of operation and maintenance of water supply facilities and helping communities to fulfill the critical requirements. In addition, each community in Acholi Sub-region has characteristic that the capability of a community function has been still on the way to reproduction. Therefore, it is necessary for sustainable use of water supply facilities to make efforts to minimize the difference of contents of assistance activities among donors, implement assistance activities with high quality for community members, and make the assistant activities for communities in line with the policies and strategies of the Government of Uganda.

v) The project area has more numbers of HPMs than the numbers requested in the government strategy, and HPMs are dealing minor repairs and inspections routinely. On the other hand, opportunities to meet treatment and repair of PVC riser pipes are generally very few for HPMs, and the lack of the experience may cause higher opportunities of happening some accidents when HPMs do these unaccustomed works, and these inappropriate repairs and inspections may result in breakdown of boreholes with hand pumps. As countermeasures against this problem, the project is going to adopt hand pump unit with higher quality, for example, adoption of acid-resistant uPVC riser pipes, installation of stainless-steel socket to the end of riser pipe, and installation of centralizers to keep riser pipes at the center of casing pipes for protection of riser pipes. However most important countermeasure is a capacity development of HPMs to have specialized knowledge and skills to treat riser pipes properly when riser pipes are drawn up and down for its repair, inspection and re-installation.

3) Objectives of the Technical Assistance

To solve the issues above described, the technical assistance in the project sets the following objectives.

- Effective use of the constructed water supply facilities, and positive and smooth collection of water user fee.
- Autonomous and sustainable operation and maintenance of the constructed water supply facility under cooperation of community members and the WSC.
- Strengthened support system by local government for WSCs.
- Improvement of repair and inspection method, and proper repair of hand pumps by trained HPMs

The Project Design Matrix (PDM) of the technical assistance is shown in Table 2.2.29.

4) Outputs of the Technical Assistance

Outputs of the technical assistance program activities are shown below.

Output 1 The concerned persons at the local government and community members understand aims, roles and importance of WSC, and are willing and motivated to take part in WSC support.

Output 2 Community members understand the importance of safe water (relationship between safe water and health, sanitation, and hygiene), use efficiently constructed water supply facilities, and basic activities of WSC such as collection of water user fee go on smoothly.

Output 3 Members of WSC understand the purpose of WSC, their roles, and organizational management practice, and operation and maintenance of the constructed water supply facilities go on smoothly under cooperation of community members and the WSC.

Output 4 HPMs understand and master repair and inspection method of hand pumps installed under the project, repair and inspect hand pumps properly, and community members use the hand pumps sustainably.

5) Technical Assistance Program Activities (Inputs Plan)

“Community mobilization and sensitization” and “HPM training” are implemented to achieve above outputs. Details of the activities are shown in below.

a. Contents of the Activities

a.1 Community Mobilization and Sensitization Activities

Community mobilization and sensitization activities are implemented through following three steps. Those are “Pre-Constriction Workshop”, “During-Constriction Workshop” and “Post-Constriction Workshop”

i) Pre-Construction Workshop:
Workshop to representatives of community (boreholes with hand pump), representative of

RGC (piped water supply facility), concerned person in sub-county and community members. The purpose of the workshop is sensitization and organization of community members for fulfillment of the critical requirements.

ii) During-Construction Workshop:
Preparation for facility construction such as confirmation of construction sites, Workshop at installation of facility for explanation of facility usage, inspection and so on, construction of fence which is set up by community participation (boreholes with hand pump), take-over of facility and so on.

iii) Post-Construction Workshop:
Workshops to representatives of community (Borehole with hand pump), representatives of RGC (piped water supply facility), and concerned person in sub-county for operation and maintenance of facility: Monitoring for confirmation on rate of achievement of self-sustaining operation and maintenance, and additional workshop if it is necessary.

Pre-Construction Workshop

Pre-Construction Workshop is facilitated by consultants from local Ngo or a local consultancy firm. The consultants visit each target village/RGC at least five times for Village and six times for RGC to facilitate workshop sessions. One consultant team consists of one facilitator and one assistant facilitator.

During/Post-Construction Workshop

After finishing Pre-Construction Workshop, tendering for selection of a contractor is conducted, and During/Post-Construction Workshop begins at the same time of commencement of construction work by selected contractor. During/Post-Construction Workshop should be implemented in conformity with construction schedule so that it is important to hold workshop in appropriate timing through sufficient negotiation at regular meetings with a contractor.

During/Post-Construction Workshop is also facilitated by consultants from a local NGO/consultancy firm. Consultant teams visit each project Village/RGC. In case of boreholes with hand pump facilities, the teams implement confirmation of facility construction sites, confirmation of participation of a community in facility construction and participation plan, witness to explanation of hand pump usage done by a contractor and fence work by community members and ceremony of handing over a constructed facility to a community. In case of piped water supply facilities, the teams implement also confirmation of facility construction sites, capacity development of WSC, witness to explanation of a facility usage and operation and maintenance done by a contractor, and ceremony of handing over a constructed facility to a sub-county.

Post-Construction Workshop aims at capacity development of WSC executives on related matters to operation and maintenance of facility. Local consultants team also visit communities periodically at interval of several months, monitor the rate of activities of WSC and community members for sustainable operation and maintenance, and implement additional workshops to establish sustainable operation and maintenance activity if it is necessary. In addition, when there are communities which have problems in sustainable operation and maintenance, it is necessary to monitor their activities and implement additional workshops even after completing

the project. Therefore the issues are taken over to facilitators in concerned local government with a summary document which describes the situation of operation and maintenance and the issues of the concerned community to be solved.

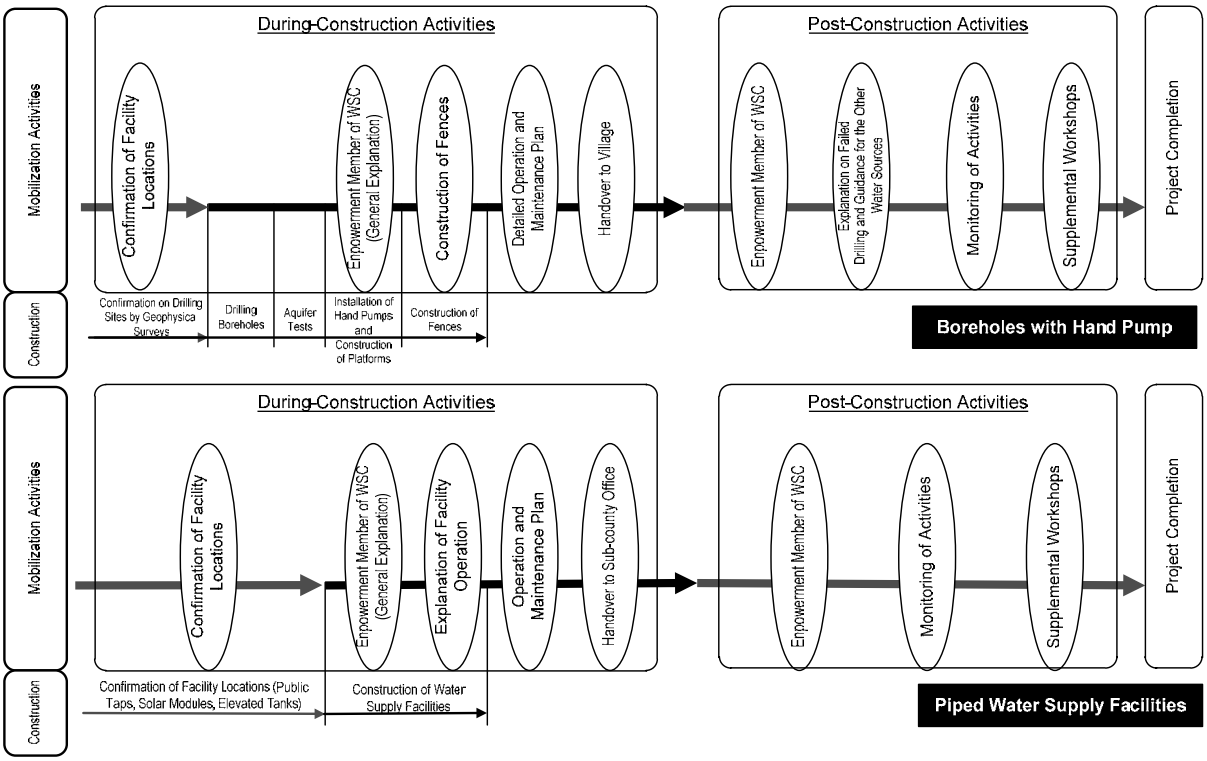


Fig. 2.2.25 Flow Chart of During/Post Construction Workshop

a.2 HPM Training

HPM training aims at prevention of accidents which are likely to take place when HPMs draw up riser pipes and re-install them. Participants of the training are three HPMs for every sub-county. The contents of HPM training is shown in below Table.

Table 2.2.30 Contents of HPM Training

Activities	Contents	Duration/ Sub-County
(Hardware) Treatment, repair and inspection methods of PVC riser pipes of U-2 type hand pumps which are installed in the project	- Structure of the hand pumps installed in the project and the pump up technology. - Hand pump repair tools and their usage. - Procedure and points about drawing up existing riser pipes and re-installation of fixed riser pipes. - Safety management and caution for handling - Common mistakes in installation and handling - Points for special attention when working with community members.	2 days

One local specialist of HPM training and his/her assistant visit each constructed site of borehole with hand pump under the project, and implement HPM training using the constructed facility. HPM training will execute immediately after the completion of construction of the facility if

possible.

6) Implementation Schedule of Technical Assistance Program

a. Mobilization and Sensitization Activities

a.1 Mobilization and Sensitization Activities at Pre-Construction Phase

Mobilization and sensitization activities at Pre-Construction Phase are implemented during Detailed Design stage. Immediately after contract between the government of Uganda and Japanese consultancy firm, Japanese expert from the Japanese consultancy firm selects local consultants (community development specialist and facilitators), and review the contents of technical assistance activities and its schedule and also prepare hand-outs and manuals for workshop with selected community development expert. After that, Japanese expert reviews assigning tasks of twelve contracted facilitators based on manuals mentioned above, and prepare holding workshop. It takes about 0.5 month for these preparation works. Period of Pre-Constriction Workshop in sites takes 3.0 months. The workshop will be held at all target sites including alternative sites. At the end of the phase, a review is implemented to confirm the rate of fulfillment of each target village/RGC on the critical requirements. It takes 0.5 month.

Implementation of these all activities is overlapped so that the total period for the activities will be 4.0 months.

a.2 Mobilization and Sensitization Activities at During/Post-Construction Phase

During/Post-Construction Workshop should be implemented in conformity with construction schedule so that the activity begins at the same time of commencement of construction each facility. After commencing construction, a contractor will spend one or two months for preparatory work. Therefore, During/Post-Construction Workshop will begin two month later of commencement of the construction. Japanese consultant begins its work such as selection of local consultants and preparation of manuals at one month before commencement of the construction. Practical period of the During/Post-Construction Workshop will be 12.0 months; the last one month will be spent for making report which describes the rate of achievement of the implemented activities. The report, which describes contents, schedules and results of the technical assistance program activities, will be submitted as an accomplishment report of technical assistance program activities. During/Post-Construction Workshop will take long period, 12.0 months, so that two current status reports are submitted at each juncture, those reports describe contents and progress of the activities implemented in corresponding periods. Total period of the Mobilization and Sensitization Activities at During/Post-Construction Phase takes 13.0 month.

b. HPM Training

HPM trainings are conducted in conformity with the progress of the construction of the water supply facilities in parallel with the During/Post-construction workshops.

6) Outputs of Technical Assistance Program Activities

Outputs of technical assistance program activities are as follows:

Table 2.2.31 Technical Assistance Activities and their Outputs

Outputs	Contents
Pre-construction Workshop manual for community members	Project Outline
	Handout/material on community-based operation and maintenance
	Handout/material on water supply facilities
	Handout/material on water and health, sanitation and hygiene
	Handout/material on community sensitization
	Handout/material on operation and maintenance plan
	Handout/material on monitoring
During/Post-Construction Workshop manual for WSC	Handout material on WSC
	Handout material on WSC management
	Form for operation and maintenance fee collection
	Accounting Form for operation and maintenance fee
	Form for WSC meetings
	Monitoring form for water supply facility
	Monitoring form for WSC management
Workshop planning report	Workshop procedures, methods, etc.
Workshop report	Report of workshop results
Planning Report for HPM training	Training procedures, methods, etc.
Training Report for MPMs	Report on training results

An accomplishment report of technical assistance program activities including outputs above mentioned is submitted to the responsible organization of the project in the Government of Uganda.

(9) Implementation Schedule

Since the urgency of this project is considered high, it is necessary to complete the project works as in short period as one (1) fiscal year. The implementation schedule of the project is illustrated in Fig. 2.2.26.

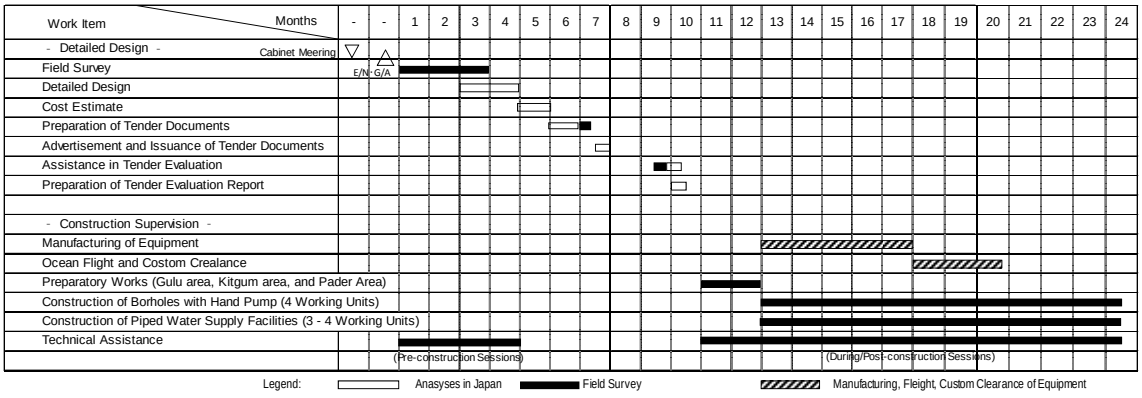


Fig. 2.2.26 Implementation Schedule of the Project

The target villages and RGCs are scattered widely in the Acholi Sub-region. Considering the long travelling time from site to site, it is difficult to proceed with the construction works and their supervision in one project unit. Therefore, the project area is divided into three (3) sections for construction, in each of which the construction works proceed simultaneously with the base camp of either Gulu, Kitgum or Pader where stay of Japanese staff is allowed in order to complete whole of the construction works and the necessary activities in such limited period.

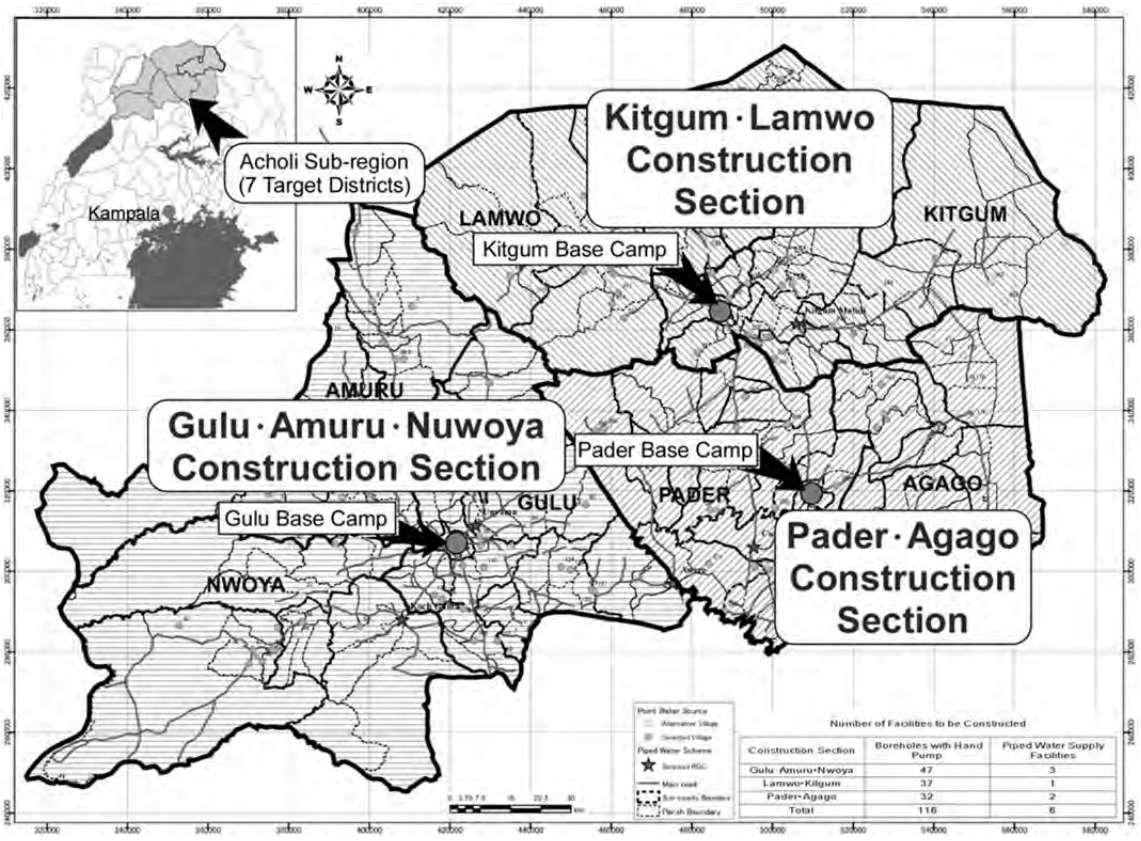


Fig. 2.2.27 Construction Sections for Implementation

2.3 Obligations of Recipient Country

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

i) Provision of necessary data and materials for this project
ii) Security at the project sites
iii) Payment of fees for Banking Arrangement (B/A) and Authorization to Pay (A/P)
iv) Quick loading and unloading, and customs clearance procedures for the equipment and materials to be procured and imported into Uganda
v) To make action of exemption from taxation for the equipment and materials to be brought in Uganda by the Japanese personnel and taxes of subcontractors for the procurement of the equipment and materials, and the execution of services based on the approved contract
vi) Appropriate use and maintenance of procured equipment and materials, and constructed facilities in this project
vii) The following provisions of the human resources and the expenses for the engineers and technical staff, and the lands and spaces belonging to DWD and the water office of the district local government which will not be appropriated from the Japanese Grant Aid.

Table 2.3.1 Obligations to be Shouldered by Ugandan Side

Items	Remarks
(1) Provision of temporary yards	Since the yards of the district water offices are planned to be used, any expense will be born.
(2) Secure of facility yard for construction	The yard for the water supply facilities (yards for water source boreholes, etc.) have to be provided free of charge with the agreement of the villagers in accordance with the water law of Uganda. Therefore, no land acquisition cost is required.
(3) Removal of trees, etc. in the facility yard and leveling of lands	The villagers will complete it before the commencement of the construction works free of charge.
(4) Secure of access road from main roads	The villagers will complete it before the commencement of the construction works free of charge.
(5) Construction of fences around borehole sites	The villagers will install the protection fences around the borehole after the borehole construction is completed including the procurement of local materials.
(6) Assignment of operation staff and provision of yard for service rig	DWD will assign the staff necessary for operation and maintenance of the service rig including the arrangement of the yard for storage and park.
(7) Storage of repair tools of hand pumps	The tools will be kept at the sub-county office.
(8) Assignment of staff required for the operation and maintenance of water supply facilities	The boreholes with hand pump will be operated and maintained by WSCs to be established for each borehole, and the piped water supply facilities will be operated and maintained in the responsibility of the Water Board of sub-county and sub-committee (Tap Water Committees).

2.4 Project Operation Plan

2.4.1 Operation Plan of Water Supply Facilities

(1) Characteristics of the Operation and Maintenance System of Water Supply Systems in Uganda

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 community (Demand Responsive Approach) and sustainable operation and maintenance of water facilities by Water and Sanitation Committees (community management).

1) 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 (HAs) and community development assistants (CDAs).

In addition, DWD also compiled two guidelines so called "Steps in Implementation of Water and Sanitation Software Activities, December 2004"、"Steps in Carrying out Mobilization Activities in Rural Growth Centres, September 2005 ", which describe contents and procedures on mobilization and sensitization activities for communities and Water and Sanitation

Committees conducted by DWD and concerned persons in local governments.

All the water facilities constructions in Uganda are to be managed in accordance with the handbook and guidelines.

Prescribed mobilization and sensitization activities start well before and continue even after facility construction. In the handbooks and guidelines, the activities are divided into the following four (4) phases:

Table 2.4.1 Mobilization and Sensitization Activities in Uganda

Phase	Activities	
	Borehole with hand pump	Piped Water Supply Facility
i) Advocacy/ Promotion	- Review on the water and sanitation situation in the district - Shortlisting of communities for provision of safe water and announcement of the shortlist	- Review on the general water and sanitation situation conditions in the RGCs and agree on the priority RGC, preconditions such as fulfillment of the critical requirements and roles among stakeholders. - Formation of WSC - Signing the Memorandum of Understanding (MOU)
ii) Pre-Construction	- Agreement among stakeholders on taking actions to fulfill the critical requirements for construction of water supply facility. - Signing the Memorandum of Understanding (MOU) - Selection of water supply technology, selection of preferred site for construction of water supply facility. - Formation of WSC - Training of WSC - Conducting a sanitation baseline survey - Verification of communities that fulfill the critical requirements - Promotion on sanitation and hygiene activities - Preparation of a plan for operation and maintenance - Preparation of a plan on during construction plan.	- Consultation and agreement on the boundary of RGC, pipe layout, and sites for public tap stand location. - Conducting a sanitation baseline survey. - Feedback the baseline survey result to community. - Agreement on action plan on how to fulfill the critical requirements. - Confirmation of the rate of achievement of the critical requirements (every month). - Promotion on sanitation and hygiene activities. - Registration of beneficiary households
iii) During-Construction	- Participation of the communities to construction - Training of water source caretakers in preventive maintenance - Training of WSC on operation and maintenance - Commissioning of the water supply facility to the community.	- Participation of the communities to construction. - Formation of WSC. - Training of WSC on operation and maintenance. - Procurement of the operator and the contract. - Training of the operator. - Commissioning of the water supply facility.
iv) Post-Construction	- Capacity development of communities continues even after construction. Community members also continue to engage in operation and maintenance and construct sanitation facilities.	- Capacity development of communities continues even after construction. Community members also continue to engage in operation and maintenance and construct sanitation facilities. - Continuous replacement and retraining

Phase	Activities	
	Borehole with hand pump	Piped Water Supply Facility
	- Participatory monitoring and follow-up, facilitation on sanitation and hygiene promotion and so on continue throughout this phase.	of WSC - Participatory monitoring and follow-up, facilitation on sanitation and hygiene promotion and so on continue throughout this phase.

2) Operation and Maintenance managed by Water and Sanitation Committee

Responsible organization of operation and maintenance of each water supply facility is a Water and Sanitation Committee for a borehole with hand pump, and a sub-county office for a piped water supply facility.

Playing key roles in operation and maintenance of both kinds of water supply facilities are community members in water supply area (users) and the WSC formulated by the users. However, in case of a piped water supply facility, the operation and maintenance activities are under the supervision of the sub-county office due to large scale of the water supply facility. Some communities with even larger-scale piped water supply facilities such as Kitgum Town Council entrust the operation and maintenance to private sectors.

A WSC shall be formulated for every water supply facility, and the basic composition and the roles are shown in following table.

Table 2.4.2 Composition of WSC and their Roles

Staffing	Roles
Chairperson (1) [Vice Chairperson (1)] Treasurer (1) Secretary (1) Member (1) Caretakers (2) Mobiliser (2) <u>Remarks</u> - The composition of WSCs shall include at least 50% women - At least, one of caretakers must be women. - At least one of executive members (Chairperson, Treasurer and Secretary) must be women.	- Promotion of improved sanitation and hygiene practice among community members. - Mobilization and sensitization of community towards improvement of sanitation and hygiene. - Keeping a newest list of water users. - Promotion of payment of operation and maintenance cost (water user fee) to users - Regular monitoring of water supply facility condition. - Execution of preventive operation and maintenance - Fixing for repair and payment of the expense of the repair in case of troubles happen in the water supply facility. - Purchase any materials needed for repair.

Note: Figure in the () shows number of person assigned to the roles

3) Actors Responsible to the Project in Local Government

Local governments, especially District Water Offices (DWOs) play a supporting role by offering various kinds of assistance to WSCs. The main actors for supporting these activities above mentioned in the local government are shown in Table 2.2.28.

District water office and CDAs and HAs in sub-counties are core organization and persons to conduct real activities to facilitate community members and support WSCs.

Fig. 2.4.1 shows typical example of human resources assigned to a DWO. However, DWOs of Nwoya, Lamwo and Agago districts, which are new districts recently spun off from existing districts, do not have enough human resources at present.

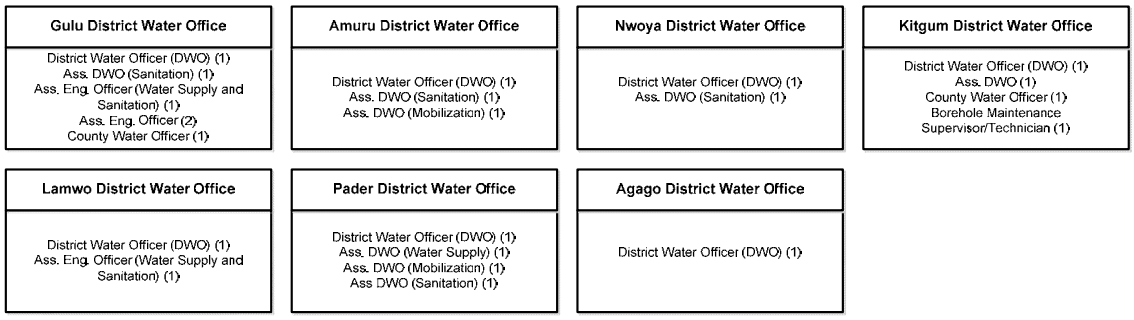


Fig. 2.4.1 Staffing of District Water Offices

4) Other Supporting Framework

a. Technical Support Unit (TSU)

The Government of Uganda has eight (8) TSUs and manages whole land through them, and TSUs are under direct supervision of Assistant commissioner of Rural Water Supply and Sanitation Department within the DWD.

Acholi Sub-region is under the control of TSU-2, and Core staffs of TSU-2 are all technical assistance specialists on water and sanitation (1), public health (2), and community development (2). 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). The roles of TSU is summarized in Table 2.4.3.

Table 2.4.3 Roles of TSU

Planning support to districts	
1	Preparation of district water and sanitation plans
2	Procurement planning and management
3	Development of monitoring and information system
4	Maintenance planning and management
Support and strengthen quality assurance	
5	Compliance to national policies and guidelines
6	Adherence to standards and specification
7	Transparent tendering and procurement management
8	Recruitment and training of appropriate staff in terms of quality and quantity
Coordination of capacity building and inter-district cooperation	
9	Needs assessment define capacity gap
10	Promotion of inter-district learning
11	Advice on private sector interface and private sector capacity building
12	Advice on NGO/CBO interface and coordination

As the above Table shows, capacity building of the staff of DWOs for sustainable operation and management is within the scope of TSU's activities. TSU-2 is currently in state of lack of manpower so that it is not expected that direct impacts of TSU-2 on the project which requires a large quantity of inputs within a short period. However, organized capacity development for DWOs is expected in the long term.

b. Umbrella Associations

Member schemes through WSCs of Small Towns and RGCs constitute a general Assembly of the Umbrella Organization. The General Assembly elects an Executive Board which recruits and monitors staff hired to carry out key umbrella functions to their members. Constitution of

Executive Board consists of two representatives from each member WSC and District Water Officer.

Core part of an Umbrella Association so-called "UMBRELLA REGIONAL SECRETARIAT ORGANIZATION" consists of Manager, Water quality analyst, electro-mechanical engineer, monitoring assistant, administrator, management account assistant, and secretary. Member schemes pay a membership fee and an annual subscription. The basic concept says, running cost of an Umbrella Organization must be covered by these incomes.

The major roles of the Umbrella Association are shown in the following table.

Table 2.4.4 Major Roles of Umbrella Associations

・ Create adequate organizational structures and management capabilities for a successful operation and maintenance system, including strategic plans, annual business plans, well-defined legal structures, staff training, data management and provision of specific spare-parts
・ Protect and monitor water quality and quantity by establishing sampling and monitoring procedures and creating regional water laboratories where necessary
・ Make technical expertise and specific spare parts available for routine maintenance.
・ Improvement of water supply system and technical support to extension works of pipeline.
・ Promote innovative and sustainable technologies in water supply and sanitation.

c. Water and Sanitation Development Facility Northern Uganda (WSDF-N)

Water and Sanitation Development Facility Northern Uganda (WSDF-N) is the organization controlled by the Urban Water Supply Department of DWD for design and implementation of piped water supply facilities of small towns.

d. Framework for Hand Pump Repair

The water sector in Uganda has a strategy to deploy two HPMs in one sub-county or maximum number of boreholes with hand pumps to be assigned a single HPM will be fifty units. In case of the project area, there are more numbers of HPMs than the numbers requested above as shown in Table 2.4.5.

Table 2.4.5 Number of Sub-Counties and their Hand Pump Mechanics

DWO	No. of Sub-County	No. of HPMs
Gulu	16	55
Amuru	5	32
Nwoya	4	15
Kitgum	10	112
Lamwo	10	115
Pader	12	80
Agago	16	36
Total	73	445

DWOs are headed to establish “Hand pump Mechanic Associations (HPMAs)” with the support of MoWE, UNICEF and other donors. The associations are a kind of private organizations, and will be registered at the district level as a Community Based Organization. Each HPM become a member of a HPMA (registered HPM) with paying membership fee. All the registered HPMs will form part of the District HPMA. A representative of HPMs (Senior HPM) at sub-county level will be selected among themselves. And a HPMA will be led by a single HPM selected from among the Senior HPMs. HPMAs aim at organizing HPMs who are so far solely doing repair and inspection of hand pumps as a sideline, giving education and skill upgrading to HPMs with lack skills, lifting their social status and increasing their incomes.

(2) Issues and Coping Strategies on Operation and Maintenance of Water Supply Facilities to be constructed in the project

1) Common Issue within Target Villages an RGCs

<Issue 1>

Government of Uganda obliges RGCs/Villages to fulfill the Critical Requirements prior to construction of water supply facilities as a pre-requisite of community based management. The Critical Requirements are forced to RGCs/Villages to conduct formulation of WSCs, preparation of contribution, making operation and maintenance plan, promotion of latrines and dry-racks, etc. One of important roles of DWOs and Sub-county must be played in the project is a back-up support to RGCs/Villages to fulfill the Critical Requirements.

The project requires 152 Villages (aiming at construction of boreholes with hand pumps) and 6 RGCs (aiming at construction of piped water supply facilities) of fulfilling the Critical Requirements under the back-up support above mentioned.

However, it is clear from typical organization chart of DWO mentioned above that DWOs are facing lack of human resources at present. In addition, District Water Officers in newly established districts tend to have been running multiple posts and duties, and they sometimes cannot grasp the present water supply situations of their own districts.

In addition, sub-county offices substantially have no technical specialists of water resources development. As a result, real activities to facilitate community members and support WSCs are to be carried out by CDAs and HAs. In implementing these 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

Moreover, in a related move, it is necessary to pay attention to the followings.

- Coordination among Ministry of Water and Environment, Ministry of Gender, Labour and Social Development and Ministry of Health relating to assistance in operation and maintenance of the water supply facilities
- Continuous monitoring by the Ugandan side after the facility construction, and continuous replacement and retraining of WSC

<Coping Strategy 1>

To solve <Issue 1>, technical assistance program in the project include mobilization and sensitization activities for communities and WSCs under cooperation among concerned person in DWOs, CDAs and HAs. This technical assistance program activity aims at not only fulfillment of the Critical Requirements by communities and capacity development of community members, but also strengthening community based operation and maintenance including back-up supports by DWOs and Sub-county Offices.

2) Operation and Maintenance for Boreholes with Hand pumps

Operation and maintenance of boreholes with hand pumps will basically follow conventional method and procedures of Uganda, which is described in the National Framework for Operation and Maintenance of Rural Water Supply in Uganda, July 2011.

However, it is necessary to implement mobilization and sensitization activities for communities/WSC by participatory approach. Moreover, communities in Acholi Sub-region have following special characteristics and issue.

<Issue 2>

Target villages have no safe water resources around the villages. Despite the situation, number of households which are using safe water from boreholes with hand pumps reached 82% (384 households) of the total number of interviewees of the household survey conducted in the second preparatory survey. However, the distances of their fetching water are long, and average time for one roundtrip takes 84 minutes. Only 109 households (28%) have been paying water user fees. Each household is paying the water user fee not on a jerry can basis but on a monthly basis. The amounts vary from 200 UGX to 1,000 UGX/ month/household. Given this situation, many households have higher willingness to pay for water user fee, but it is judged to be difficult to conduct smooth collection of water use fees.

< Coping Strategy 2>

Smooth collection of water user fees is crucial for sustainable operation and maintenance of water supply facilities to be constructed. To solve <Issue 2>, mobilization and sensitization activities for smooth collection of water user fee are to be executed in the project. Practical collection system is to be reviewed and determined with each community in the activities. For example, the fee is set up as lower as possible during early stage, and is to be collected monthly or seasonally basis. Ownership is expected to be brought up gradually through these activities,

3) Operatioon and Maintenance for Piped Water Supply Facilities

<Issue 3>

Social survey result for 6 target RGCs shows that collections of water user fee are only conducted in Kochi Goma RGC, and the amount is set up to 500 UGX/month.

In addition, household survey result says that only one household has been paying the water user fee even in Kochi Goma RGC. In short, real situation is that only one household among 30 households has been paying the water user fee.

When the second preparatory survey team visited target RGCs, the team had some interviews with community members. Many of interviewees answered that the Government is responsible to supply safe water, and a few of them including staffs in sub-county offices answered payment of water user fee is a responsibility of user for operation and maintenance of water supply facility.

Almost all members of the communities are involved in agricultural business so that the cash incomes are small; however, it is possible for them to pay 500 UGX/month of water use fee.

The most week point is a shortage of wills to prepare necessary expenses for operation and

maintenance by communities/themselves and to execute sustainable operation and maintenance on their own responsibilities.

< Coping Strategy 3>

Given this situation, to solve <Issue 3>, it is necessary to begin from promotion of sensitization of community members (villagers) towards formulation of sustainable system of operation and maintenance of water supply facilities. The sensitization must be finished during Pre-Construction Phase, and collection system of water user fee also must be formulated during Pre-Construction Phase. These are essential matter for realization of sustainable operation and maintenance of water supply facilities.

For the reason mentioned above, mobilization and sensitization activities for smooth collection of water user fee are also to be executed for target RGCs in the project.

<Issue 4>

The government of Uganda recommended entrusting operation and maintenance of piped water supply facilities to scheme operators. The advantages and disadvantages in direct management by WSCs and indirect management through contract with specialized private sector for operation and maintenance are summarized in the following table.

Table 2.4.6 Advantages and Disadvantages of Actors in Operation and Maintenance

Actor of Operation and Maintenance	Advantages	Disadvantages
Direct management by WSCs	・Reduction of operation and maintenance cost due to direct management	・High possibility to be amateur group so that the actor does not suitable for operation and maintenance of facilities with advanced technology.
Indirect management by contract with specialized private sectors	・Receiving service from specialist for operation and maintenance.	・In case of low water user fee setting up, the collected fee may spend only for labor and vehicle cost of contracted private sector due to shortage of budget, and no budget may be left for operation and maintenance for facilities.

When adopting indirect management system, for the purpose, here are Umbrella Associations (UAs) for the purpose. As mentioned before, Umbrella Associations are semi-private agency for back-up support of operation and maintenance for Small Towns and RGCs. As seen from their specified roles, there are some possibilities that Umbrella Associations are to be ideal organizations for sustainable operation and maintenance of the facilities to be constructed in the project.

However, realization of sustainable operation and maintenance under the support of UAs is not expected in the short run due to the reasons described below.

- ”Umbrella-North” is in charge of agency for Acholi Sub-region. However, the agency is just behind of its formulation and the hired staff is a manager only at present.
- It is necessary for target RGCs to be a member community of the HAs, and to pay registered fee and monthly membership expense.
- “South Western Umbrella” was established on 1996, and has chalked up a track of operation and maintenance and has borne fruitful results. However, the income from

member WSCs occupied around only 4% of the necessary management cost, and most of the budget has relied on subsidy from the Government of Uganda.

In addition, the social survey result says that the amount of willingness to pay for safe water among most households is around 1,000 UGX/month/household in the target RGCs. And almost all households do not have experience of payment for safe water. Given this situation, Adoption of indirect management method is not realistic, and the recommendable choice is installation of maintenance-free water supply facilities whatever possible.

< Coping Strategy 4>

Under these conditions of target RGCs, on the assumption of installation of solar power generation system as almost maintenance-free power supply system to submersible pumps, an operation and maintenance system, which brings up secure collection of water user fees and ownership of the water supply facility by the community itself, is proposed as follows.

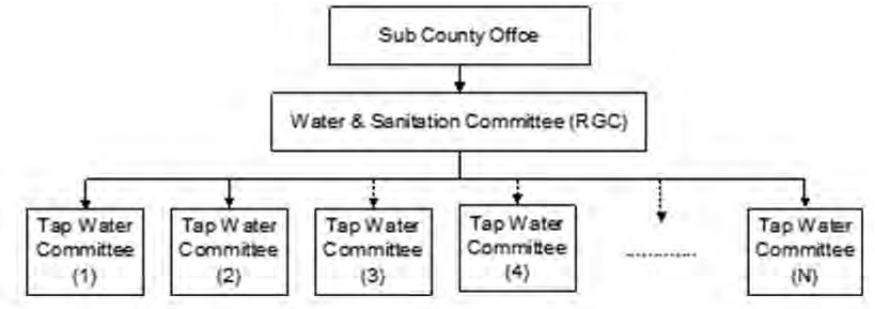


Fig. 2.4.2 Operation and Maintenance Structure of Piped Water Supply System

Each public water tap is controlled by a “Tap Water Committee” which is under WSC. Each public water stand has its command area, and the Tap Water Committee to be established in each command area collects user fees from users who live in such command area as presented in Fig. 2.4.2.

The roles of each operation and maintenance organization are summarized in the following table.

Table 2.4.7 Envisaged Roles of Operation and Maintenance Organization

Organization	Roles of the Organization	Staff
Sub-county	Coordination between DWO and community	Sub-county Chief
Water and Sanitation Committee (WSC)	・ Operation & maintenance of piped water supply system (On and off of submersible pump, Cleaning of elevated tank, Cleaning of solar panels, Finding water leakage from transmission pipe and distribution pips, and take action for repair, Treatment of Valves, etc.） ・ Deployment of night watch for solar power generation system. ・ Collection of user fees from TWCs and manage the fund. ・ Hold a meeting regularly to keep community active for operation and maintenance. ・ Maintain record of community meetings ・ Community mobilization for various activities related to water and sanitation. ・ Fixing for repair and payment of the expense of the repair in case of troubles happen in public taps. ・ Purchase any materials needed for repair.	Chairperson Vice Chairperson Treasurer Secretary Caretaker (man) Caretaker (woman) Mobilizer (3)

Organization	Roles of the Organization	Staff
Tap Water Committee (TWCs)	・ Daily maintenance of public taps and soak pit ・ Collection of user fees ・ Record discharged volume of groundwater with flow meter, ・ Find leakage from discharged records.	Caretaker (man) Caretaker (woman) Treasurer (1)

The activities to assist formulation of these committees and to execute training of them are to be included in the technical assistance program in the project.

However, extra-ordinary repair may happen in future. When such a need happens, relevant community will enlist support/help from DWO/DWD. Therefore, it is important to establish secure collection system of water user fee, and to accumulate wealth of the community as much as possible by that time.

2.4.2 Operation Plan of Procured Equipment

Operation and Maintenance of procured equipment in the project is to be conducted as described in the following table.

Table 2.4.8 Operation Plan of Procured Equipment

No.	Items	Amount	Management System of Equipment	Delivered Site
1.	Service Rig	1	Well repair team in DWD is to be a user and to execute operation and maintenance of the service rig. Repair and inspection of the service rig are to be executed by the contract factory with DWD	DWD
2.	Tool Kit for Hand pump Repair	73 sets	Sub-county Chiefs are to be in charge of person of control the tool kits, and lend the tool kits HPMs upon their requests.	Sub-county Office

2.5 Project Cost Estimation

2.5.1 Initial Cost Estimation

(1) Costs Covered by Ugandan Side

Costs Covered by Ugandan Side is estimated to be 55,090,000 UGX (1.7 million JPY). The costs covered by the Ugandan side are broken down in Table 2.5.1.

Table 2.5.1 Costs Covered by Ugandan Side

(Unit: 1,000 UGX)

Items	Costs	Remarks
(1) Provision of temporary yards	-	Since the yards of the district water offices are planned to be used, any expense will be born.
(2) Secure of facility yard for construction	-	The yard for the water supply facilities (yards for water source boreholes, etc.) have to be provided free of charge with the agreement of the villagers in accordance with the water law of Uganda. Therefore, no land acquisition cost is required.
(3) Removal of trees, etc. in the facility yard and leveling of lands	-	The villagers will complete it before the commencement of the construction works free of charge.
(4) Secure of access road from main roads	-	The villagers will complete it before the commencement of the construction works free of charge.
(5) Construction of fences around borehole sites	-	The villagers will install the protection fences around the borehole after the borehole construction is completed including the procurement of local materials.
(6) Assignment of operation staff and provision of yard for service rig	55,090	DWD will assign the staff necessary for operation and maintenance of the service rig including the arrangement of the yard for storage and park.

Table 2.5.1 Costs Covered by Ugandan Side

(Unit: 1,000 UGX)

Items	Costs	Remarks
(7) Storage of repair tools of hand pumps	-	The tools will be kept at the sub-county office.
(8) Assignment of staff required for the operation and maintenance of water supply facilities	-	The boreholes with hand pump will be operated and maintained by WSCs to be established for each borehole, and the piped water supply facilities will be operated and maintained in the responsibility of the Water Board of sub-county and sub-committee (Tap Water Committees).
Total	55,090	-

(2) Conditions of Cost Estimate

i) Time of Estimate: December 2011

ii) Exchange Rates: 1 USD = 79.11 JPY
1 UGX = 0.03 JPY
Average of six (6) months from June to November 2011

iii) Construction/Procurement Period: The period for detailed design and construction/procurement period is indicated in the implementation plan.

2.5.2 Operation and Maintenance Cost

(1) Deep Boreholes with Hand Pump

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.

Table 2.5.2 Responsibility for Operation and Maintenance Expenses of Boreholes

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 U-2 hand pumps is as follows:

Table 2.5.3 Cost of Spare Parts of One (1) Hand Pump Unit (10 Years)

Items	Unit	Q'ty per Year	Unit Price (UGX)	Quantity	Cost (UGX)
Spare for Pump Head					
Bolt M12 x 40	Nos	0.20	1,500	2	3,000
Bolt M12 x 20	Nos	0.20	1,300	2	2,600
Nuts M12	Nos	0.20	1,100	2	2,200
Head without fitting	Nos	0.10	222,700	1	222,700

Table 2.5.3 Cost of Spare Parts of One (1) Hand Pump Unit (10 Years)

Items	Unit	Q'ty per Year	Unit Price (UGX)	Quantity	Cost (UGX)
Handle without fitting	Nos	0.10	142,700	1	142,700
Front cover	Nos	0.20	58,400	2	116,800
Chain with coupling	Nos	0.20	37,800	2	75,600
Fulcrum bolts (Axle bolt)	Nos	0.20	48,600	2	97,200
Chain bolt (M10 x 40)	Nos	0.50	1,200	5	6,000
Chain nut M10	Nos	0.30	1,100	3	3,300
Bearings 6204Z	Nos	0.20	33,900	2	67,800
Bearing spacer	Nos	0.20	3,200	2	6,400
M12 Washer	Nos	0.20	1,100	2	2,200
Axle Washer	Nos	0.20	1,100	2	2,200
Spare for Cylinder					
Rubber seating lower	Nos	0.20	3,900	2	7,800
Rubber seating upper	Nos	0.20	3,900	2	7,800
Upper plunger valve	Nos	0.10	135,100	1	135,100
Lower plunger valve	Nos	0.10	65,900	1	65,900
Sealing ring	Nos	0.20	19,500	2	39,000
Spare for Connecting Rods and Riser Pipes					
uPVC Riser pipe OD50mm PN20 (3 mtr long with a soket on one end AUSI 316)	Nos	0.10	71,300	1	71,300
Stainless Steel Connecting Rods (12mm dia, 3 mtr long)) AISI 316	Nos	0.10	133,500	1	133,500
Stainless Steel Connecting Rods centraliser	Nos	0.20	4,300	2	8,600
uPVC OD50mm pipe centraliser	Nos	0.20	7,600	2	15,200
Total					1,234,900

As shown in the above table, the estimated total cost for replacement parts and consumable is 1,235,000 UGX/year in average. Furthermore, adding maintenance and repair costs for pump main unit and platform can be estimated as follows:

Table 2.5.4 Cost of Pump Spare Parts and Renewal

(Unit: 1,000 UGX)

Description	10 years	Per Year	Remarks
Consumable Parts	1,235	123	
Renewal of Platform	629	63	Durable period: 20 years
Main unit, Hand Pump	937	94	
Hand Pump Installation Works	320	32	
Maintenance for Protective Fence	0	0	Villagers Contribution
Cleaning for Leak Pit	0	0	
Total	3,121	312	

Total cost per hand pump for maintenance and periodic replacement is 312,000 UGX/year, resulting in 26,000 UGX (= 312,000/12) on a monthly basis. Average cost for beneficiary, per capita and household are shown below.

Table 2.5.5 Expense Borne by Community

(Unit: UGX)

Description	Annual: UGX	Monthly: UGX	Remarks
Total expense borne by community	312,000	26,000	
Expense per capita	1,040	87	Beneficiary per hand pump: 300 persons
Expense per household	6,264	522	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 522 UGX. According to the results of the household survey conducted in the course of the socio-economic condition survey for the 152 target villages, the average value of water charge affordable to the villagers is calculated to be about 738 UGX. The above amount of the operation and maintenance cost is, therefore, judged to be payable by the villagers.

(2) Piped Water Supply Facilities

The items to be considered as the operation and maintenance costs for piped water supply facilities of RGCs are summarized in Table 2.5.6. The cleaning and weeding in the facility yards are carried out by the care takers and the villagers on a voluntary basis, and any cost is not borne.

Table 2.5.6 Operation and Maintenance Costs of Piped Water Supply Facilities

(Unit: UGX)

Items	Piped Water Supply Facilities					
	Koch Goma	Unyama	Awere	Adilang	Kitgum Matidi	Corner Kilak
1. Water source Facility						
・ Cleaning and Weeding*	17,738	17,738	8,869	35,476	17,738	26,607
2. Transmission and Distribution Pipelines						
・ Repair of Leakage, Etc.	395,017	566,563	232,307	813,324	697,761	441,273
3. Elevated Water Tank						
・ Cleaning and Weeding*	56,331	114,005	76,755	115,044	119,833	67,227
・ Painting	72,944	146,770	72,060	155,283	153,641	92,228
・ Disinfection (chlorine)	320,197	480,296	240,148	480,296	400,247	240,148
4. Public Taps						
・Repair of Outlet	148,572	643,814	297,145	594,290	480,120	346,669
・ Cleaning*	27,450	118,950	54,900	109,800	109,800	64,050
5. Solar Power Generation Facilities						
・ Cleaning of Modules*	36,600	177,771	41,829	177,771	188,229	73,200
6. Security Measures						
・ Security Guards for Generation Modules	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Total	2,272,850	3,465,907	2,224,013	3,6817,284	3,367,369	2,551,402
Annual Operation and Maintenance Costs per Household	6,500	5,777	7,849	5,813	7,216	7,654
Monthly Operation and Maintenance Costs per Household	542	481	654	484	601	638

Notes *: Conducted by the care takers of WSC and villagers.

Monthly costs of operation and maintenance of the piped water supply facilities vary from 481 to 654 UGX/month/household depending on the sizes of facilities, and the average value is calculated to be about 567 UGX/month/household. As discussed in the previous section, the average value of the monthly water charges considered affordable by the villagers is calculated

to be 770 UGX/month/household, and this value is considered enough to pay the costs of operation and maintenance of the piped water supply facilities of 567 UGX/month/household as a water charge.

It is not necessary to replace any parts of the submersible motor pump and the solar power generation modules for about 10 years of the initial operation period if they are operated in normal conditions, but the regular inspection of five (5) year period is recommended. Such regular inspection is carried out by the Ugandan agents of makers on contract basis, and the costs for such inspection are estimated at about 2,375,000 UGX and 2,192,000 UGX for submersible motor pumps and solar generation modules, respectively, totaling 4,567,000 UGX.

On the other hand, the balance between the average value of the monthly water charges considered affordable by the villagers of 770 UGX/month/household and the monthly costs of operation and maintenance of 567 UGX/month/household is calculated to be 203 UGX/month/household, which means that if the affordable amount 770 UGX/month/household is collected constantly, the monthly balance of 203 UGX/month/household is saved as a surplus. Since the average number of households of the target RGCs is calculated to be 445 per one (1) RGC, 90,335 UGX/month of surplus is possibly saved equivalent to 1,084,000 UGX/year. The total amount saved for five (5) years are estimated at 5,420,000 UGX, and the amount of 4,567,000 UGX required for the regular inspection is covered by this saved amount. Therefore, if the affordable monthly price of 770 UGX is collected continuously for five (5) years, the regular inspection of every five (5) years is considered realistic. Various activities are planned to be conducted under this project, and the water charges and the necessary operation and maintenance costs will be explained to the villagers to facilitate their understandings and awareness. Through these activities for the villagers, the continuity of water charge collection on the affordable price basis will be secured.

(3) Truck-mounted Service Rig

The service rig is procured to rehabilitate the non-functional boreholes having been abandoned in the Acholi Sub-region since the civil war. The rig is operated and managed by DWD in Kampala, and stations at the yard of TSU-2 in Lira in charge of the Acholi Sub-region, when it is on duty.

The operation and maintenance costs of the service rig are shown in Table 2.5.7, and the annual costs are calculated to be 136.1 million UGX. The costs for the spare parts etc. are managed to be shouldered by the district water offices or WSCs of the boreholes to be rehabilitated, while the costs for fuel and operators are borne by DWD. The fuel costs for transportation often shared between DWD and the district water offices.

Table 2.5.7 Operation and Maintenance Costs of Truck-mounted Service Rig

Descriptions	Remarks	Amount
1. Service Rig	Spec.: 158 kW (215ps), fuel, spare parts	65,520,000
2. Engine Compressor	Spec.: 0.69 Mpa, fuel, spare parts	11,650,700
3. Engine Welder	Spec.: 8.7 kW, fuel, spare parts	3,831,900
4. Rig Operator	Operator, Technical Staff (4 persons)	55,089,500
Total		136,092,100

The budget allocated to the Rural Water Supply and Sanitation Department of DWD is 77.7

billion UGX in the fiscal year of 2010/11. Out of this amount, 56.6 billion UGX is distributed for the district government offices as the District Water and Sanitation Grant, the remaining 15.4 billion UGX is considered to be available for the department. The calculated operation and maintenance costs of the service rig is considered equivalent to about 0.9 % of this amount, and it is possible for the department to operate and manage the service rig with this budget.

Table 2.2.2 Selection of Villages (1st. Step)

No.	Village	District	Population (2015)	Score on Population (2015)	Total of Water Sources	Pop. Served by Ex. Facilities	Coverage (%) max=100%	Score on Coverage	Number of Experiences	Score on Experiences	Season (1:good / 2: Not good / 3:Impossible / 4:Others)	Season (1:good / 2: Not good / 3:Impossible / 4:Others)	Point on Accessibility	Score on Accessibility	Expected Yield (m3/hr)	Score on Expected Yield	Total Score	Order in Whole Villages	District	Order in District	Order in Dist-rict	No.	Selected Village
1	Bibia East	Amuru	3,437	28	4	1,200	35%	130	0	0	1	1	3	100	2.58	79	337	107	Amuru	12	1	27	Amoyokuma
2	Kal east	Amuru	1,154	9	4	1,200	100%	0	0	0	2	2	1	33	2.58	79	0	233	Amuru	33	2	30	Mutema
3	Okidi North	Amuru	1,426	12	1	300	21%	158	2	25	1	1	3	100	2.58	79	374	74	Amuru	8	3	12	Olinga
4	Paciło East	Amuru	716	6	1	300	42%	116	2	25	1	1	3	100	2.58	79	326	118	Amuru	13	4	32	Reckiceke
5	Palukere East	Amuru	2,566	21	5	1,500	58%	83	2	25	1	2	2	67	2.58	79		180	Amuru	25	5	31	Ogeli
6	Agoro	Amuru	190	2	2	600	100%	0	2	25	1	1	3	100	2.58	79	0	233	Amuru	33	6	19	Opok
7	Pukumu	Amuru	2,049	17	5	1,500	74%	53	3	38	1	1	3	100	2.58	79		166	Amuru	21	7	29	Lujoro
8	Pupwonya East	Amuru	597	5	1	300	50%	99	2	25	1	2	2	67	2.58	79		179	Amuru	24	8	3	Okidi North
9	Paomo	Amuru	4,951	40	3	900	18%	164	1	13	2	2	1	33	2.17	58	308	142	Amuru	18	9	17	Abyee
10	Kal centre	Amuru	4,349	35	3	800	18%	163	2	25	2	2	1	33	2.17	58	315	131	Amuru	15	10	23	Odur
11	Andara	Amuru	3,437	28	0	0	0%	200	2	25	3	3	0	0	2.17	58	311	136	Amuru	17	11	28	Labongo
12	Olinga	Amuru	12,289	100	2	600	5%	190	3	38	2	2	1	33	2.17	58	419	36	Amuru	3	12	1	Bibia East
13	Kati Kati A	Amuru	1,852	15	4	1,200	65%	70	4	50	2	2	1	33	2.17	58		212	Amuru	29	13	4	Paciło East
14	Abera	Amuru	734	6	0	0	0%	200	2	25	2	2	1	33	2.17	58	323	124	Amuru	14	14	14	Abera
15	Ceri	Amuru	1,629	13	1	300	18%	163	0	0	2	2	1	33	2.17	58		186	Amuru	26	15	10	Kal centre
16	otorokume	Amuru	882	7	1	300	34%	132	2	25	3	3	0	0	2.17	58	223	213	Amuru	30	16	21	Coorom
17	Abyee	Amuru	10,936	89	7	1,900	17%	165	3	38	3	3	0	0	2.23	62	353	91	Amuru	9	17	11	Andara
18	Amora	Amuru	1,127	9	3	800	27%	147	3	38	2	2	1	33	2.23	62		161	Amuru	20	18	9	Paomo
19	Opok	Amuru	11,639	95	2	600	5%	190	3	38	3	3	0	0	2.23	62	384	63	Amuru	6	19	20	Pukere
20	Pukere	Amuru	3,622	29	3	900	25%	150	2	25	2	2	1	33	2.23	62		149	Amuru	19	20	18	Amora
21	Coorom	Amuru	1,730	14	0	0	0%	200	3	38	3	3	0	0	2.23	62	313	135	Amuru	16	21	7	Pukumu
22	Amilobo	Amuru	298	2	2	600	100%	0	3	38	2	2	1	33	2.23	62	0	233	Amuru	33	22	33	Lamogi Coke
23	Odur	Amuru	9,502	77	8	2,100	22%	156	2	25	2	2	1	33	2.23	62	353	93	Amuru	10	23	35	Palukere West
24	Apotokito	Amuru	524	4	1	300	57%	85	3	38	2	2	1	33	2.23	62	222	214	Amuru	31	24	8	Pupwonya East
25	Teddi	Amuru	4,201	34	7	2,100	50%	100	4	50	1	3	0	0	2.19	59		206	Amuru	27	25	5	Palukere East
26	Abongo	Amuru	1,451	12	4	1,000	69%	62	4	50	2	2	1	33	2.19	59	217	215	Amuru	32	26	15	Ceri
27	Amoyokuma	Amuru	9,485	77	1	200	2%	196	3	38	1	2	2	67	2.19	59	436	27	Amuru	1	27	25	Teddi
28	Labongo	Amuru	2,750	22	0	0	0%	200	3	38	2	2	1	33	2.19	59	353	96	Amuru	11	28	34	Apaa
29	Lujoro	Amuru	2,740	22	1	300	11%	178	4	50	1	2	2	67	2.19	59	376	71	Amuru	7	29	13	Kati Kati A
30	Mutema	Amuru	9,474	77	4	1,200	13%	175	4	50	2	1	2	67	2.19	59	428	32	Amuru	2	30	16	otorokume
31	Ogeli	Amuru	10,880	89	1	300	3%	194	3	38	2	2	1	33	2.19	59	413	40	Amuru	5	31	24	Apotokito
32	Reckiceke	Amuru	10,233	83	0	0	0%	200	3	38	2	2	1	33	2.19	59	413	39	Amuru	4	32	26	Abongo
33	Lamogi Coke	Amuru	1,897	15	2	600	32%	137	3	38	2	3	1	33	2.23	62		170	Amuru	22	-	2	Kal east
34	Apaa	Amuru	1,294	11	2	600	46%	107	2	25	2	2	1	33	2.17	58		209	Amuru	28	-	6	Agoro
35	Palukere West	Amuru	1,687	14	1	300	18%	164	2	25	3	3	0	0	2.58	79		172	Amuru	23	-	22	Amilobo
36	Bwobonam A	Nwoya	3,348	27	3	700	21%	158	4	50	1	1	3	100	1.86	43	379	69	Nwoya	14	1	65	Patira East
37	Bwobonam B	Nwoya	4,352	35	4	1,100	25%	149	6	75	1	1	3	100	1.86	43	403	47	Nwoya	12	2	64	Lodi
38	Gotringo	Nwoya	1,849	15	5	1,500	81%	38	4	50	1	1	3	100	1.86	43	0	233	Nwoya	32	3	70	Lagazi
39	Langol	Nwoya	3,217	26	2	600	19%	163	3	38	1	1	3	100	1.86	43	369	77	Nwoya	16	4	48	Kal
40	Latekodong	Nwoya	10,958	89	2	600	5%	189	4	50	1	1	3	100	1.86	43	471	13	Nwoya	5	5	40	Latekodong
41	Lalar	Nwoya	2,901	24	4	1,100	38%	124	3	38	1	2	2	67	1.86	43	295	152	Nwoya	30	6	66	Patira West
42	oyinya	Nwoya	3,227	26	4	1,100	34%	132	4	50	1	1	3	100	1.86	43	351	97	Nwoya	20	7	68	Pawatomero East
43	Lulyango	Nwoya	6,680	54	4	1,200	18%	164	4	50	1	2	2	67	1.86	43	378	70	Nwoya	15	8	54	Agonga B
44	Amuka	Nwoya	1,897	15	7	2,000	100%	0	4	50	1	2	2	67	2.52	76	0	233	Nwoya	32	9	67	Pawatomero Central
45	kweyo	Nwoya	2,466	20	3	800	32%	135	4	50	1	2	2	67	2.52	76	348	100	Nwoya	21	10	62	Paminolango
46	Akago	Nwoya	2,790	23	3	700	25%	150	5	63	1	1	3	100	2.52	76	411	42	Nwoya	11	11	46	Akago
47	Lapono	Nwoya	3,459	28	6	1,600	46%	107	4	50	1	2	2	67	2.52	76	329	114	Nwoya	23	12	37	Bwobonam B
48	Kal	Nwoya	9,039	74	11	2,900	32%	136	8	100	1	1	3	100	2.52	76	486	10	Nwoya	4	13	51	Labyei
49	Owak	Nwoya	2,790	23	2	500	18%	164	5	63	2	3	0	0	2.52	76	326	119	Nwoya	24	14	36	Bwobonam A
50	Pajaa	Nwoya	2,288	19	6	1,600	70%	60	5	63	1	1	3	100	2.52	76	317	128	Nwoya	28	15	43	Lulyango
51	Labyei	Nwoya	3,125	25	3	900	29%	142	4	50	1	1	3	100	2.52	76	394	53	Nwoya	13	16	39	Langol
52	Okii	Nwoya	1,210	10	5	1,400	100%	0	4	50	1	2	2	67	2.52	76	0	233	Nwoya	32	17	58	Goro
53	onyomtil	Nwoya	3,116	25	5	1,200	39%	123	4	50	2	2	1	33	2.52	76	308	143	Nwoya	29	18	61	Pakiye
54	Agonga B	Nwoya	4,653	38	1	300	6%	187	5	63	1	1	3	100	2.12	56	444	22	Nwoya	8	19	56	Lakalac
55	Kalang	Nwoya	5,580	45	7	2,000	36%	128	2	25	1	2	2	67	2.12	56	322	125	Nwoya	25	20	42	oyinya
56	Lakalac	Nwoya	3,906	32	5	1,500	38%	123	6	75	1	2	2	67	2.12	56	353	95	Nwoya	19	21	45	kweyo
57	Lapem	Nwoya	2,879	23	3	800	28%	144	5	63	2	2	1	33	2.12	56	320	126	Nwoya	26	22	69	Pawatomero West
58	Goro	Nwoya	1,774	14	2	600	34%	132	5	63	1	1	3	100	2.12	56	365	80	Nwoya	17	23	47	Lapono
59	Kal B	Nwoya	3,632	30	5	1,500	41%	117	4	50	1	2	2	67	2.12	56	320	127	Nwoya	27	24	49	Owak
60	bungu	Nwoya	4,486	37	10	3,000	67%	66	5	63	1	2	2	67	2.12	56	288	162	Nwoya	31	25	55	Kalang
61	Pakiye	Nwoya	5,133	42	4	1,200	23%	153	3	38	1	2	2	67	2.12	56	355	90	Nwoya	18	26	57	Lapem
62	Paminolango	Nwoya	2,901	24	6	1,600	55%	90	4	50	1	1	3	100	3.97	149	412	41	Nwoya	10	27	59	Kal B
63	Belkec	Nwoya	1,953	16	9	2,500	100%	0	5	63	1	2	2	67	3.97	149	0	233	Nwoya	32	28	50	Pajaa
64	Lodi	Nwoya	2,455	20	2	500	20%	159	5	63	1	1	3	100	3.97	149	490	4	Nwoya	2	29	53	onyomtil
65	Patira East	Nwoya	2,790	23	2	600	22%	157	5	63	1	1	3	100	3.97	149	491	3	Nwoya	1	30	41	Lalar
66	Patira West	Nwoya	2,901	24	3	900	31%	138	4	50	1	1	3	100	3.97	149	460	15	Nwoya	6	31	60	bungu
67	Pawatomero Central	Nwoya	2,923	24	5	1,300	44%	111	3	38	1	1	3	100	3.97	149	421	35	Nwoya	9	-	38	Gotringo
68	Pawatomero East	Nwoya	8,927	73	2	500	6%	189	3	38	1	3	0	0	3.97	149	448	21	Nwoya	7	-	44	Amuka
69	Pawatomero West	Nwoya	2,434	20	7	1,700	70%	60	4	50	1	2	2	67	3.97	149	345	101	Nwoya	22	-	52	Okii
70	Lagazi	Nwoya	2,120	17	1	300	14%	172	4	50	1	1	3	100	3.97	149	488	6	Nwoya	3	-	63	Belkec

Table 2.2.2 Selection of Villages (1st. Step)

No.	Village	District	Population (2015)	Score on Population (2015)	Total of Water Sources	Pop. Served by Ex. Facilities	Coverage (%) max=100%	Score on Coverage	Number of Experiences	Score on Experiences	Season (1:good / 2: Not good / 3:Impossible / 4:Others)	Season (1:good / 2: Not good / 3:Impossible / 4:Others)	Point on Accessibility	Score on Accessibility	Expected Yield (m3/hr)	Score on Expected Yield	Total Score	Order in Whole Villages	District	Order in District	Orde r in Dist- rict	No.	Selected Village
71	Burcoro I	Gulu	625	5	3	800	100%	0	2	25	3	2	0	0	2.41	71	0	233	Gulu	47	1	105	Adak
72	Burcoro II	Gulu	625	5	3	800	100%	0	2	25	1	2	2	67	2.41	71	0	233	Gulu	47	2	111	Ariya
73	Paromo I	Gulu	1,674	14	3	800	48%	104	1	13	1	2	2	67	2.41	71	268	189	Gulu	37	3	138	Lamin Lawino
74	Paromo II	Gulu	1,674	14	2	500	30%	140	1	13	1	2	2	67	2.41	71	304	148	Gulu	29	4	95	Gulu PTC
75	Ayweri I	Gulu	536	4	3	800	100%	0	1	13	1	1	3	100	2.41	71	0	233	Gulu	47	5	106	Labworomor
76	Tugo	Gulu	536	4	3	800	100%	0	1	13	1	2	2	67	2.41	71	0	233	Gulu	47	6	107	Along
77	Oguru-Lakuny I	Gulu	334	3	2	600	100%	0	1	13	2	2	1	33	2.41	71	0	233	Gulu	47	7	116	Kal A and B
78	Oguru-Lakuny II	Gulu	713	6	2	600	84%	32	1	13	2	2	1	33	2.41	71	0	233	Gulu	47	8	126	Aparowiya I
79	Twonokun	Gulu	2,305	19	3	700	30%	139	3	38	2	2	1	33	1.98	49	278	173	Gulu	33	9	108	Ibar
80	Cetkana	Gulu	2,971	24	6	1,700	57%	86	4	50	2	2	1	33	1.98	49	242	202	Gulu	41	10	136	Owak
81	Bwobo I	Gulu	758	6	3	900	100%	0	3	38	2	2	1	33	1.98	49	0	233	Gulu	47	11	123	Otal
82	Bwobo II	Gulu	392	3	3	900	100%	0	3	38	2	2	1	33	1.98	49	0	233	Gulu	47	12	110	Adak
83	Obiya	Gulu	1,356	11	2	600	44%	112	3	38	1	2	2	67	1.98	49	276	177	Gulu	35	13	101	Kiteny Central
84	Paminmel	Gulu	1,207	10	9	2,300	100%	0	4	50	2	2	1	33	1.98	49	0	233	Gulu	47	14	124	Alwii
85	Lukodi I	Gulu	1,937	16	1	300	15%	169	2	25	1	2	2	67	1.98	49	325	121	Gulu	23	15	127	Aparowiya II
86	Lagot Ki Col	Gulu	504	4	1	300	60%	81	2	25	2	2	1	33	1.98	49	192	222	Gulu	45	16	114	Atede
87	Kati-Kati Lacor	Gulu	2,550	21	6	1,700	67%	67	2	25	2	2	1	33	1.98	49	195	220	Gulu	44	17	89	Acutomer
88	Lakwela	Gulu	335	3	2	500	100%	0	1	13	1	1	3	100	2.62	81	0	233	Gulu	47	18	90	Omel
89	Acutomer	Gulu	1,958	16	2	600	30%	139	1	13	1	1	3	100	2.62	81	349	99	Gulu	17	19	96	Agoro I
90	Omel	Gulu	3,620	29	2	600	17%	167	2	25	2	2	1	33	2.62	81	336	108	Gulu	18	20	115	Obwola
91	Atupibokeber I	Gulu	1,897	15	3	900	47%	105	1	13	1	1	3	100	2.62	81	314	134	Gulu	25	21	125	Latinnyer
92	Atupibokeber II	Gulu	1,562	13	3	900	58%	85	1	13	1	1	3	100	2.62	81	291	157	Gulu	31	22	137	Bwobo tochi
93	Ajuku	Gulu	670	5	1	300	45%	110	1	13	1	1	3	100	2.62	81	309	139	Gulu	28	23	85	Lukodi I
94	Agung B	Gulu	781	6	3	800	100%	0	1	13	2	2	1	33	2.62	81	0	233	Gulu	47	24	130	Idure
95	Gulu PTC	Gulu	5,580	45	1	300	5%	189	2	25	1	1	3	100	2.62	81	441	24	Gulu	4	25	91	Atupibokeber I
96	Agoro I	Gulu	1,415	12	1	300	21%	158	2	25	2	2	1	33	3.07	103	331	110	Gulu	19	26	120	Hima
97	Kidiro	Gulu	481	4	1	300	62%	75	2	25	2	2	1	33	3.07	103	241	204	Gulu	43	27	131	Awatlela
98	Mede Centre I	Gulu	664	5	5	1,500	100%	0	2	25	2	2	1	33	3.07	103	0	233	Gulu	47	28	93	Ajuku
99	Mede Centre II	Gulu	2,320	19	5	1,500	65%	71	2	25	2	2	1	33	3.07	103	251	196	Gulu	40	29	74	Paromo II
100	Kiteny	Gulu	2,122	17	3	900	42%	115	2	25	2	2	1	33	3.07	103	294	153	Gulu	30	30	100	Kiteny
101	Kiteny Central	Gulu	1,319	11	0	0	0%	200	2	25	2	2	1	33	3.07	103	372	75	Gulu	13	31	92	Atupibokeber II
102	Anyadwe	Gulu	993	8	3	900	91%	19	1	13	2	3	0	0	4.84	192	0	233	Gulu	47	32	118	Labuje
103	Angany	Gulu	1,538	13	4	1,200	78%	44	2	25	1	1	3	100	4.84	192	0	233	Gulu	47	33	79	Twonokun
104	Alanu	Gulu	531	4	2	600	100%	0	2	25	1	1	3	100	4.84	192	0	233	Gulu	47	34	140	Abuga
105	Adak	Gulu	2,232	18	2	600	27%	146	2	25	1	1	3	100	4.84	192	481	12	Gulu	1	35	83	Obiya
106	Labworomor	Gulu	2,164	18	0	0	0%	200	4	50	1	1	3	100	2.36	68	436	28	Gulu	5	36	132	Laminokure
107	Along	Gulu	9,636	78	7	1,600	17%	167	1	13	1	1	3	100	2.36	68	426	33	Gulu	6	37	73	Paromo I
108	Ibar	Gulu	9,262	75	9	2,700	29%	142	3	38	1	2	2	67	2.36	68	385	57	Gulu	9	38	133	Acet Central
109	Aremo	Gulu	3,348	27	10	3,000	90%	21	1	13	1	2	2	67	2.36	68	0	233	Gulu	47	39	128	Wanglobo
110	Adak	Gulu	10,071	82	2	600	6%	188	3	38	3	3	0	0	2.36	68	376	73	Gulu	12	40	99	Mede Centre II
111	Ariya	Gulu	3,348	27	2	500	15%	170	5	63	1	1	3	100	2.93	96	456	17	Gulu	2	41	80	Cetkana
112	Abole	Gulu	1,552	13	8	2,400	100%	0	3	38	1	2	2	67	2.93	96	0	233	Gulu	47	42	139	Dika
113	Abili	Gulu	301	2	1	300	100%	1	4	50	1	1	3	100	2.93	96	0	233	Gulu	47	43	97	Kidiro
114	Atede	Gulu	2,252	18	2	600	27%	147	2	25	1	2	2	67	2.93	96	353	94	Gulu	16	44	87	Kati-Kati Lacor
115	Obwola	Gulu	1,518	12	3	800	53%	95	2	25	1	1	3	100	2.93	96	328	115	Gulu	20	45	86	Lagot Ki Col
116	Kal A and B	Gulu	2,797	23	1	300	11%	179	3	38	1	2	2	67	2.93	96	402	48	Gulu	7	46	134	Agangolaro
117	Acutyeng	Gulu	189	2	1	300	100%	0	4	50	1	2	2	67	2.36	68	0	233	Gulu	47	-	71	Burcoro I
118	Labuje	Gulu	1,461	12	3	800	55%	90	4	50	1	2	2	67	2.36	68	287	164	Gulu	32	-	72	Burcoro II
119	Abura	Gulu	144	1	1	300	100%	0	5	63	1	2	2	67	2.36	68	0	233	Gulu	47	-	75	Ayweri I
120	Hima	Gulu	797	6	2	500	63%	75	5	63	1	1	3	100	2.36	68	311	137	Gulu	26	-	76	Tugo
121	Abuturu I	Gulu	495	4	2	600	100%	0	1	13	1	1	3	100	2.39	70	0	233	Gulu	47	-	77	Oguru-Lakuny I
122	Abuturu II	Gulu	308	3	1	300	97%	5	1	13	1	1	3	100	2.39	70	0	233	Gulu	47	-	78	Oguru-Lakuny II
123	Otal	Gulu	2,307	19	1	300	13%	174	2	25	1	1	3	100	2.39	70	387	59	Gulu	11	-	81	Bwobo I
124	Alwii	Gulu	1,897	15	1	300	16%	168	1	13	1	1	3	100	2.39	70	396	79	Gulu	14	-	82	Bwobo II
125	Latinnyer	Gulu	1,518	12	2	600	40%	121	2	25	1	1	3	100	2.39	70	328	116	Gulu	21	-	84	Paminmel
126	Aparowiya I	Gulu	2,203	18	0	0	0%	200	1	13	1	1	3	100	2.39	70	400	50	Gulu	8	-	88	Lakwela
127	Aparowiya II	Gulu	1,730	14	1	300	17%	165	1	13	1	1	3	100	2.39	70	362	83	Gulu	15	-	94	Agung B
128	Wanglobo	Gulu	480	4	1	300	63%	75	1	13	1	1	3	100	2.39	70	261	191	Gulu	39	-	98	Mede Centre I
129	Adak	Gulu	931	8	3	900	97%	7	1	13	1	1	3	100	2.39	70	0	233	Gulu	47	-	102	Anyadwe
130	Idure	Gulu	1,674	14	2	600	36%	128	1	13	1	1	3	100	2.39	70	324	123	Gulu	24	-	103	Angany
131	Awatlela	Gulu	1,644	13	2	600	36%	127	0	0	1	1	3	100	2.39	70	310	138	Gulu	27	-	104	Alanu
132	Laminokure	Gulu	989	8	2	600	61%	79	1	13	1	1	3	100	2.39	70	289	185	Gulu	36	-	109	Aremo
133	Acet Central	Gulu	4,854	39	8	2,200	45%	109	2	25	1	2	2	67	1.43	22	262	190	Gulu	38	-	112	Abole
134	Agangolaro	Gulu	2,726	22	6	1,800	66%	68	1	13	1	2	2	67	1.43	22	191	223	Gulu	46	-	113	Abili
135	Barolam	Gulu	1,624	13	5	1,500	92%	15	2	25	1	1	3	100	1.43	22	0	233	Gulu	47	-	117	Acutyeng
136	Owak	Gulu	4,464	36	2	600	13%	173	2	25	1	2	2	67	2.73	86	387	58	Gulu	10	-	119	Abura
137	Bwobo tochi	Gulu	4,352	35	6	1,600	37%	126	1	13	1	2	2	67	2.73	86	327	117	Gulu	22	-	121	Abuturu I
138	Lamin Lawino	Gulu	4,118	34	1	300	7%	185	4	50	1	1	3	100	2.73	86	455	16	Gulu	3	-	122	Abuturu II
139	Dika	Gulu	2,061	17	6	1,600	77%	46	2	25	1	2	2	67	2.73	86	241	203	Gulu	42	-	129	Adak
140	Abuga	Gulu	778	6	2	500	64%	71	1	13	1	1	3	100	2.73	86	277	175	Gulu	34	-	135	Barolam

Table 2.2.2 Selection of Villages (1st. Step)

No.	Village	District	Population (2015)	Score on Population (2015)	Total of Water Sources	Pop. Served by Ex. Facilities	Coverage (%) max=100%	Score on Coverage	Number of Experiences	Score on Experiences	Season (1:good / 2: Not good / 3:Impossible / 4:Others)	Season (1:good / 2: Not good / 3:Impossible / 4:Others)	Point on Accessibility	Score on Accessibility	Expected Yield (m3/hr)	Score on Expected Yield	Total Score	Order in Whole Villages	District	Order in District	Orde r in Dist- rict	No.	Selected Village
141	Lutage	Agago	585	5	0	0	0%	200	5	63	1	1	3	100	2.53	76	443	23	Agago	9	1	151	Amin Ogwal
142	Lapirin	Agago	468	4	1	300	64%	72	3	38	1	2	2	67	2.53	76	256	195	Agago	32	2	153	Te Vwao
143	Langalagada	Agago	702	6	0	0	0%	200	2	25	2	2	1	33	2.53	76	340	106	Agago	27	3	173	Lela Kabala
144	Sub County HQ	Agago	2,106	17	2	600	28%	143	5	63	1	1	3	100	3.00	100	423	34	Agago	15	4	163	Abalukwang
145	Tori East	Agago	912	7	1	300	33%	134	3	38	1	1	3	100	3.00	100	379	67	Agago	19	5	158	Owito
146	Agweng	Agago	725	6	1	300	41%	117	3	38	1	1	3	100	3.00	100	361	86	Agago	23	6	150	Kotomor east
147	Alwee	Agago	491	4	1	300	61%	78	4	50	1	2	2	67	3.00	100	298	150	Agago	29	7	148	Lapyem
148	Lapyem	Agago	550	4	0	0	0%	200	4	50	1	1	3	100	3.00	100	454	19	Agago	7	8	176	Tong Wiri South
149	Olokitoo	Agago	292	2	2	600	100%	0	4	50	1	1	3	100	3.00	100	0	233	Agago	35	9	141	Lutage
150	Kotomor east	Agago	2,106	17	1	300	14%	172	4	50	1	1	3	100	3.88	144	483	11	Agago	6	10	152	Oringo Ongom
151	Amin Ogwal	Agago	936	8	0	0	0%	200	4	50	1	1	3	100	3.88	144	502	1	Agago	1	11	170	Laming Onen
152	Oringo Ongom	Agago	602	5	0	0	0%	200	2	25	1	2	2	67	3.88	144	441	25	Agago	10	12	156	Opal Oryoneko
153	Te Vwao	Agago	585	5	0	0	0%	200	4	50	1	1	3	100	3.88	144	499	2	Agago	2	13	167	Wii Atup
154	opyel Central	Agago	559	5	1	300	54%	93	4	50	1	1	3	100	3.88	144	391	56	Agago	18	14	166	Aleb Tong
155	apano Central	Agago	889	7	1	300	34%	133	2	25	2	2	1	33	3.88	144	342	104	Agago	26	15	144	Sub County HQ
156	Opal Oryoneko	Agago	573	5	0	0	0%	200	4	50	2	2	1	33	3.88	144	432	29	Agago	12	16	178	Labedongony
157	Gweno	Agago	409	3	1	300	73%	53	4	50	1	1	3	100	3.88	144	351	98	Agago	25	17	179	Te Okiro
158	Owito	Agago	643	5	0	0	0%	200	3	38	1	1	3	100	3.88	144	487	8	Agago	5	18	154	opyel Central
159	Atanga	Agago	533	4	1	300	56%	87	4	50	1	1	3	100	3.68	134	376	72	Agago	21	19	145	Tori East
160	Apil West	Agago	468	4	1	300	64%	72	2	25	2	2	1	33	3.68	134	268	187	Agago	31	20	171	Lakwa A
161	Katongotut	Agago	281	2	1	300	100%	0	2	25	2	2	1	33	3.68	134	0	233	Agago	35	21	159	Atanga
162	Kapir	Agago	415	3	1	300	72%	55	0	0	1	1	3	100	3.68	134	293	156	Agago	30	22	172	Acam Roma
163	Abalukwang	Agago	433	4	0	0	0%	200	4	50	1	1	3	100	3.68	134	488	7	Agago	4	23	146	Agweng
164	Awelo	Agago	409	3	1	300	73%	53	4	50	3	3	0	0	2.75	88	194	221	Agago	34	24	168	Okwang Central
165	Dong Agweng B	Agago	468	4	2	600	100%	0	4	50	1	1	3	100	2.75	88	0	233	Agago	35	25	157	Gweno
166	Aleb Tong	Agago	409	3	0	0	0%	200	3	38	1	1	3	100	2.75	88	428	31	Agago	14	26	155	apano Central
167	Wii Atup	Agago	468	4	0	0	0%	200	3	38	1	1	3	100	2.75	88	429	30	Agago	13	27	143	Langalagada
168	Okwang Central	Agago	562	5	1	300	53%	93	6	75	1	1	3	100	2.75	88	360	87	Agago	24	28	177	Loborom
169	Acan Dano	Agago	415	3	1	300	72%	55	3	38	1	2	2	67	2.75	88	250	197	Agago	33	29	147	Alwee
170	Laming Onen	Agago	585	5	0	0	0%	200	4	50	1	1	3	100	2.67	83	436	26	Agago	11	30	162	Kapir
171	Lakwa A	Agago	468	4	0	0	0%	200	2	25	1	2	2	67	2.67	83	379	68	Agago	20	31	160	Apil West
172	Acam Roma	Agago	433	4	0	0	0%	200	2	25	1	2	2	67	2.53	76	371	76	Agago	22	32	142	Lapirin
173	Lela Kabala	Agago	435	4	0	0	0%	200	4	50	1	1	3	100	3.68	134	488	5	Agago	3	33	169	Acan Dano
174	Wilo Pany	Agago	526	4	2	600	100%	0	4	50	1	1	3	100	3.88	144	0	233	Agago	35	34	164	Awelo
175	Lapirin	Agago	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	0	233	Agago	35	-	149	Olokitoo
176	Tong Wiri South	Agago	338	3	0	0	0%	200	5	63	1	1	3	100	2.67	83	449	20	Agago	8	-	161	Katongotut
177	Loborom	Agago	468	4	1	300	64%	72	4	50	1	1	3	100	2.67	83	309	140	Agago	28	-	165	Dong Agweng B
178	Labedongony	Agago	491	4	0	0	0%	200	5	63	1	2	2	67	2.67	83	416	37	Agago	16	-	174	Wilo Pany
179	Te Okiro	Agago	491	4	0	0	0%	200	3	38	1	2	2	67	2.67	83	391	55	Agago	17	-	175	Lapirin
180	Apyela Central	Lamwo	467	4	1	300	64%	72	3	63	2	2	1	33	2.14	57		211	Lamwo	28	1	208	Lanywang E-walagiri
181	Padwat Central (Padwat P/S)	Lamwo	910	7	2	600	66%	68	6	75	1	1	3	100	2.14	57	307	144	Lamwo	14	2	207	Lin Central
182	Padwat West (Laluru Oyika)	Lamwo	463	4	1	300	65%	70	5	63	1	1	3	100	2.14	57	290	154	Lamwo	16	3	196	Obere
183	Mudu East (Mal)	Lamwo	642	5	2	600	93%	13	5	63	1	1	3	100	2.14	57	0	233	Lamwo	30	4	212	Pawena central (Tee Kasia)
184	Le-Tee okworo	Lamwo	435	4	1	300	69%	62	3	38	1	1	3	100	1.52	26		210	Lamwo	27	5	216	Kafata (Mbuya Parent sch.)
185	Dech East	Lamwo	688	6	0	0	0%	200	3	38	1	1	3	100	1.52	26	369	78	Lamwo	8	6	218	Kamama central H/C III
186	Dog Lokutu East	Lamwo	335	3	1	300	90%	27	4	50	1	1	3	100	1.52	26		174	Lamwo	22	7	187	Tadi South
187	Tadi South	Lamwo	489	4	0	0	0%	200	4	50	1	1	3	100	1.52	26	380	66	Lamwo	7	8	185	Dech East
188	Gem (Gem)	Lamwo	474	4	1	300	63%	73	4	50	1	1	3	100	2.25	63	290	158	Lamwo	18	9	197	Loromibenge B
189	Popany (Popany)	Lamwo	758	6	2	600	79%	42	4	50	1	1	3	100	2.25	63	0	233	Lamwo	30	10	209	Ayuu-lupur(Barara)
190	Pobutu	Lamwo	332	3	1	300	90%	64	3	38	1	1	3	100	2.25	63		154	Lamwo	20	11	215	Dyangbi (Near lutara's hom
191	Mekmek	Lamwo	321	3	1	300	93%	13	3	38	2	2	1	33	1.67	33	0	233	Lamwo	30	12	217	Arusha (Aloyi)
192	Kamama Central	Lamwo	583	5	2	600	100%	0	3	38	1	1	3	100	1.67	33	0	233	Lamwo	30	13	199	Moroto East
193	Lagwel P/S	Lamwo	847	7	2	600	71%	56	3	38	1	1	3	100	1.67	33		205	Lamwo	26	14	181	Padwat Central (Padwat P/S
194	Amica South	Lamwo	418	3	2	600	100%	0	5	63	2	2	1	33	1.67	33	0	233	Lamwo	30	15	210	Ajaa ogala (Alere)
195	Tumbafu West	Lamwo	755	6	1	300	38%	124	3	63	2	2	1	33	1.67	33		192	Lamwo	24	16	182	Padwat West (Laluru Oyika)
196	Obere	Lamwo	712	6	1	300	42%	116	4	50	1	1	3	100	3.56	128	400	51	Lamwo	3	17	206	Guria North
197	Loromibenge B	Lamwo	503	4	1	300	60%	81	4	50	1	1	3	100	3.56	128	363	81	Lamwo	9	18	188	Gem (Gem)
198	Tumanun A	Lamwo	221	2	2	600	100%	0	4	50	1	2	2	67	3.56	128	0	233	Lamwo	30	19	200	Lumwaka A
199	Moroto East	Lamwo	552	4	1	300	54%	91	2	25	1	2	2	67	3.56	128	315	130	Lamwo	13	20	203	Bibe (Itiba)
200	Lumwaka A	Lamwo	582	5	1	300	51%	99	2	25	2	2	1	33	3.56	128		159	Lamwo	19	21	201	Lobiliuku (obokolot)
201	Lobiliuku (obokolot)	Lamwo	707	6	1	300	42%	115	2	25	1	1	3	100	1.78	39		169	Lamwo	21	22	186	Dog Lokutu East
202	Langole (Kesa)	Lamwo	721	6	1	300	42%	117	3	38	1	2	0	0	1.78	39		218	Lamwo	29	23	190	Pobutu
203	Bibe (Itiba)	Lamwo	567	5	1	300	53%	94	4	50	1	1	3	100	1.78	39		153	Lamwo	20	24	195	Tumbafu West
204	Aguu P/S	Lamwo	426	3	2	600	100%	0	3	38	1	1	3	100	2.83	91	0	233	Lamwo	30	25	214	Amina (Nino mit)
205	Tedo pe	Lamwo	838	7	3	900	100%	0	4	50	1	1	3	100	2.83	91	0	233	Lamwo	30	26	193	Lagwel P/S
206	Guria North	Lamwo	397	3	1	300	76%	49	4	50	1	1	3	100	2.83	91	293	155	Lamwo	17	27	184	Le-Tee okworo
207	Lin Central	Lamwo	481	4	0	0	0%	200	3	38	1	1	3	100	3.33	116	458	16	Lamwo	2	28	180	Apyela Central
208	Lanywang E-walagiri	Lamwo	895	7	0	0	0%	200	5	63	1	1	3	100	3.33	116	486	9	Lamwo	1	29	202	Langole (Kesa)
209	Ayuu-lupur(Barara)	Lamwo	1,122	9	2	600	53%	93	7	88	1	1	3	100	2.27	64	353	92	Lamwo	10	-	183	Mudu East (Mal)
210	Ajaa ogala (Alere)	Lamwo	713	6	1	300	42%	116	7	88	2	2	1	33	2.27	64	308	145	Lamwo	15	-	189	Popany (Popany)
211	Anaka South (Alwala)	Lamwo	649	5	3	900	100%	0	6	75	1	2	2	67	2.27	64	0	233	Lamwo	30	-	191	Mekmek
212	Pawena central (Tee Kasia)	Lamwo	992	8	1	300	30%	140	6	75	1	1	3	100	2.27	64	388	60	Lamwo	4	-	192	Kamama Central
213	Abera (Tee Ogali)	Lamwo	368	3	2	600	100%	0	6	75	1	1	3	100	2.27	64	0	233	Lamwo	30	-	194	Amica South
214	Amina (Nino mit)	Lamwo	852	7	2	600	70%	59	6	75	2	2	1	33	2.27	64		205	Lamwo	25	-	198	Tumanun A
215	Dyangbi (Near lutara's home)	Lamwo	992	8	0	0	0%	200	3	38	2	2	1	33	2.27	64	343	102	Lamwo	11	-	204	Aguu P/S
216	Kafata (Mbuya Parent sch.)	Lamwo	957	8	1	300	31%	137	6	75	1	1	3	100	2.27	64	384	62	Lamwo	5	-	205	Tedo pe
217	Arusha (Aloyi)	Lamwo	735	6	1	300	41%	118	6	75	1	2	2	67	2.27	64	330	111	Lamwo	12	-	211	Anaka South (Alwala)
218	Kamama central H/C III	Lamwo	2,357	19	3	900	38%	124	6	75	1	1	3	100	2.27	64	381	64	Lamwo	6	-	213	Abera (Tee Ogali)

Table 2.2.2 Selection of Villages (1st. Step)

No.	Village	District	Population (2015)	Score on Population (2015)	Total of Water Sources	Pop. Served by Ex. Facilities	Coverage (%) max=100%	Score on Coverage	Number of Experiences	Score on Experiences	Season (1:good / 2: Not good / 3:Impossible / 4:Others)	Season (1:good / 2: Not good / 3:Impossible / 4:Others)	Point on Accessibility	Score on Accessibility	Expected Yield (m3/hr)	Score on Expected Yield	Total Score	Order in Whole Villages	District	Order in District	Order in District	No.	Selected Village
219	Lugwar central	Kitgum	904	7	1	300	33%	134	2	25	1	3	0	0	1.63	32	198	219	Kitgum	23	1	239	Yepa A
220	Lokira S	Kitgum	564	5	2	600	100%	0	0	0	2	3	0	0	2.03	52	0	233	Kitgum	32	2	235	Ayom Okola "B"
221	Okidi central	Kitgum	765	6	1	300	39%	122	2	25	1	1	3	100	2.03	52	304	147	Kitgum	10	3	241	Lacen Otinga West
222	Tangi Agoro	Kitgum	782	6	2	600	77%	47	0	0	1	2	2	67	2.03	52	171	229	Kitgum	28	4	230	Gulu gwen Orua 'B.
223	Parwech Alango	Kitgum	564	5	1	300	53%	94	0	0	1	2	2	67	1.87	44	209	217	Kitgum	22	5	228	Rucurucu
224	Bol kol Central	Kitgum	628	5	1	300	48%	104	1	13	3	3	0	0	1.87	44	166	231	Kitgum	30	6	253	Agora
225	Langi	Kitgum	837	7	1	300	36%	128	0	0	1	2	2	67	1.87	44	245	198	Kitgum	17	7	232	Pagen Central (Corner Padi
226	Jerusalem	Kitgum	469	4	1	300	64%	72	2	25	1	2	2	67	1.87	44	211	216	Kitgum	21	8	243	Lakokok
227	Apeca	Kitgum	361	3	2	600	100%	0	1	13	1	2	2	67	2.26	63	0	233	Kitgum	32	9	233	Pamolo central
228	Rucurucu	Kitgum	484	4	0	0	0%	200	2	25	1	2	2	67	2.26	63	359	88	Kitgum	5	10	221	Okidi central
229	Akino (Dem kulu kwach)	Kitgum	792	6	1	300	38%	124	2	25	1	2	2	67	2.26	63	285	168	Kitgum	12	11	249	Lobale
230	Gulu gwen Orua 'B.	Kitgum	767	6	0	0	0%	200	2	25	1	2	2	67	2.26	63	381	84	Kitgum	4	12	229	Akino (Dem kulu kwach)
231	Ocettokkee Trading centre	Kitgum	1,111	9	2	600	54%	92	0	0	1	1	3	100	1.83	42	243	201	Kitgum	18	13	240	Juba
232	Pagen Central (Corner Padibe	Kitgum	1,234	10	1	300	24%	151	3	38	1	1	3	100	1.83	42	340	105	Kitgum	7	14	246	Labworomor
233	Pamolo central	Kitgum	1,210	10	1	300	25%	150	1	13	1	1	3	100	1.83	42	314	133	Kitgum	9	15	234	Panyum "A"
234	Panyum "A"	Kitgum	546	4	1	300	55%	90	0	0	1	1	3	100	2.55	78	272	181	Kitgum	15	16	252	Otoboi (security site)
235	Ayom Okola "B"	Kitgum	373	3	0	0	0%	200	2	25	1	1	3	100	2.55	78	406	45	Kitgum	2	17	225	Langi
236	Lagot B	Kitgum	359	3	1	300	84%	33	0	0	2	2	1	33	2.55	78	0	233	Kitgum	32	18	231	Ocettokkee Trading centre
237	Daniel Comboni P/S	Kitgum	478	4	2	600	100%	0	0	0	1	2	2	67	2.55	78	0	233	Kitgum	32	19	242	Winyorac-Pawiny
238	Degwac P/s	Kitgum	652	5	2	600	92%	16	0	0	1	1	3	100	2.55	78	0	233	Kitgum	32	20	244	Nyapea A
239	Yepa A	Kitgum	378	3	0	0	0%	200	2	25	1	1	3	100	2.55	78	406	44	Kitgum	1	21	226	Jerusalem
240	Juba	Kitgum	847	7	0	0	0%	200	0	0	2	3	0	0	2.55	78	284	171	Kitgum	13	22	223	Parwech Alango
241	Lacen Otinga West	Kitgum	301	2	0	0	0%	200	0	0	1	1	3	100	2.55	78	380	65	Kitgum	3	23	219	Lugwar central
242	Winyorac-Pawiny	Kitgum	530	4	1	300	57%	87	2	25	1	1	3	100	1.42	21	237	206	Kitgum	19	24	251	Ladot onen central (P/S)
243	Lakokok	Kitgum	450	4	0	0	0%	200	3	38	1	2	2	67	1.42	21	329	113	Kitgum	8	25	247	Obwore west
244	Nyapea A	Kitgum	735	6	1	300	41%	118	2	25	1	2	2	67	1.42	21	237	207	Kitgum	20	26	250	Loluko (Tumatoo)
245	Lelapongor	Kitgum	406	3	1	300	74%	52	0	0	1	2	2	67	1.89	45	167	230	Kitgum	29	27	255	Akilok south-kalor(security si
246	Labworomor	Kitgum	543	4	1	300	55%	90	3	38	1	1	3	100	1.89	45	276	176	Kitgum	14	28	222	Tangi Agoro
247	Obwore west	Kitgum	393	3	1	300	76%	47	2	25	1	2	2	67	1.89	45	187	225	Kitgum	25	29	245	Lelapongor
248	Pella wicere	Kitgum	649	5	2	600	92%	15	1	13	1	2	2	67	1.89	45	0	233	Kitgum	32	30	224	Bol kol Central
249	Lobale	Kitgum	420	3	0	0	0%	200	0	0	1	2	2	67	1.33	17	287	165	Kitgum	11	31	254	Lokom (P/S)
250	Loluko (Tumatoo)	Kitgum	560	5	1	300	54%	93	0	0	1	2	2	67	1.33	17	181	227	Kitgum	26	-	220	Lokira S
251	Ladot onen central (P/S)	Kitgum	459	4	1	300	65%	69	0	0	1	1	3	100	1.33	17	190	224	Kitgum	24	-	227	Apeca
252	Otoboi (security site)	Kitgum	753	6	1	300	40%	120	2	25	1	1	3	100	1.33	17	288	188	Kitgum	16	-	236	Lagot B
253	Agora	Kitgum	559	4	0	0	0%	200	3	38	1	1	3	100	1.33	17	358	89	Kitgum	6	-	237	Daniel Comboni P/S
254	Lokom (P/S)	Kitgum	414	3	1	300	72%	55	0	0	2	3	0	0	1.33	17	75	232	Kitgum	31	-	238	Degwac P/s
255	Akilok south-kalor(security site	Kitgum	482	4	1	300	62%	76	1	13	1	2	2	67	1.33	17	175	228	Kitgum	27	-	248	Pella wicere
256	Lapa mac	Pader	161	1	3	900	100%	0	1	13	2	3	0	0	1.54	27	0	233	Pader	30	1	270	Atup
257	Ogan Gwok Roko	Pader	439	4	1	300	68%	63	4	50	1	1	3	100	1.54	27	244	199	Pader	28	2	286	Dure north
258	Alilli	Pader	702	6	0	0	0%	200	2	25	1	2	2	67	1.54	27	324	122	Pader	15	3	282	Bangalela
259	Nek-Nono	Pader	338	3	0	0	0%	200	1	13	1	1	3	100	1.54	27	342	103	Pader	11	4	285	Lela awoki
260	Te-okuto	Pader	666	5	0	0	0%	200	2	25	1	1	3	100	1.61	30	361	85	Pader	10	5	271	Parwech Lukee east
261	Tee tworo	Pader	434	4	0	0	0%	200	4	50	1	1	3	100	1.61	30	384	61	Pader	8	6	263	Apwor kla
262	Lacek Onyele	Pader	431	4	1	300	70%	61	5	63	1	1	3	100	1.61	30	257	194	Pader	27	7	266	Lapoyaokwee
263	Apwor kla	Pader	402	3	0	0	0%	200	5	63	1	1	3	100	1.61	30	396	52	Pader	6	8	261	Tee tworo
264	Arta	Pader	643	5	0	0	0%	200	4	50	1	3	0	0	2.47	74	329	112	Pader	13	9	292	Lapeny
265	Panyakawa	Pader	973	8	1	300	31%	138	3	38	1	3	0	0	2.47	74	257	193	Pader	26	10	260	Te-okuto
266	Lapoyaokwee	Pader	289	2	0	0	0%	200	4	50	1	2	2	67	2.47	74	393	54	Pader	7	11	259	Nek-Nono
267	Otinga	Pader	216	2	0	0	0%	200	0	0	3	3	0	0	2.47	74	275	178	Pader	23	12	290	Pagor
268	Aringo yon	Pader	421	3	0	0	0%	200	3	38	2	3	0	0	2.47	74	315	132	Pader	17	13	264	Ana
269	Libii	Pader	654	5	0	0	0%	200	3	38	1	3	0	0	2.47	74	317	129	Pader	16	14	289	Dagolwato
270	Atup	Pader	1,144	9	0	0	0%	200	4	50	1	1	3	100	3.11	105	455	14	Pader	1	15	258	Alilli
271	Parwech Lukee east	Pader	704	6	1	300	43%	115	6	75	1	1	3	100	3.11	105	401	49	Pader	5	16	269	Libii
272	Bolo laming	Pader	454	4	1	300	66%	68	1	13	1	1	3	100	3.11	105	290	160	Pader	21	17	268	Aringo yon
273	Atede central	Pader	723	6	2	600	83%	34	6	75	1	1	3	100	3.11	105	0	233	Pader	30	18	276	Lali
274	Tungtwon	Pader	931	8	1	300	32%	136	3	38	2	2	1	33	2.64	82	296	151	Pader	20	19	287	Obalo
275	Ongako	Pader	889	7	1	300	34%	133	4	50	2	3	0	0	2.64	82	272	182	Pader	24	20	274	Tungtwon
276	Lanyalwala	Pader	445	4	0	0	0%	200	0	0	3	3	0	0	2.64	82	286	167	Pader	22	21	272	Bolo laming
277	Wiko	Pader	447	4	2	600	100%	0	3	38	3	3	0	0	2.64	82	0	233	Pader	30	22	276	Lanyalwala
278	Lali	Pader	181	1	0	0	0%	200	2	25	3	3	0	0	2.64	82	309	141	Pader	18	23	267	Otinga
279	Leebit	Pader	398	3	1	300	75%	49	5	63	1	3	0	0	2.34	67	182	226	Pader	29	24	275	Ongako
280	Adula West	Pader	856	7	2	600	70%	60	3	38	1	1	3	100	2.34	67	271	183	Pader	25	25	280	Adula West
281	Alipan West	Pader	407	3	2	600	100%	0	5	63	1	1	3	100	2.63	81	0	233	Pader	30	26	265	Panyakawa
282	Bangalela	Pader	385	3	0	0	0%	200	2	25	1	1	3	100	2.63	81	410	43	Pader	3	27	262	Lacek Onyele
283	Bunga	Pader	219	2	2	600	100%	0	5	63	1	1	3	100	2.63	81	0	233	Pader	30	28	257	Ogan Gwok Roko
284	Keko Paadum	Pader	234	2	1	300	100%	0	2	25	1	2	2	67	2.63	81	0	233	Pader	30	29	279	Leebit
285	Lela awoki	Pader	328	3	0	0	0%	200	3	38	1	1	3	100	2.26	63	403	46	Pader	4	-	256	Lapa mac
286	Dure north	Pader	398	3	0	0	0%	200	4	50	1	1	3	100	2.26	63	416	38	Pader	2	-	273	Atede central
287	Obalo	Pader	632	5	0	0	0%	200	3	38	3	3	0	0	2.26	63	306	146	Pader	19	-	277	Wiko
288	Wang Opok East	Pader	318	3	2	600	100%	0	2	25	1	2	2	67	2.26	63	0	233	Pader	30	-	281	Alipan West
289	Dagolwato	Pader	514	4	1	300	58%	83	6	75	1	1	3	100	2.26	63	325	120	Pader	14	-	283	Bunga
290	Pagor	Pader	649	5	1	300	46%	108	3	38	1	1	3	100	2.63	81	332	109	Pader	12	-	284	Keko Paadum
291	Telela west	Pader	721	6	2	600	83%	34	5	63	1	1	3	100	2.63	81	0	233	Pader	30	-	288	Wang Opok East
292	Lapeny	Pader	211	2	0	0	0%	200	1	13	1	2	2	67	2.63	81	362	82	Pader	9	-	291	Telela west
293	Tetito	Pader	312	3	1	300	96%	8	4	50	1	1	3	100	3.77	139	0	233	Pader	30	-	293	Tetito
294	Onganv Nangulu	Pader	626	5	3	900	100%	0	0	0	1	3	0	0	3.77	139	0	233	Pader	30	-	294	Onganv Nangulu

Table 2.2.3 Selection of Target Villages and Priority (2nd Step)

No.	Village	District	Sub-county	Access to Site		Drilling Depth		Bedrock Depth		Static Water Level		Yield		Total Point	Rank
				Eva	Score	(m)	Score	(m)	Score	(m)	Score	(m3/hr)	Score		
8	Pupwonya East	Amuru	Attiak	Ok	100	68.6	44.9	32.8	63.6	12.7	63.8	2.6	52.4	325	1
21	Coorom	Amuru	Lamogi	Ok	100	67.1	47.1	31.7	61.3	10.9	68.8	2.2	39.2	316	2
4	Pacilo East	Amuru	Attiak	Ok	100	68.6	41.1	29.5	56.7	12.7	63.8	2.6	52.4	314	3
12	Olinga	Amuru	Pabbo	Ok	100	62.9	52.9	19.3	35.1	7.6	78.3	2.2	38.6	305	4
10	Kal centre	Amuru	Pabbo	Ok	100	62.9	52.9	18.3	33.0	7.6	78.3	2.2	38.6	303	5
13	Kati Kati A	Amuru	Pabbo	Ok	100	62.9	52.9	17.5	31.3	7.6	78.3	2.2	38.6	301	6
32	Reckiceke	Amuru	Amuru	Ok	100	71.9	40.1	31.8	61.5	13.8	60.6	2.0	34.1	296	7
28	Labongo	Amuru	Amuru	Ok	100	71.9	40.1	31.7	61.3	13.8	60.6	2.0	34.1	296	8
23	Odur	Amuru	Lamogi	Ok	100	67.1	47.1	20.2	37.0	10.9	68.8	2.2	39.2	292	9
33	Lamolo Coke	Amuru	Lamogi	Ok	100	67.1	47.1	20.2	37.0	10.9	68.8	2.2	39.2	292	9
17	Abyee	Amuru	Lamogi	Ok	100	67.1	47.1	20.2	37.0	10.9	68.8	2.2	39.2	292	9
18	Amora	Amuru	Lamogi	Ok	100	67.1	47.1	17.8	31.9	10.9	68.8	2.2	39.2	287	12
3	Okidi North	Amuru	Attiak	Ok	100	68.6	41.1	13.7	23.3	12.7	63.8	2.6	52.4	281	13
19	Opok	Amuru	Lamogi	Ok	100	67.1	47.1	13.8	23.5	10.9	68.8	2.2	39.2	278	14
9	Paomo	Amuru	Pabbo	Ok	100	62.9	52.9	5.7	6.3	7.6	78.3	2.2	38.6	276	15
20	Pukure	Amuru	Lamogi	Ok	100	67.1	47.1	12.6	20.9	10.9	68.8	2.2	39.2	276	16
14	Abera	Amuru	Pabbo	Ok	100	62.9	52.9	5.6	6.1	7.6	78.3	2.2	38.6	276	17
35	Palukere West	Amuru	Attiak	Ok	100	68.6	44.9	9.1	13.5	12.7	63.8	2.6	52.4	275	18
5	Palukere East	Amuru	Attiak	Ok	100	68.6	41.1	9.1	13.5	12.7	63.8	2.6	52.4	271	19
34	Apaa	Amuru	Pabbo	Ok	100	62.9	52.9	2.7	0.0	7.6	78.3	2.2	38.6	270	20
1	Bibia East	Amuru	Attiak	Ok	100	68.6	41.1	7.5	10.1	12.7	63.8	2.6	52.4	268	21
30	Mutema	Amuru	Amuru	Ok	100	71.9	40.1	17.8	31.9	13.8	60.6	2.0	34.1	267	22
7	Pukumu	Amuru	Attiak	Ok	100	68.6	44.9	3.7	2.1	12.7	63.8	2.6	52.4	263	23
25	Teddi	Amuru	Amuru	Ok	100	71.9	40.1	11.1	17.8	13.8	60.6	2.0	34.1	253	24
31	Ogeli	Amuru	Amuru	Ok	100	71.9	40.1	10.8	17.1	13.8	60.6	2.0	34.1	252	25
27	Amoyokuma	Amuru	Amuru	Ok	100	71.9	40.1	4.7	4.2	13.8	60.6	2.0	34.1	239	26
29	Lujoro	Amuru	Amuru	Ok	100	71.9	40.1	4.7	4.2	13.8	60.6	2.0	34.1	239	26
15	Ceri	Amuru	Pabbo	Hard	40	62.9	52.9	16.4	29.0	7.6	78.3	2.2	38.6	239	28
11	Andara	Amuru	Pabbo	Hard	40	62.9	52.9	4.7	4.2	7.6	78.3	2.2	38.6	214	29
67	Pawatomero Central	Nwoya	Puronga	Ok	100	66.4	48.0	24.9	46.9	15.3	56.4	3.9	96.4	348	1
65	Patira East	Nwoya	Puronga	Ok	100	66.4	48.0	22.1	41.0	15.3	56.4	3.9	96.4	342	2
66	Patira West	Nwoya	Puronga	Ok	100	66.4	48.0	22.1	41.0	15.3	56.4	3.9	96.4	342	2
68	Pawatomero East	Nwoya	Puronga	Ok	100	66.4	48.0	22.1	41.0	15.3	56.4	3.9	96.4	342	2
62	Paminolango	Nwoya	Puronga	Ok	100	66.4	48.0	19.5	35.5	15.3	56.4	3.9	96.4	336	5
64	Lodi	Nwoya	Puronga	Ok	100	66.4	48.0	16.9	30.0	15.3	56.4	3.9	96.4	331	6
70	Lagazi	Nwoya	Puronga	Ok	100	66.4	48.0	7.4	9.9	15.3	56.4	3.9	96.4	311	7
48	Kal	Nwoya	Anaka	Ok	100	78.7	30.4	28.3	54.1	10.2	70.8	2.3	42.2	297	8
54	Agonga B	Nwoya	Koch Goma	Ok	100	56.3	62.5	12.1	19.9	11.6	66.9	2.1	36.8	286	9
46	Akago	Nwoya	Anaka	Ok	100	78.7	30.4	10.0	15.4	10.2	70.8	2.3	42.2	259	10
37	Bwobonam B	Nwoya	Alero	Ok	100	75.0	35.6	9.2	13.7	10.3	70.6	1.8	27.9	248	11
40	Latekodong	Nwoya	Alero	Ok	100	75.0	35.6	8.9	13.1	10.3	70.6	1.8	27.9	247	12
106	Labworomor	Gulu	Bobi	Ok	100	59.0	58.6	44.8	89.0	9.7	72.2	2.3	44.5	364	1
96	Agoro I	Gulu	Palaro	Ok	100	63.5	52.2	35.3	68.9	11.4	67.3	3.1	68.9	357	2
116	Kal A and B	Gulu	Koro	Ok	100	61.9	54.4	31.6	61.1	9.8	72.0	2.9	64.2	352	3
105	Adak	Gulu	Patiko	Ok	100	63.5	52.2	6.3	7.6	7.7	78.0	4.8	100.0	338	4
111	Ariya	Gulu	Koro	Ok	100	61.9	54.4	22.3	41.4	9.8	72.0	2.9	64.2	332	5
124	Alwii	Gulu	Lalogi	Ok	100	64.1	51.3	29.1	55.8	10.5	70.0	2.4	46.4	324	6
125	Latinnyer	Gulu	Lalogi	Ok	100	64.1	51.3	29.1	55.8	10.5	70.0	2.4	46.4	324	6
101	Kiteny Central	Gulu	Palaro	Ok	100	63.5	52.2	17.8	31.9	11.4	67.3	3.1	68.9	320	8
115	Obwola	Gulu	Koro	Ok	100	61.9	54.4	15.8	27.7	9.8	72.0	2.9	64.2	318	9
90	Omel	Gulu	Paicho	Ok	100	72.9	38.8	26.8	51.0	9.9	71.6	2.6	53.7	315	10
136	Owak	Gulu	Ongako	Ok	100	74.5	36.4	26.6	50.5	9.9	71.8	2.7	55.8	314	11
108	Ibar	Gulu	Bobi	Ok	100	59.0	58.6	20.8	38.3	9.7	72.2	2.3	44.5	314	12
95	Gulu PTC	Gulu	Paicho	Ok	100	72.9	38.8	22.3	41.4	9.9	71.6	2.6	53.7	306	13
107	Along	Gulu	Bobi	Ok	100	59.0	58.6	16.1	28.3	9.7	72.2	2.3	44.5	304	14
138	Lamin Lawino	Gulu	Ongako	Ok	100	74.5	36.4	20.8	38.3	9.9	71.8	2.7	55.8	302	15
126	Aparowiya I	Gulu	Lalogi	Ok	100	64.1	51.3	17.6	31.5	10.5	70.0	2.4	46.4	299	16
127	Aparowiya II	Gulu	Lalogi	Ok	100	64.1	51.3	17.6	31.5	10.5	70.0	2.4	46.4	299	16

Table 2.2.3 Selection of Target Villages and Priority (2nd Step)

No.	Village	District	Sub-county	Access to Site		Drilling Depth		Bedrock Depth		Static Water Level		Yield		Total Point	Rank
				Eva	Score	(m)	Score	(m)	Score	(m)	Score	(m3/hr)	Score		
114	Atede	Gulu	Koro	Ok	100	61.9	54.4	5.7	6.3	9.8	72.0	2.9	64.2	297	18
89	Acutomer	Gulu	Paicho	Ok	100	72.9	38.8	7.6	10.4	9.9	71.6	2.6	53.7	275	19
123	Otal	Gulu	Lalogi	Hard	40	64.1	51.3	19.3	35.1	10.5	70.0	2.4	46.4	243	21
110	Adak	Gulu	Bobi	Hard	40	59.0	58.6	10.7	16.9	9.7	72.2	2.3	44.5	232	21
163	Abalukwang	Agago	Wol	Ok	100	60.7	56.1	58.9	100.0	22.5	35.8	3.3	75.8	368	1
154	opyel Central	Agago	Patongo	Ok	100	57.7	60.5	24.4	45.9	11.4	67.5	3.6	85.6	359	2
145	Tori East	Agago	Lira Palwo	Ok	100	60.6	56.2	36.8	72.1	9.7	72.4	2.6	52.1	353	3
146	Agweng	Agago	Lira Palwo	Ok	100	60.6	56.2	36.8	72.1	9.7	72.4	2.6	52.1	353	3
150	Kotomor east	Agago	Kotomor (Patongo)	Ok	100	57.7	60.5	18.0	32.3	11.4	67.5	3.6	85.6	346	5
151	Amin Ogwal	Agago	Kotomor (Patongo)	Ok	100	57.7	60.5	18.0	32.3	11.4	67.5	3.6	85.6	346	5
156	Opal Oryoneko	Agago	Patongo	Ok	100	57.7	60.5	11.2	18.0	11.4	67.5	3.6	85.6	331	7
152	Oringo Ongom	Agago	Kotomor (Patongo)	Ok	100	57.7	60.5	9.6	14.6	11.4	67.5	3.6	85.6	328	8
167	Wii Atup	Agago	Arum (Omot)	Ok	100	54.1	65.6	17.8	31.9	7.7	78.0	2.6	52.3	328	9
153	Te Vwao	Agago	Kotomor (Patongo)	Ok	100	57.7	60.5	9.4	14.2	11.4	67.5	3.6	85.6	328	10
158	Owito	Agago	Patongo	Ok	100	57.7	60.5	9.0	13.3	11.4	67.5	3.6	85.6	327	11
166	Aleb Tong	Agago	Arum (Omot)	Ok	100	54.1	65.6	17.2	30.7	7.7	78.0	2.6	52.3	327	12
173	Lela Kabala	Agago	Wol	Ok	100	60.7	56.1	26.8	51.0	22.5	35.8	3.3	75.8	319	13
148	Lapyem	Agago	Lira Palwo	Ok	100	60.6	56.2	11.1	17.8	9.7	72.4	2.6	52.1	299	14
144	Sub County HQ	Agago	Lira Palwo	Ok	100	60.6	56.2	7.0	9.1	9.7	72.4	2.6	52.1	290	15
159	Atanga	Agago	Wol	Ok	100	60.7	56.1	11.8	19.2	22.5	35.8	3.3	75.8	287	16
172	Acam Roma	Agago	Lokole	Ok	100	59.1	58.5	15.8	27.7	24.4	30.4	2.2	40.0	256	17
141	Lutage	Agago	Lokole	Ok	100	59.1	58.5	15.0	26.0	24.4	30.4	2.2	40.0	255	18
170	Laming Onen	Agago	Omiya Pacwa (Paimol)	Ok	100	60.9	55.8	17.8	31.9	25.5	27.1	2.1	36.0	251	19
171	Lakwa A	Agago	Omiya Pacwa (Paimol)	Ok	100	60.9	55.8	15.8	27.7	25.5	27.1	2.1	36.0	247	20
178	Labedongony	Agago	Paimol	Ok	100	60.9	55.8	10.9	17.3	25.5	27.1	2.1	36.0	236	21
179	Te Okiro	Agago	Paimol	Ok	100	60.9	55.8	10.9	17.3	25.5	27.1	2.1	36.0	236	21
176	Tong Wiri South	Agago	Paimol	Ok	100	60.9	55.8	7.4	9.9	25.5	27.1	2.1	36.0	229	23
207	Liri Central	Lamwo	Palabek Kal	Ok	100	64.3	51.0	39.5	77.8	14.5	58.5	3.3	76.9	364	1
199	Moroto East	Lamwo	Agoro	Ok	100	60.9	55.9	46.1	91.8	25.0	28.5	3.5	81.9	358	2
196	Obere	Lamwo	Agoro	Ok	100	60.9	55.9	45.4	90.3	25.0	28.5	3.5	81.9	357	3
217	Arusha (Aloyi)	Lamwo	Palabek Gem	Ok	100	55.9	62.9	21.7	40.2	13.7	60.9	2.3	42.4	306	4
214	Amina (Nino mit)	Lamwo	Palabek Gem	Ok	100	55.9	62.9	21.7	40.2	13.7	60.9	2.3	42.4	306	4
188	Gem (Gem)	Lamwo	Madi-opei	Ok	100	75.8	34.6	120.0	100.0	26.5	24.2	2.2	39.1	298	6
216	Kafata	Lamwo	Palabek Gem	Ok	100	55.9	62.9	17.6	31.5	13.7	60.9	2.3	42.4	298	7
215	Dyangbii	Lamwo	Palabek Gem	Ok	100	55.9	62.9	17.6	31.5	13.7	60.9	2.3	42.4	298	7
203	Biber (Itiba)	Lamwo	Paloga	Ok	100	60.7	56.2	38.2	75.1	20.9	40.2	1.8	25.7	297	9
208	Lanywang E-walagiri	Lamwo	Palabek Kal	Ok	100	64.3	51.0	5.4	5.7	14.5	58.5	3.3	76.9	292	10
206	Guria North	Lamwo	Lokung	Hard	40	57.9	60.1	24.0	45.0	13.8	60.5	3.5	81.9	288	11
180	Apyeta Central	Lamwo	Palabek Ogili	Ok	100	64.9	50.2	33.1	64.3	23.1	33.9	2.1	35.5	284	12
209	Ayuu-lupur(Barara)	Lamwo	Palabek Gem	Ok	100	55.9	62.9	8.8	12.9	13.7	60.9	2.3	42.4	279	13
218	Kamama central H/C III	Lamwo	Palabek Gem	Ok	100	55.9	62.9	7.9	11.0	13.7	60.9	2.3	42.4	277	14
212	Pawena central (Tee Kasia)	Lamwo	Palabek Gem	Ok	100	55.9	62.9	5.7	6.3	13.7	60.9	2.3	42.4	273	15
197	Loromibenge B	Lamwo	Agoro	Ok	100	60.9	55.9	5.3	5.5	25.0	28.5	3.5	81.9	272	16
201	Lobiluku (obokolot)	Lamwo	Paloga	Ok	100	60.7	56.2	22.5	41.9	20.9	40.2	1.8	25.7	264	17
190	Pobutu	Lamwo	Madi-opei	Ok	100	75.8	34.6	32.9	63.8	26.5	24.2	2.2	39.1	262	18
182	Padwat West (Laluru Oyika)	Lamwo	Palabek Ogili	Ok	100	64.9	50.2	17.8	31.9	23.1	33.9	2.1	35.5	251	19
195	Tumbafu West	Lamwo	Padibe West	Ok	100	66.3	48.2	23.3	43.6	21.9	37.5	1.6	21.5	251	20
185	Dech East	Lamwo	Padibe East	Ok	100	60.9	55.8	18.0	32.3	21.8	37.6	1.5	16.7	243	21
186	Dog Lokutu East	Lamwo	Padibe East	Ok	100	60.9	55.8	18.0	32.3	21.8	37.6	1.5	16.7	243	21
184	Lio-Tee okworo	Lamwo	Padibe East	Ok	100	60.9	55.8	17.8	31.9	21.8	37.6	1.5	16.7	242	23
187	Tadi South	Lamwo	Padibe East	Ok	100	60.9	55.8	17.8	31.9	21.8	37.6	1.5	16.7	242	23

Table 2.2.3 Selection of Target Villages and Priority (2nd Step)

No.	Village	District	Sub-county	Access to Site		Drilling Depth		Bedrock Depth		Static Water Level		Yield		Total Point	Rank
				Eva	Score	(m)	Score	(m)	Score	(m)	Score	(m3/hr)	Score		
181	Padwat Central (Padwat P/S)	Lamwo	Palabek Ogili	Ok	100	64.9	50.2	11.5	18.6	23.1	33.9	2.1	35.5	238	25
193	Lagwel P/S	Lamwo	Padibe West	Ok	100	66.3	48.2	15.6	27.3	21.9	37.5	1.6	21.5	234	26
202	Langole (Keca)	Lamwo	Paloga	Hard	40	60.7	56.2	31.3	60.5	20.9	40.2	1.8	25.7	223	27
210	Ajaa ogala (Alere)	Lamwo	Palabek Gem	Hard	40	55.9	62.9	7.9	11.0	13.7	60.9	2.3	42.4	217	28
200	Lumwaka A	Lamwo	Agoro	No	0	60.9	55.9	11.5	18.6	25.0	28.5	2.0	33.3	136	29
234	Panyum "A"	Kitgum	Mucwini	Ok	100	57.6	60.5	56.4	100.0	26.2	25.2	2.5	50.6	336	1
241	Lacen Otinga West	Kitgum	Mucwini	Ok	100	57.6	60.5	31.6	61.1	26.2	25.2	2.5	50.6	297	2
229	Akino	Kitgum	Lagoro	Ok	100	62.0	54.3	29.0	55.6	21.3	39.2	2.2	40.0	289	3
246	Labworomor	Kitgum	Omiya Anyima	Ok	100	63.9	51.6	31.5	60.9	25.2	28.1	1.8	27.8	268	4
225	Langii	Kitgum	Kitgum Matidi	Ok	100	64.1	51.3	29.0	55.6	23.7	32.3	1.8	27.6	267	5
239	Yepa A	Kitgum	Mucwini	Ok	100	57.6	60.5	16.5	29.2	26.2	25.2	2.5	50.6	265	6
230	Gulu gwen Orua .B.	Kitgum	Lagoro	Ok	100	62.0	54.3	16.0	28.1	21.3	39.2	2.2	40.0	262	7
242	Winyorac-Pawiny	Kitgum	Namokora	Ok	100	75.4	35.2	120.0	100.0	30.3	13.4	1.3	10.6	259	8
231	Ocettokkee Trading centre	Kitgum	Layamo	Ok	100	63.9	51.6	20.8	38.3	25.0	28.5	1.8	25.9	244	9
232	Pagen Central	Kitgum	Layamo	Ok	100	63.9	51.6	20.5	37.6	25.0	28.5	1.8	25.9	244	10
235	Ayom Olola "B"	Kitgum	Mucwini	Ok	100	57.6	60.5	5.7	6.3	26.2	25.2	2.5	50.6	243	11
228	Rucurucu	Kitgum	Lagoro	Ok	100	62.0	54.3	5.2	5.3	21.3	39.2	2.2	40.0	239	12
221	Okidi central	Kitgum	Amida	Ok	100	62.7	53.3	12.8	21.4	24.1	31.1	2.0	32.6	238	13
240	Juba	Kitgum	Mucwini	Hard	40	57.6	60.5	31.6	61.1	26.2	25.2	2.5	50.6	237	14
233	Pamolo central	Kitgum	Layamo	Ok	100	63.9	51.6	11.9	19.5	25.0	28.5	1.8	25.9	226	15
252	Otoboi	Kitgum	Orom	Ok	100	69.8	43.2	20.8	38.3	30.8	12.1	1.2	5.6	199	16
253	Agora	Kitgum	Orom	Ok	100	69.8	43.2	17.8	31.9	30.8	12.1	1.2	5.6	193	17
243	Lakokok	Kitgum	Namokora	Ok	100	75.4	35.2	8.7	12.7	30.3	13.4	1.3	10.6	172	18
249	Lobale	Kitgum	Orom	Ok	100	69.8	43.2	5.6	6.1	30.8	12.1	1.2	5.6	167	19
266	Lapoyaokwee	Pader	Atanga	Ok	100	56.4	62.3	103.4	100.0	9.2	73.9	2.5	50.1	386	1
259	Nek-Nono	Pader	Lapul	Ok	100	58.4	59.4	138.4	100.0	8.8	74.7	1.5	17.9	352	2
261	Tee tworo	Pader	Puranga	Ok	100	54.0	65.7	35.6	69.6	9.2	73.7	1.6	20.3	329	3
292	Lapeny	Pader	Ogom (Kilak)	Ok	100	61.7	54.8	26.8	51.0	14.3	59.2	2.7	57.2	322	4
268	Aringo yon	Pader	Angagura (Atanga)	Ok	100	56.4	62.3	13.8	23.5	9.2	73.9	2.5	50.1	310	5
269	Libii	Pader	Angagura (Atanga)	Ok	100	56.4	62.3	13.8	23.5	9.2	73.9	2.5	50.1	310	5
271	Parwech Lukee east	Pader	Awere	Ok	100	60.7	56.1	5.8	6.6	9.3	73.6	3.1	70.2	306	7
270	Atup	Pader	Awere	Ok	100	60.7	56.1	5.4	5.7	9.3	73.6	3.1	70.2	306	8
287	Obalo	Pader	Latanya (Acholibur)	Ok	100	60.4	56.6	34.9	68.1	21.7	38.1	2.3	42.2	305	9
282	Bangalela	Pader	Pajule	Ok	100	62.4	53.7	16.2	28.5	16.1	54.0	2.6	54.4	291	10
263	Apwor kla	Pader	Puranga	Ok	100	54.0	65.7	16.9	30.0	9.2	73.7	1.6	20.3	290	11
258	Alilli	Pader	Lapul	Ok	100	58.4	59.4	20.0	36.6	8.8	74.7	1.5	17.9	289	12
260	Te-okuto	Pader	Puranga	Ok	100	54.0	65.7	14.6	25.2	9.2	73.7	1.6	20.3	285	13
290	Pagor	Pader	Ogom (Kilak)	Ok	100	61.7	54.8	7.1	9.3	14.3	59.2	2.7	57.2	281	14
286	Dure north	Pader	Latanya (Acholibur)	Ok	100	60.4	56.6	10.7	16.9	21.7	38.1	2.3	42.2	254	15
289	Dagolwato	Pader	Latanya (Acholibur)	Ok	100	60.4	56.6	10.5	16.5	21.7	38.1	2.3	42.2	253	16
285	Lela awoki	Pader	Latanya (Acholibur)	Ok	100	60.4	56.6	7.3	9.7	21.7	38.1	2.3	42.2	247	17
278	Lali	Pader	Laguti	No	0	58.4	59.4	8.5	12.3	11.0	80.6	2.6	53.7	206	18
264	Aria	Pader	Atanga	No	0	56.4	62.3	10.0	15.4	9.2	73.9	2.5	50.1	202	19

Table 2.2.4 Selection of Target RGCs

No.	District	RGC	Served Pop.	Population (2015)	Score on Population (2015)	Coverage	Score on Coverage	Experiences in Mobilization	Score on Experiences	Accessibility and Road Conditions		Point on Accessibility	Score on Accessibility
										Dry Season	Rainy Season		
PWS-01	Amuru	Pabbo T/Centre	2,300	2,243	58	100%	0	2	40	1	1	3	50
PWS-02		Elegu	600	469	12	100%	0	0	0	1	1	3	50
PWS-03	Nwoya	Koch Goma	1,200	2,009	52	60%	81	3	60	2	2	1	17
PWS-04		Alero	1,500	1,782	46	84%	32	2	40	2	2	1	17
PWS-05	Gulu	Awach	1,500	1,057	27	100%	0	0	0	1	2	2	33
PWS-06		Unyama	1,200	3,443	88	35%	130	3	60	1	1	3	50
PWS-07		Bobi	1,200	2,232	57	54%	92	2	40	1	2	2	33
PWS-08		Awere	600	1,586	41	38%	124	3	60	1	2	2	33
PWS-09	Agago	Lira Palwo	900	632	16	100%	0	4	80	1	1	3	50
PWS-10		Adilang	2,400	3,527	91	68%	64	1	20	1	1	3	50
PWS-11	Lamwo	Lamwo T/C	2,100	1,966	50	100%	0	4	80	1	1	3	50
PWS-12		Agoru	1,800	713	18	100%	0	5	100	1	1	3	50
PWS-13	Kitgum	Omiya-Anyima	600	757	19	79%	41	2	40	1	1	3	50
PWS-14		Kitgum Matidi	250	2,800	72	9%	182	1	20	1	1	3	50
PWS-15	Pader	Corner Kilak	900	1,432	37	63%	74	2	40	1	1	3	50
PWS-16		Pajule	5,300	3,897	100	100%	0	5	100	1	1	3	50

No.	District	RGC	Electric Availability	Available Hours a Day	Point on Electricity	Score on Electricity	Number of Ex. Boreholes	Score on Ex. Boreholes	Number of Func. Boreholes	Functionality	Score on Functionality	Expected Yield (m3/hr)	Score on Expected Yield	Total Score
PWS-01	Amuru	Pabbo T/Centre	0	0	0	0	5	23	5	100	50	2.60	80	N/A
PWS-02		Elegu	0	0	0	0	2	9	2	100	50	1.16	8	N/A
PWS-03	Nwoya	Koch Goma	0	0	0	0	6	27	4	67	33	1.14	7	276
PWS-04		Alero	0	0	0	0	8	36	5	63	31	3.27	114	N/A
PWS-05	Gulu	Awach	1	12	12	12.5	4	18	4	100	50	3.07	104	N/A
PWS-06		Unyama	2	12	24	25	6	27	4	67	33	2.01	51	465
PWS-07		Bobi	2	12	24	25	8	36	4	50	25	1.64	32	341
PWS-08		Awere	0	0	0	0	4	18	2	50	25	1.89	45	346
PWS-09	Agago	Lira Palwo	2	24	48	50	6	27	4	67	33	1.42	21	N/A
PWS-10		Adilang	2	24	48	50	10	45	8	80	40	1.40	20	380
PWS-11	Lamwo	Lamwo T/C	2	12	24	25	10	45	7	70	35	2.04	52	N/A
PWS-12		Agoru	0	0	0	0	6	27	6	100	50	4.07	154	N/A
PWS-13	Kitgum	Omiya-Anyima	0	0	0	0	4	18	2	50	25	1.50	25	N/A
PWS-14		Kitgum Matidi	0	0	0	0	2	9	0	0	0	1.97	49	382
PWS-15	Pader	Corner Kilak	2	12	24	25	11	50	3	27	14	1.38	19	309
PWS-16		Pajule	2	18	36	37.5	22	100	16	73	36	1.91	46	N/A

Table 2.2.10 Hydrogeological Condition of Each Site

No.	Village	District	Sub-county	Drilling Depth (m)	Bedrock Depth (m)	Static Water Level (m)	Dynamic Water Level (m)	Installation Depth of Pump (m)
1	Bibia East	Amuru	Attiak	70.0	7.5	12.7	28.0	33.0
3	Okidi North	Amuru	Attiak	70.0	13.7	12.7	28.0	33.0
4	Pacilo East	Amuru	Attiak	70.0	29.5	12.7	28.0	33.0
5	Palukere East	Amuru	Attiak	70.0	9.1	12.7	28.0	33.0
7	Pukumu	Amuru	Attiak	70.0	3.7	12.7	28.0	33.0
8	Pupwonya East	Amuru	Attiak	70.0	32.8	12.7	28.0	33.0
9	Paomo	Amuru	Pabbo	70.0	5.7	7.6	22.9	27.9
10	Kal centre	Amuru	Pabbo	70.0	18.3	7.6	22.9	27.9
11	Andara	Amuru	Pabbo	70.0	4.7	7.6	22.9	27.9
12	Olinga	Amuru	Pabbo	70.0	19.3	7.6	22.9	27.9
13	Kati Kati A	Amuru	Pabbo	70.0	17.5	7.6	22.9	27.9
14	Abera	Amuru	Pabbo	70.0	5.6	7.6	22.9	27.9
15	Ceri	Amuru	Pabbo	70.0	16.4	7.6	22.9	27.9
17	Abyee	Amuru	Lamogi	70.0	20.2	10.9	26.2	31.2
18	Amora	Amuru	Lamogi	70.0	17.8	10.9	26.2	31.2
19	Opok	Amuru	Lamogi	70.0	13.8	10.9	26.2	31.2
20	Pukure	Amuru	Lamogi	70.0	12.6	10.9	26.2	31.2
21	Coorom	Amuru	Lamogi	70.0	31.7	10.9	26.2	31.2
23	Odur	Amuru	Lamogi	70.0	20.2	10.9	26.2	31.2
25	Teddi	Amuru	Amuru	70.0	11.1	13.8	29.1	34.1
27	Amoyokuma	Amuru	Amuru	70.0	4.7	13.8	29.1	34.1
28	Labongo	Amuru	Amuru	70.0	31.7	13.8	29.1	34.1
29	Lujoro	Amuru	Amuru	70.0	4.7	13.8	29.1	34.1
30	Mutema	Amuru	Amuru	70.0	17.8	13.8	29.1	34.1
31	Ogeli	Amuru	Amuru	70.0	10.8	13.8	29.1	34.1
32	Reckiceke	Amuru	Amuru	70.0	31.8	13.8	29.1	34.1
33	Lamolo Coke	Amuru	Lamogi	70.0	20.2	10.9	26.2	31.2
34	Apaa	Amuru	Pabbo	70.0	2.7	7.6	22.9	27.9
35	Palukere West	Amuru	Attiak	70.0	9.1	12.7	28.0	33.0
37	Bwobonam B	Nwoya	Alero	80.0	9.2	10.3	25.6	30.6
40	Latekodong	Nwoya	Alero	80.0	8.9	10.3	25.6	30.6
46	Akago	Nwoya	Anaka	80.0	10.0	10.2	25.5	30.5
48	Kal	Nwoya	Anaka	80.0	28.3	10.2	25.5	30.5
54	Agonga B	Nwoya	Koch Goma	70.0	12.1	11.6	26.9	31.9
62	Paminolango	Nwoya	Puronga	70.0	19.5	15.3	30.6	35.6
64	Lodi	Nwoya	Puronga	70.0	16.9	15.3	30.6	35.6
65	Patira East	Nwoya	Puronga	70.0	22.1	15.3	30.6	35.6
66	Patira West	Nwoya	Puronga	70.0	22.1	15.3	30.6	35.6
67	Pawatomero Central	Nwoya	Puronga	70.0	24.9	15.3	30.6	35.6
68	Pawatomero East	Nwoya	Puronga	70.0	22.1	15.3	30.6	35.6
70	Lagazi	Nwoya	Puronga	70.0	7.4	15.3	30.6	35.6
89	Acutomer	Gulu	Paicho	70.0	7.6	9.9	25.2	30.2
90	Omel	Gulu	Paicho	70.0	26.8	9.9	25.2	30.2
95	Gulu PTC	Gulu	Paicho	70.0	22.3	9.9	25.2	30.2
96	Agoro I	Gulu	Palaro	70.0	35.3	11.4	26.7	31.7
101	Kiteny Central	Gulu	Palaro	70.0	17.8	11.4	26.7	31.7
105	Adak	Gulu	Patiko	70.0	6.3	7.7	23.0	28.0
106	Labworomor	Gulu	Bobi	70.0	44.8	9.7	25.0	30.0
107	Along	Gulu	Bobi	70.0	16.1	9.7	25.0	30.0
108	Ibar	Gulu	Bobi	70.0	20.8	9.7	25.0	30.0
110	Adak	Gulu	Bobi	70.0	10.7	9.7	25.0	30.0
111	Ariya	Gulu	Koro	70.0	22.3	9.8	25.1	30.1
114	Atede	Gulu	Koro	70.0	5.7	9.8	25.1	30.1
115	Obwola	Gulu	Koro	70.0	15.8	9.8	25.1	30.1
116	Kal A and B	Gulu	Koro	70.0	31.6	9.8	25.1	30.1
123	Otal	Gulu	Lalogi	70.0	19.3	10.5	25.8	30.8
124	Alwii	Gulu	Lalogi	70.0	29.1	10.5	25.8	30.8
125	Latinnyer	Gulu	Lalogi	70.0	29.1	10.5	25.8	30.8
126	Aparowiya I	Gulu	Lalogi	70.0	17.6	10.5	25.8	30.8
127	Aparowiya II	Gulu	Lalogi	70.0	17.6	10.5	25.8	30.8
136	Owak	Gulu	Ongako	70.0	26.6	9.9	25.2	30.2

Table 2.2.10 Hydrogeological Condition of Each Site

No.	Village	District	Sub-county	Drilling Depth (m)	Bedrock Depth (m)	Static Water Level (m)	Dynamic Water Level (m)	Installation Depth of Pump (m)
138	Lamin Lawino	Gulu	Ongako	70.0	20.8	9.9	25.2	30.2
141	Lutage	Agago	Lokole	70.0	15.8	24.4	39.7	44.7
144	Sub County HQ	Agago	Lira Palwo	70.0	7.0	9.7	25.0	30.0
145	Tori East	Agago	Lira Palwo	70.0	36.8	9.7	25.0	30.0
146	Agweng	Agago	Lira Palwo	70.0	36.8	9.7	25.0	30.0
148	Lapyem	Agago	Lira Palwo	70.0	11.1	9.7	25.0	30.0
150	Kotomor east	Agago	Kotomor	70.0	18.0	11.4	26.7	31.7
151	Amin Ogwal	Agago	Kotomor	70.0	18.0	11.4	26.7	31.7
152	Oringo Ongom	Agago	Kotomor	70.0	9.6	11.4	26.7	31.7
153	Te Vwao	Agago	Kotomor	70.0	9.4	11.4	26.7	31.7
154	opyel Central	Agago	Patongo	70.0	24.4	11.4	26.7	31.7
156	Opal Oryoneko	Agago	Patongo	70.0	11.2	11.4	26.7	31.7
158	Owito	Agago	Patongo	70.0	9.0	11.4	26.7	31.7
159	Atanga	Agago	Wol	70.0	11.8	22.5	37.8	42.8
163	Abalukwang	Agago	Wol	70.0	58.9	22.5	37.8	42.8
166	Aleb Tong	Agago	Arum	70.0	17.2	7.7	23.0	28.0
167	Wii Atup	Agago	Arum	70.0	17.8	7.7	23.0	28.0
170	Laming Onen	Agago	Omiya Pacwa	70.0	17.8	25.5	40.8	45.8
171	Lakwa A	Agago	Omiya Pacwa	70.0	15.8	25.5	40.8	45.8
172	Acam Roma	Agago	Lokole	70.0	15.8	24.4	39.7	44.7
173	Lela Kabala	Agago	Wol	70.0	26.8	22.5	37.8	42.8
176	Tong Wiri South	Agago	Paimol	70.0	7.4	25.5	40.8	45.8
178	Labedongony	Agago	Paimol	70.0	10.9	25.5	40.8	45.8
179	Te Okiro	Agago	Paimol	70.0	10.9	25.5	40.8	45.8
180	Apyeta Central	Lamwo	Palabek Ogili	70.0	33.1	23.1	38.4	43.4
181	Padwat Central	Lamwo	Palabek Ogili	70.0	11.5	23.1	38.4	43.4
182	Padwat West	Lamwo	Palabek Ogili	70.0	17.8	23.1	38.4	43.4
184	Lio-Tee okworo	Lamwo	Padibe East	70.0	17.8	21.8	37.1	42.1
185	Dech East	Lamwo	Padibe East	70.0	18.0	21.8	37.1	42.1
186	Dog Lokutu East	Lamwo	Padibe East	70.0	18.0	21.8	37.1	42.1
187	Tadi South	Lamwo	Padibe East	70.0	17.8	21.8	37.1	42.1
188	Gem (Gem)	Lamwo	Madi-opei	100.0	120.0	26.5	41.8	46.8
190	Pobutu	Lamwo	Madi-opei	80.0	32.9	26.5	41.8	46.8
193	Lagwel P/S	Lamwo	Padibe West	70.0	15.6	21.9	37.2	42.2
195	Tumbafu West	Lamwo	Padibe West	70.0	23.3	21.9	37.2	42.2
196	Obere	Lamwo	Agoro	70.0	45.4	25.0	40.3	45.3
197	Loromibenge B	Lamwo	Agoro	70.0	5.3	25.0	40.3	45.3
199	Moroto East	Lamwo	Agoro	70.0	46.1	25.0	40.3	45.3
200	Lumwaka A	Lamwo	Agoro	70.0	11.5	25.0	40.3	45.3
201	Lobiluku (obokolot)	Lamwo	Paloga	70.0	22.5	20.9	36.2	41.2
202	Langole (Keca)	Lamwo	Paloga	70.0	31.3	20.9	36.2	41.2
203	Biber (Itiba)	Lamwo	Paloga	70.0	38.2	20.9	36.2	41.2
206	Guria North	Lamwo	Lokung	70.0	24.0	13.8	29.1	34.1
207	Liri Central	Lamwo	Palabek Kal	70.0	39.5	14.5	29.8	34.8
208	Lanywang E-walagiri	Lamwo	Palabek Kal	70.0	5.4	14.5	29.8	34.8
209	Ayuu-lupur(Barara)	Lamwo	Palabek Gem	70.0	8.8	13.7	29.0	34.0
210	Ajaa ogala (Alere)	Lamwo	Palabek Gem	70.0	7.9	13.7	29.0	34.0
212	Pawena central	Lamwo	Palabek Gem	70.0	5.7	13.7	29.0	34.0
214	Amina (Nino mit)	Lamwo	Palabek Gem	70.0	21.7	13.7	29.0	34.0
215	Dyangbii	Lamwo	Palabek Gem	70.0	17.6	13.7	29.0	34.0
216	Kafata	Lamwo	Palabek Gem	70.0	17.6	13.7	29.0	34.0
217	Arusha (Aloyi)	Lamwo	Palabek Gem	70.0	21.7	13.7	29.0	34.0
218	Kamama central H/C III	Lamwo	Palabek Gem	70.0	7.9	13.7	29.0	34.0
221	Okidi central	Kitgum	Amida	70.0	12.8	24.1	39.4	44.4
225	Langii	Kitgum	Kitgum Matidi	70.0	29.0	23.7	39.0	44.0
228	Rucurucu	Kitgum	Lagoro	70.0	5.2	21.3	36.6	41.6
229	Akino (Dem kulu kwach)	Kitgum	Lagoro	70.0	29.0	21.3	36.6	41.6
230	Gulu gwen Orua .B.	Kitgum	Lagoro	70.0	16.0	21.3	36.6	41.6
231	Ocettokkee T/C	Kitgum	Layamo	70.0	20.8	25.0	40.3	45.3
232	Pagen Central	Kitgum	Layamo	70.0	20.5	25.0	40.3	45.3
233	Pamolo central	Kitgum	Layamo	70.0	11.9	25.0	40.3	45.3

Table 2.2.10 Hydrogeological Condition of Each Site

No.	Village	District	Sub-county	Drilling Depth (m)	Bedrock Depth (m)	Static Water Level (m)	Dynamic Water Level (m)	Installation Depth of Pump (m)
234	Panyum "A"	Kitgum	Mucwini	70.0	56.4	26.2	41.5	46.5
235	Ayom Olola "B"	Kitgum	Mucwini	70.0	5.7	26.2	41.5	46.5
239	Yepa A	Kitgum	Mucwini	70.0	16.5	26.2	41.5	46.5
240	Juba	Kitgum	Mucwini	70.0	31.6	26.2	41.5	46.5
241	Lacen Otinga West	Kitgum	Mucwini	70.0	31.6	26.2	41.5	46.5
242	Winyorac-Pawiny	Kitgum	Namokora	100.0	120.0	30.3	45.6	50.6
243	Lakokok	Kitgum	Namokora	80.0	8.7	30.3	45.6	50.6
246	Labworomor	Kitgum	Omiya Anyima	70.0	31.5	25.2	40.5	45.5
249	Lobale	Kitgum	Orom	70.0	5.6	30.8	46.1	51.1
252	Otoboi	Kitgum	Orom	70.0	20.8	30.8	46.1	51.1
253	Agora	Kitgum	Orom	70.0	17.8	30.8	46.1	51.1
258	Alilli	Pader	Lapul	70.0	20.0	8.8	24.1	29.1
259	Nek-Nono	Pader	Lapul	100.0	138.4	8.8	24.1	29.1
260	Te-okuto	Pader	Puranga	70.0	14.6	9.2	24.5	29.5
261	Tee tworo	Pader	Puranga	70.0	35.6	9.2	24.5	29.5
263	Apwor kla	Pader	Puranga	70.0	16.9	9.2	24.5	29.5
264	Aria	Pader	Atanga	70.0	10.0	9.2	24.5	29.5
266	Lapoyaokwee	Pader	Atanga	100.0	103.4	9.2	24.5	29.5
268	Aringo yon	Pader	Angagura	70.0	13.8	9.2	24.5	29.5
269	Libii	Pader	Angagura	70.0	13.8	9.2	24.5	29.5
270	Atup	Pader	Awere	70.0	5.4	9.3	24.6	29.6
271	Parwech Lukee east	Pader	Awere	70.0	5.8	9.3	24.6	29.6
278	Lali	Pader	Laguti	70.0	8.5	11.0	26.3	31.3
282	Bangalela	Pader	Pajule	70.0	16.2	16.1	31.4	36.4
285	Lela awoki	Pader	Latanya	70.0	7.3	21.7	37.0	42.0
286	Dure north	Pader	Latanya	70.0	10.7	21.7	37.0	42.0
287	Obalo	Pader	Latanya	70.0	34.9	21.7	37.0	42.0
289	Dagolwato	Pader	Latanya	70.0	10.5	21.7	37.0	42.0
290	Pagor	Pader	Ogom	70.0	7.1	14.3	29.6	34.6
292	Lapeny	Pader	Ogom	70.0	26.8	14.3	29.6	34.6
Average				71.2	21.1	15.6	30.9	35.9

Table 2.2.29 Project Design Matrix for Technical Assistance

Project： Project for Provision of Improved Water Source For Returned IDP in Acholi Sub-region
Duration ：
Target Group : Members of Target RGCs/Communities
Location： Uganda
Creation Date: Made in April 2012

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal - Smooth Operation and Maintenance and Sustainable use of the constructed water supply facilities. - Improvement of condition of sanitation and hygiene by usage of safe water	- Amount of collected water user fee - Water supply quantity by piped water supply facilities - Working ratio of borehole with hand pump - Repair record of facility	- Data from DWO - Data from District Health Office - Community mobilization and sensitization report	Water policy and national development policy of Uganda remain the same
Purpose of Technical Assistance Program - Effective use of the constructed water supply facilities and positive and smooth collection of water user fee. - Autonomous and sustainable operation and maintenance of the constructed water supply facilities under cooperation of community/RGC members and the WSC. - Improvement of repair and inspection method, and proper repair of hand pumps by trained HPMs	- Total volume of supplied water - Rate of collection of water user fee - Rate of participation in WSC meeting - Rate of participation of concerned person in local government to meetings of community/RGCs and meetings of WSCs - Conditions and frequency of hand pump repair by HPMs	- Record of facility operation - Record of collection of water user fee, and cashbook - Record of WSC meeting, activities. - Record of repair of facility	Members of RGCs/Communities and concerned person in DWD and local governments continue to implement their activities.
Outputs 1 The concerned persons at the local government and community members understand aims, roles and importance of WSC, and are willing and motivated to take part in WSC support.	- Frequency of WSC meetings and community meetings - Number of participants in community meetings.	- Community mobilization and sensitization report - Record of WSC meeting, activities.	Replacements of executives of WSCs and concerned person in local government do not happen frequently.
2 Community members understand the importance of safe water (relationship between sate water and health, sanitation, and hygiene), use efficiently constructed water supply facilities, and basic activities of WSC such as collection of water user fee go on smoothly.	- Determined water user fee - Total volume of supplied water, number of users, and rate of collection of water user fee. - Purpose of usage of existing unsafe water source and frequency of usage	- Community mobilization and sensitization report - Record of facility operation - Record of collection of water user fee, and cashbook - Interview survey	Lives of members of RGCs/Communities do not change by unexpected events such as natural disaster, epidemics, etc.
3 Members of WSC understand the purpose of WSC, their roles, and organizational management practice, and operation and maintenance of the constructed water supply facilities go on smoothly under cooperation of community members and the WSC.	- Frequency of WSC meetings and community meetings - Amount of collected water user fee and the status of accounting management. - Frequency of troubles in operation and maintenance and its contents. - Methods to solve troubles	- Community mobilization and sensitization report - Record of collection of water user fee, and cashbook - Record of WSC meeting, activities.	Members of RGCs/Communities continue to participate in the project and operation and maintenance.
4 HPMs understand and master repair and inspection method of hand pumps installed under the project, repair and inspect hand pumps properly, and community members use the hand pumps sustainably.	- Number of repair of HPs and rate of operation of HPs - Status of repair and inspection of HPs	- Training report for HPMs - Records of hand pump repair and inspection	Trained HPMs continue to participate in the project and operation and maintenance.
Activities - Following community mobilization and sensitization for target RGCs/Communities including OJT for facilitators in local government 1) Pre-Construction Workshop 2) During-Construction Workshop 3) Post-Construction Workshop 4) HPM Training	Inputs (Japanese side) - Subcontractor (Local NGO, CBO, or consultancy firm) - Japanese consultant	(Ugandan side) - Officers in DWD on mobilization and sensitization, sanitation and hygiene, - Assistant District Officers on mobilization and sensitization, sanitation and hygiene, - County officers, Community development assistant and Health assistant belongs to DWO	RGCs/Communities, those members and concerned person in local government understand necessity of facilities and the critical requirements, and agree the contents of the project Pre-Condition Members of target RGCs/Communities do not object to construction of water supply facilities.

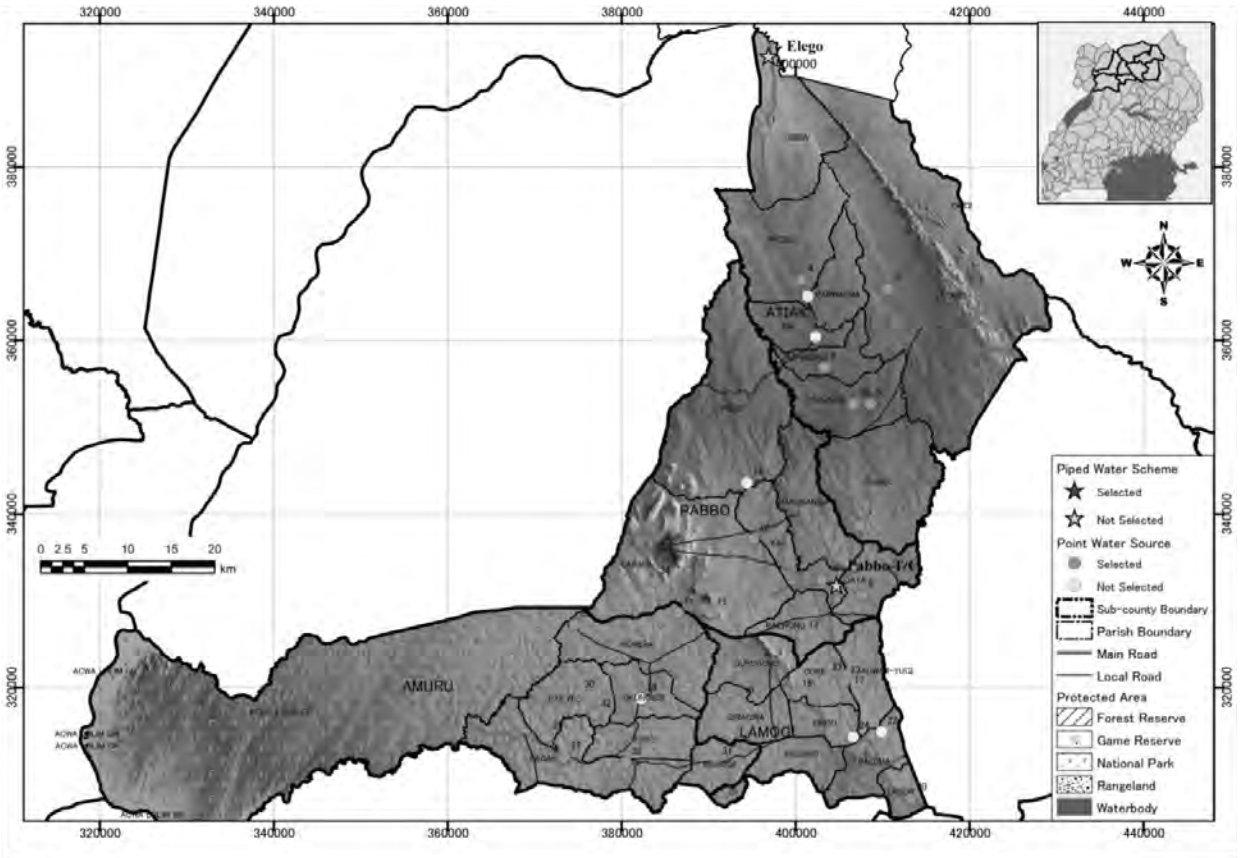


Fig. 2.2.2 Location of Target Villages and RGCs (Amuru District)

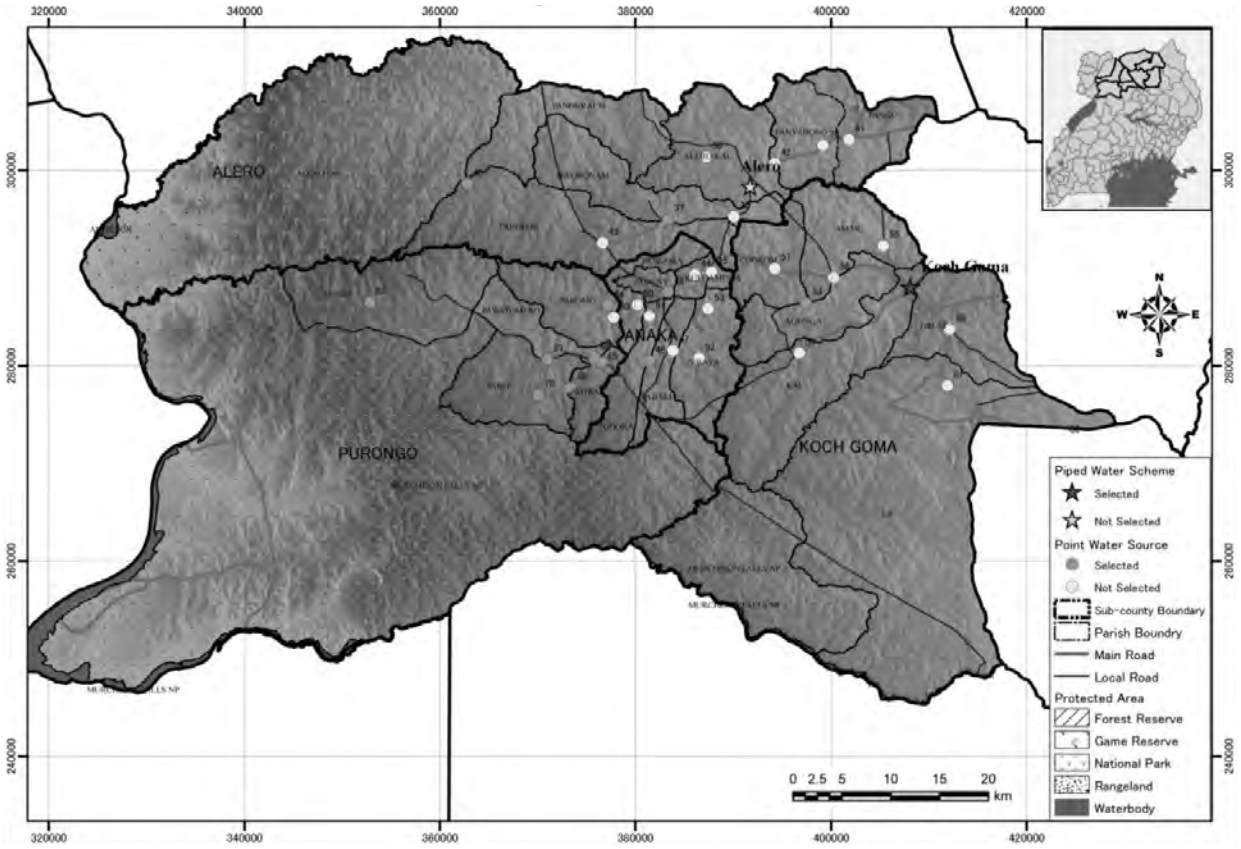


Fig. 2.2.3 Location of Target Villages and RGCs (Nuwoya District)

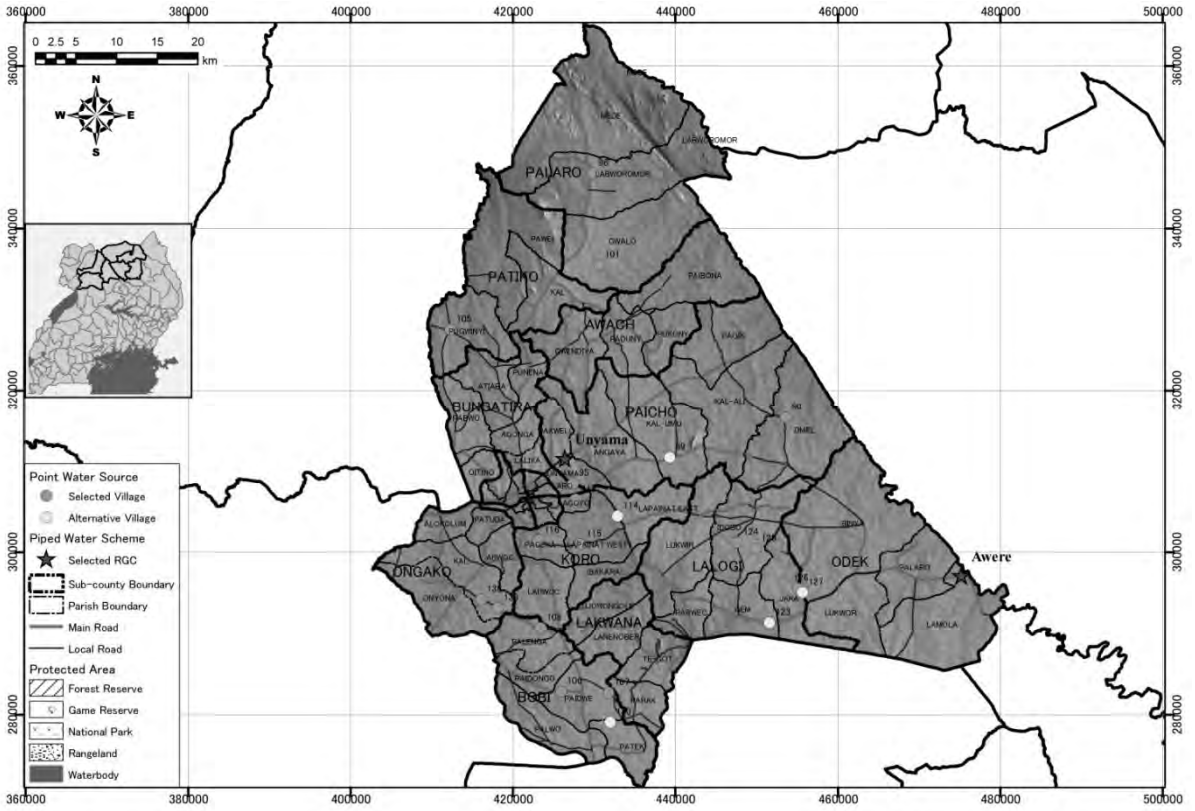


Fig. 2.2.4 Location of Target Villages and RGCs (Gulu District)

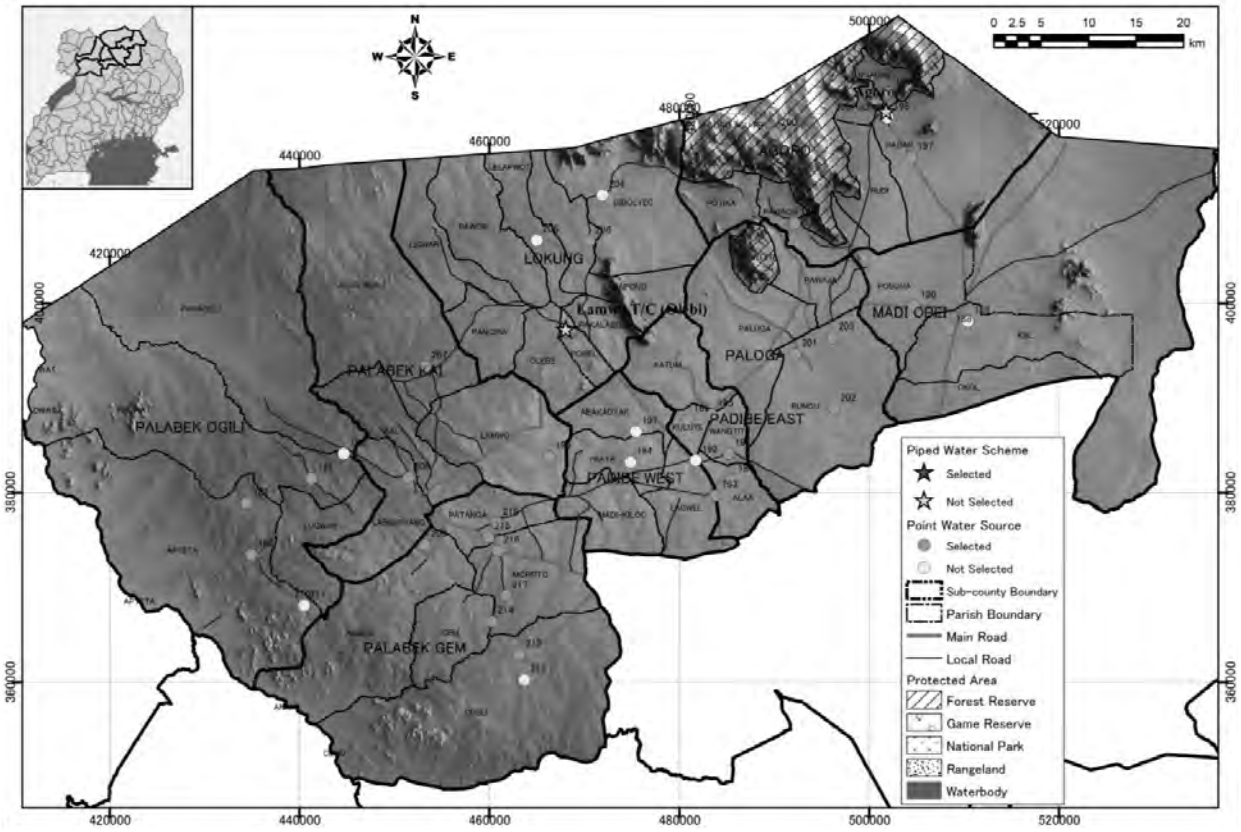


Fig. 2.2.5 Location of Target Villages and RGCs (Lamwo District)

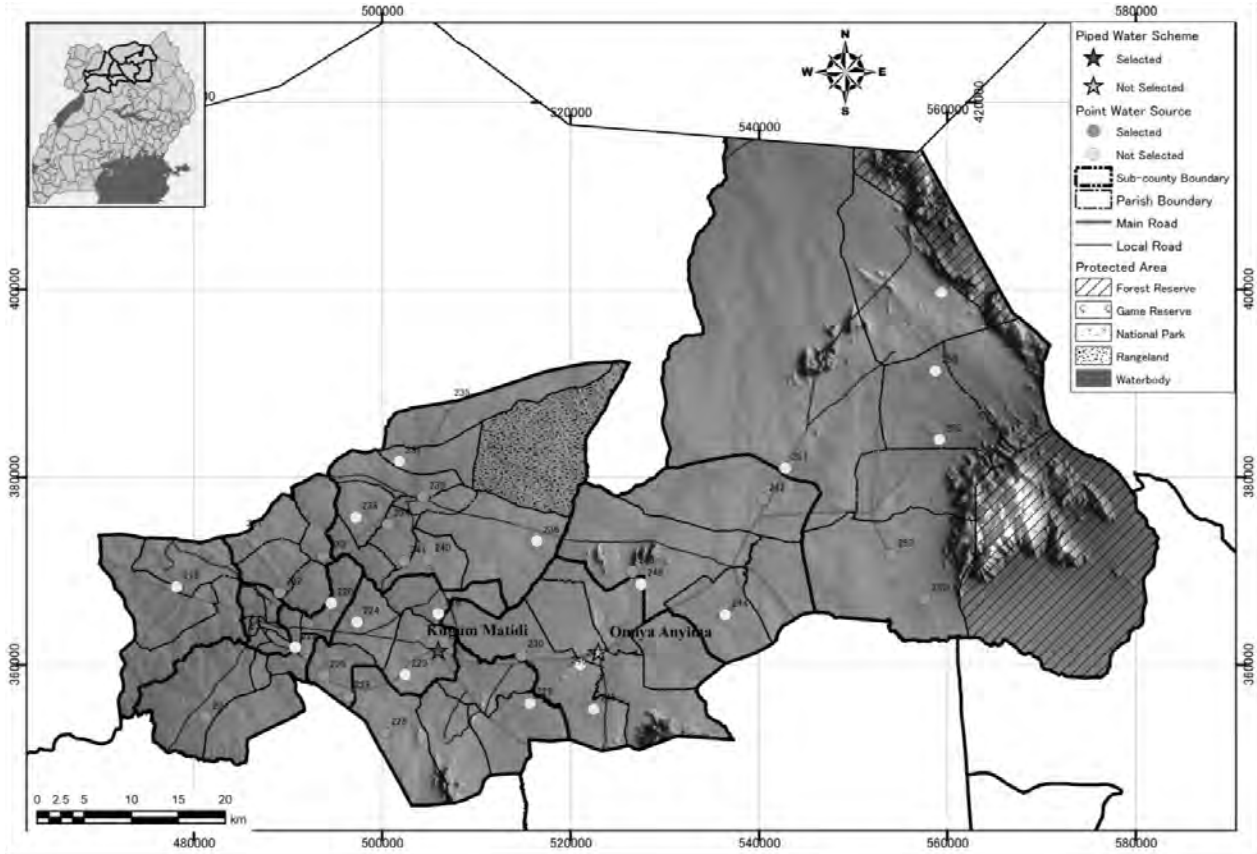


Fig. 2.2.6 Location of Target Villages and RGCs (Kitgum District)

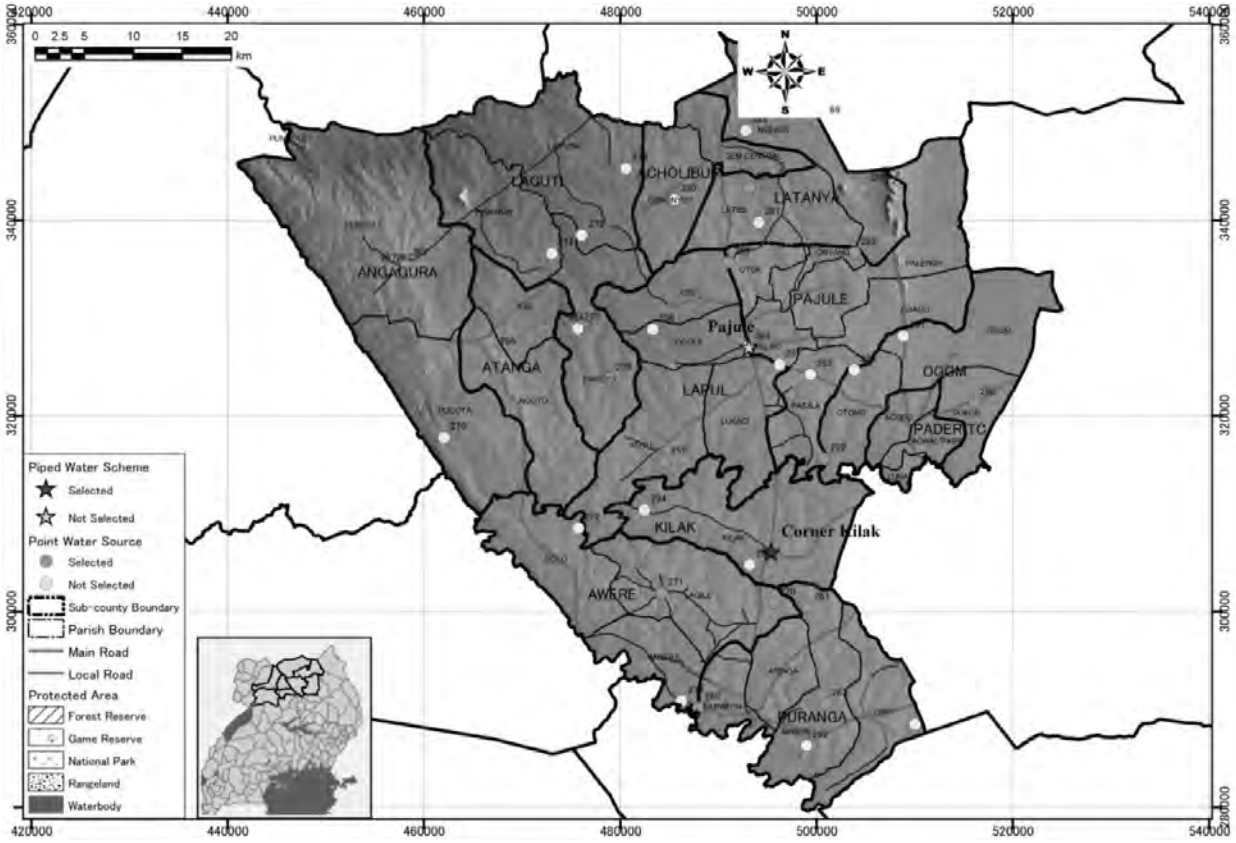


Fig. 2.2.7 Location of Target Villages and RGCs (Pader District)

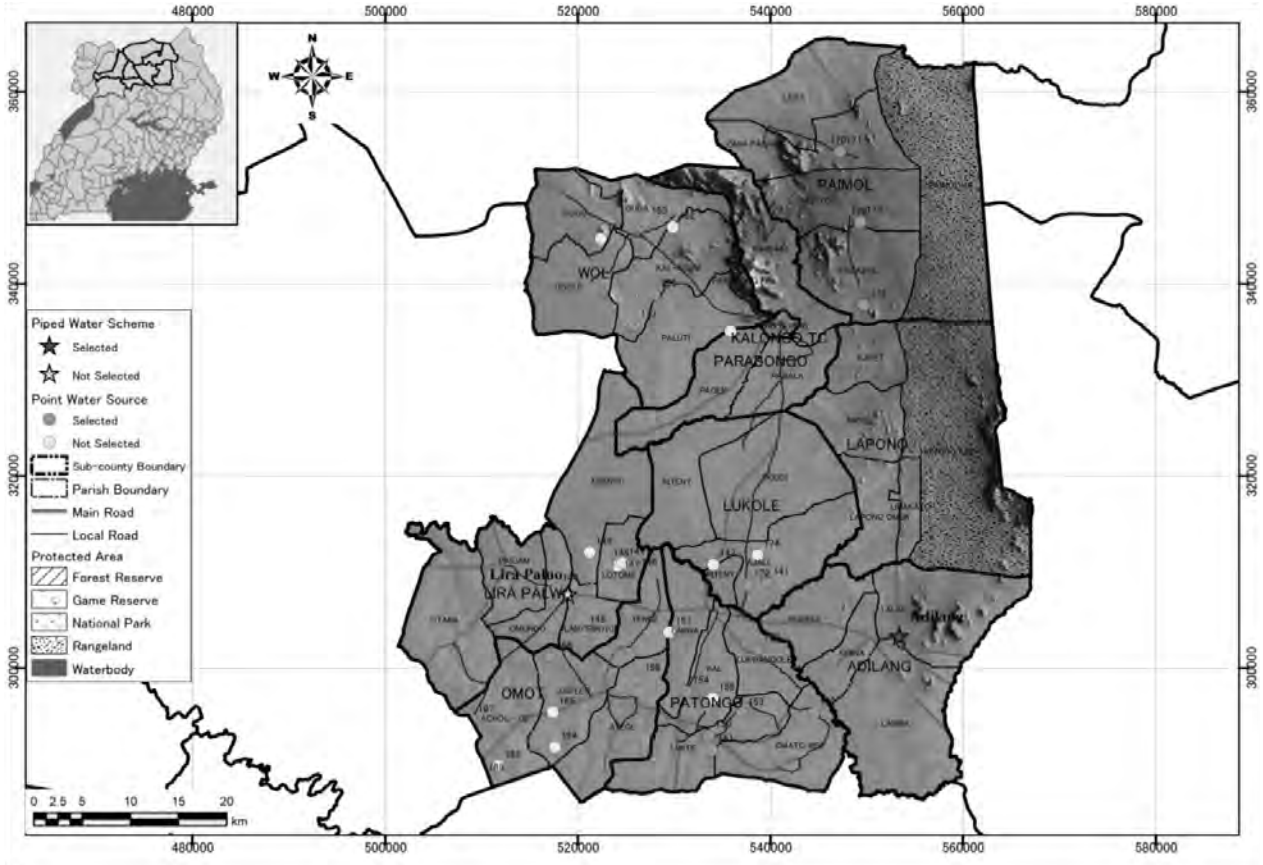


Fig. 2.2.8 Location of Target Villages and RGCs (Agago District)

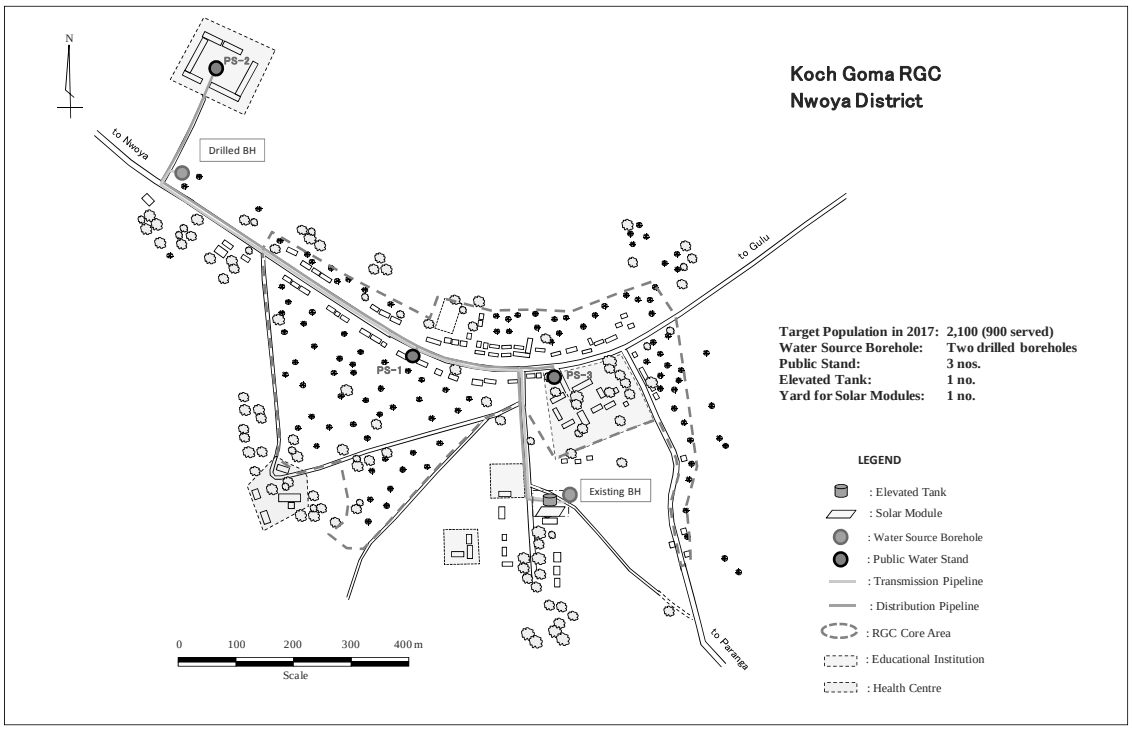


Fig. 2.2.16 General Plan of Piped Water Supply Facility (Koch Goma RGC)

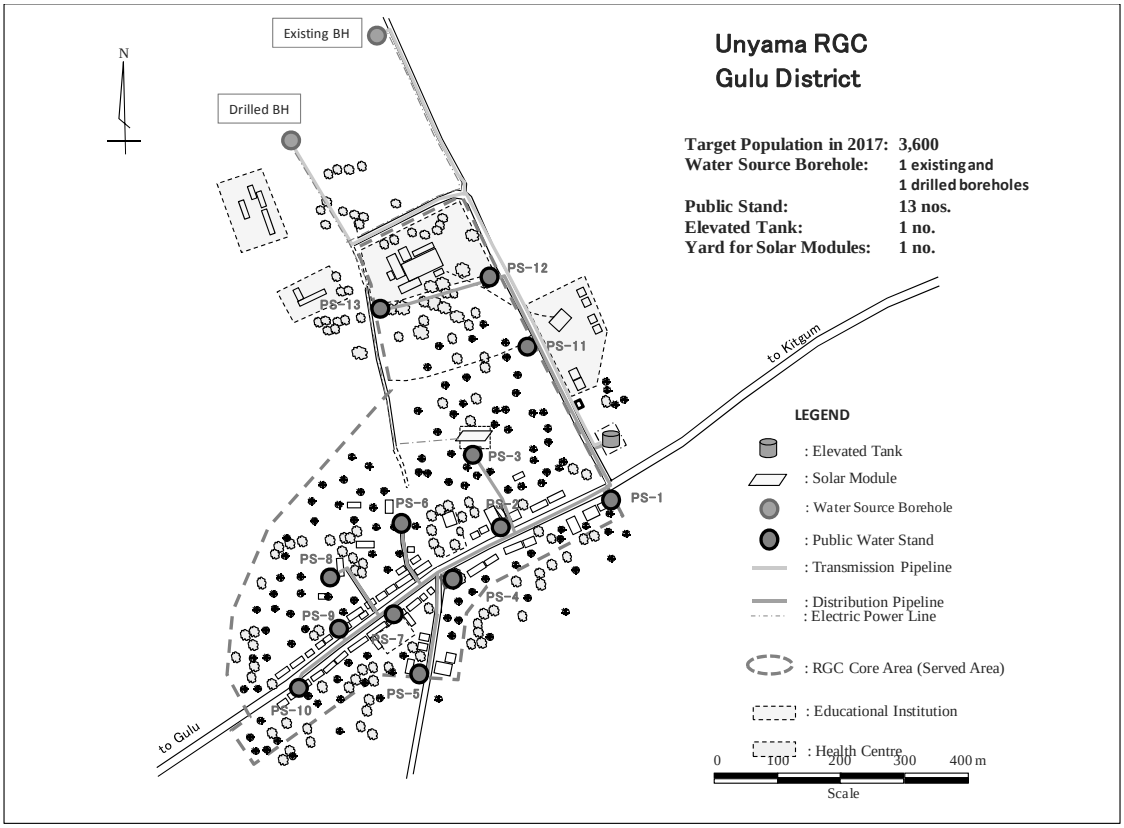


Fig. 2.2.17 General Plan of Piped Water Supply Facility (Unyama RGC)

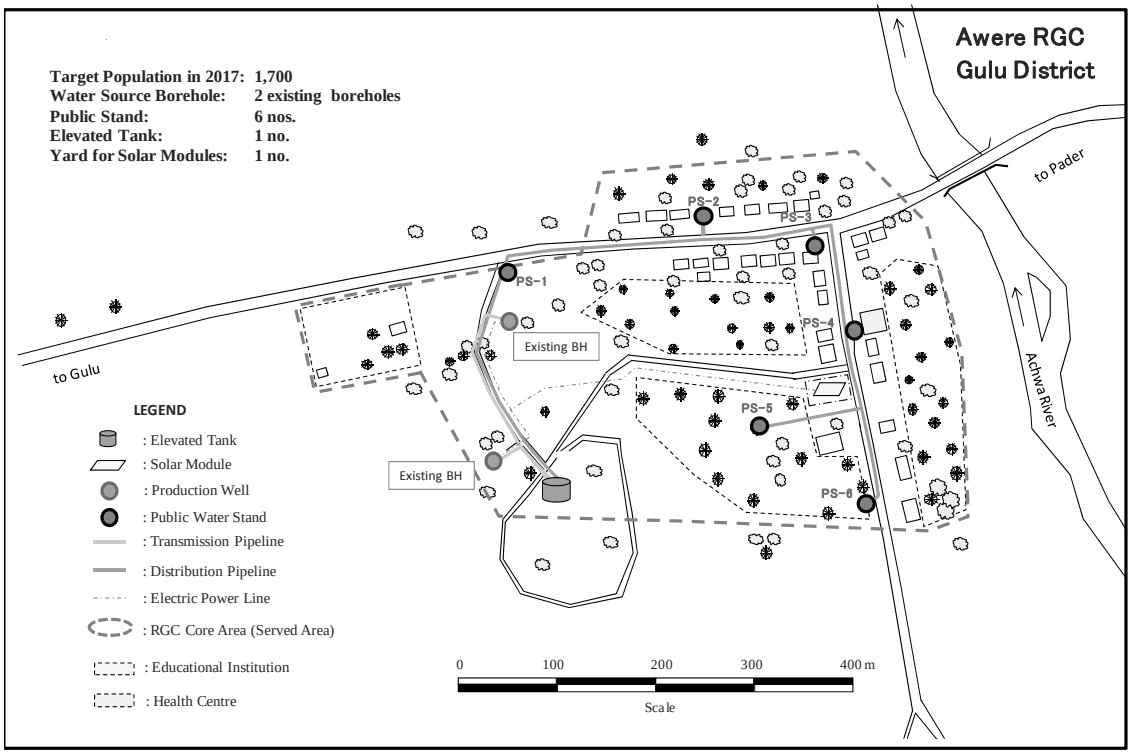


Fig. 2.2.18 General Plan of Piped Water Supply Facility (Awere RGC)

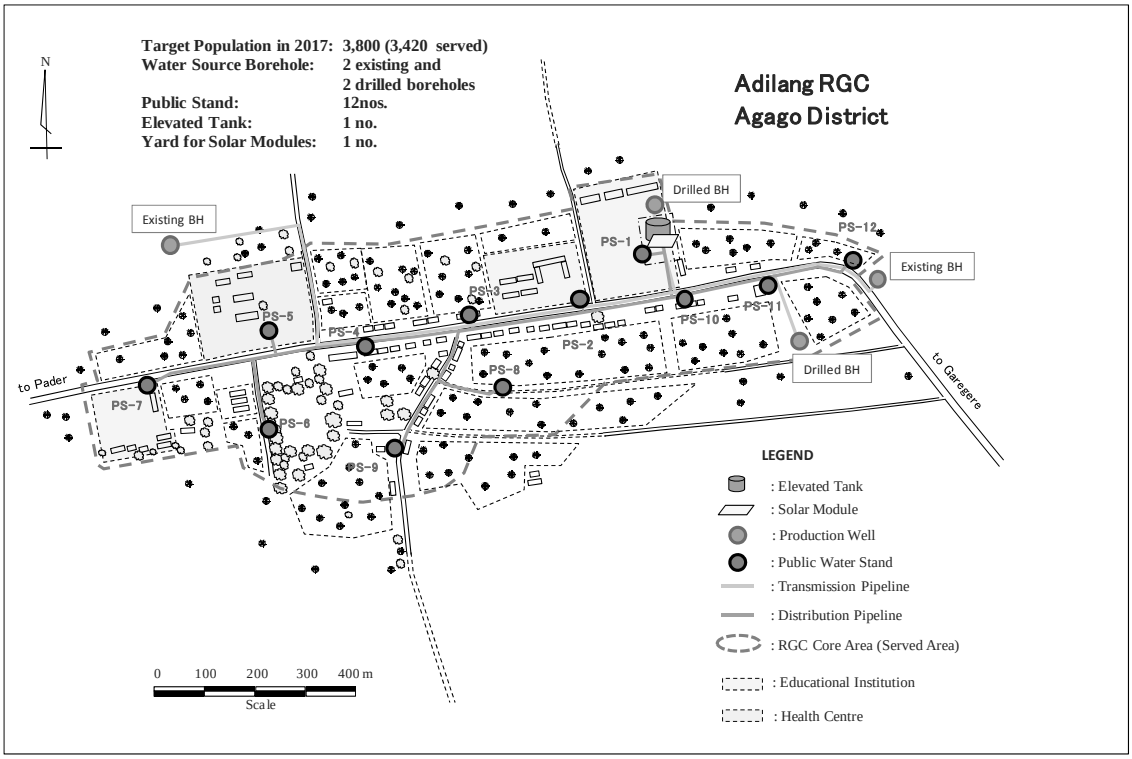


Fig. 2.2.19 General Plan of Piped Water Supply Facility (Adilang RGC)

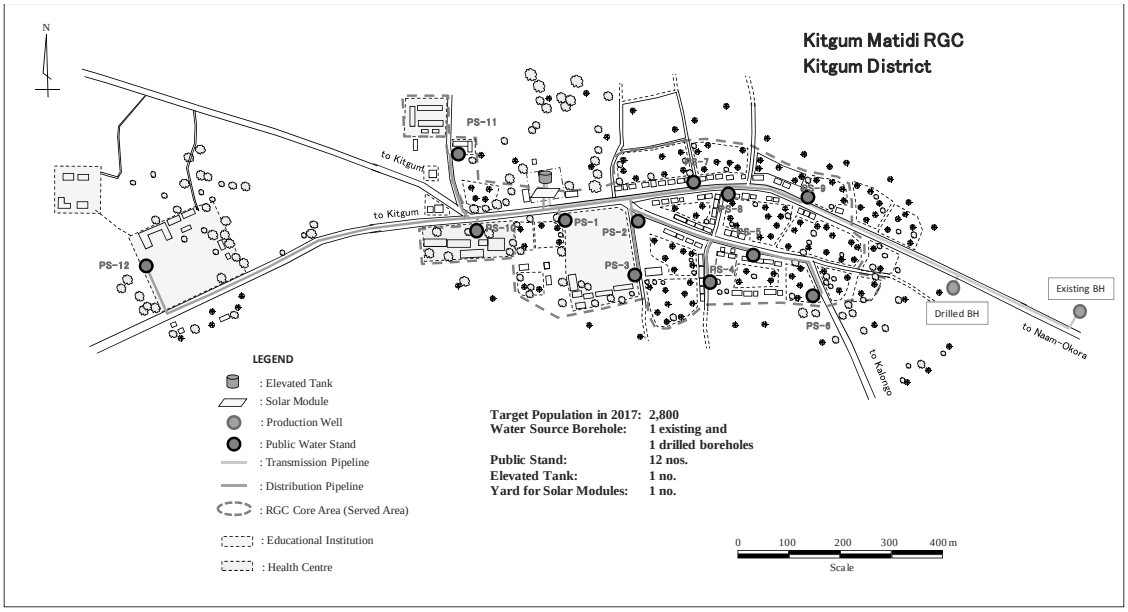


Fig. 2.2.20 General Plan of Piped Water Supply Facility (Kitgum Matidi RGC)

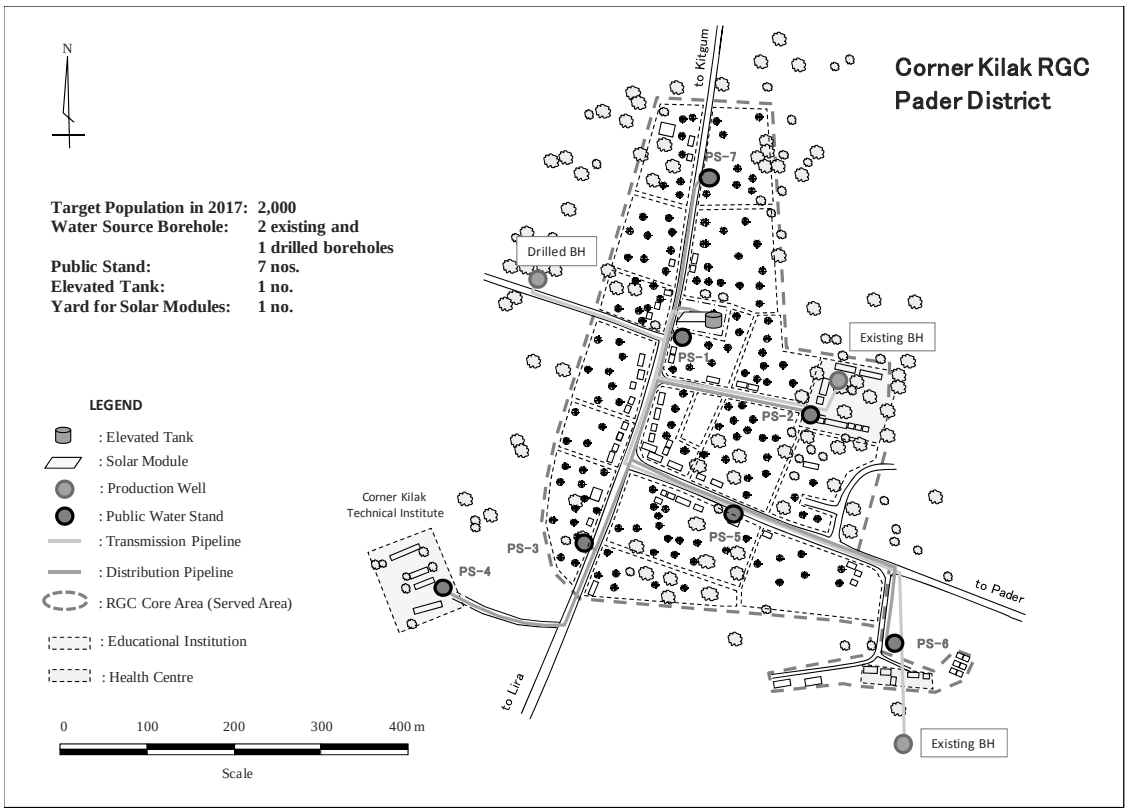


Fig. 2.2.21 General Plan of Piped Water Supply Facility (Corner Kilak RGC)

CHAPTER 3 PROJECT EVALUATION

CHAPTER 3 PROJECT EVALUATION

3.1 Preconditions

(1) Provision of Lands for Construction of Facilities

Land provision for the construction of the main facilities of the water supply systems such as boreholes, elevated tanks and installation yards for solar generating modules has been discussed with concerned persons and organizations through site survey. Local governments and water development authorities are required to ensure such lands by the starting of the project.

(2) Obligations of Recipient Country for Project Implementation

Obligations of the Government of Uganda are required to be carried out without delay with their budget being allocated.

3.2 Necessary Inputs by Recipient Country

(1) Maintaining and Monitoring of Operation and Maintenance Organization after Completion of the Project

WSCs (Water and Sanitation Committees) are established under the project, which are considered to be a core of maintaining water supply systems, and enhance the members' abilities through technical assistance activities. Because each district water office will play the role of maintaining and monitoring of the Operation and maintenance abilities after completion of the technical assistance, the district water office is required to conduct monitoring activities in cooperation with CDA (Community Development Assistant) or HA (Health Assistant). In addition, there are many district water offices which do not have necessary staffs. Such offices are needed to have necessary number and specialty of staffs immediately.

(2) Vitalization of HPMAs

Hand Pump Mechanics (HPMs) are playing significant roles in technical aspects for the operation and maintenance of the water supply systems in Uganda, and considered to play a core function. In order to maintain and improve their technical abilities, the establishment of Hand Pump Mechanics Association (HPMA) is undergoing, and then its functionalization is desired in order to improve the quality of HPMs.

3.3 Important Assumptions

The important assumptions in relation to the effectiveness and sustainability of the project are considered as follows:

(1) Sharp Price Inflation

In the project cost estimation, the price escalation of 8.1% is considered in accordance with the IMF database. If the price inflation is much sharper or more substantial than the forecast, the implementation of the project may come to be impossible, and substantial rise in replacement spare parts price will seriously affect the sustainable operation and maintenance of the facilities.

(2) Occurrence of Conflict and Sharp Security Risk Rise

The Achori sub-region, the project target area, was the most affected area by the civil war during the war, and it is considered lower that the security will get worse in future. However, there is still some possibility that the security may be getting worse when the imbalance in current security of surrounding counties happens, because there are two disputed areas; the area near the borders with the Democratic Republic of Congo in western district and the Karamojya area in northern-east district, even though both areas are coming to be stable at present.

Because the deterioration of security may be a hindrance factor against the stable economic growth of Uganda and seriously affect the project implementation and management, it is significant to take into consideration such a matter.

3.4 Project Evaluation

The feasibility and effectiveness of the project are recognized to be high as shown below.

3.4.1 Relevance

Most IDPs already returned after completion of the civil war having been continued over 20 years, while deteriorated conditions of the current infrastructure are obstacles against the settlement of IDPs because almost no maintenance works have been done on them.

The poverty ratio of the northern district is estimated at 46% (in 2010), which is significantly lower than that of the average of the whole Uganda of 24%. For this reason, the Government of Uganda has started the reconstruction development and, in the water supply sector, aims at the improvement of rural water supply ratio up to 77% by year 2015.

The purpose of the project is to contribute to improve the IDPs' living environment by the construction of the water supply facilities indispensable to IDPs' settlement and thereby raising the water supply coverage. This purpose coincides with that of the reconstruction development in the northern area.

With water supply facilities in particular, the project is required to be implemented as early as possible because of no alternative safe water source. Additionally, the project will be able to contribute to the achievement of NDP.

On the other hand, since many assistance projects were and have been implemented under the Japanese contribution for reconstruction in the northern areas of Uganda, this project is also considered as the one for improving the water supply condition thereof.

3.4.2 Effectiveness

(1) Quantitative Effectiveness

When 116 deep boreholes with hand pump and six (6) piped water supply facilities are constructed under the project, the served population and water supply coverage of seven (7) districts of Acholi Sub-region; Amur, Nwoya, Gulu, Lamwo, Kitgum, Pader and Agago districts, increased as shown in the following table.

Table 3.4.1 Effective Index of the Project

Effective Index	Base Value (2011)	Target Value (2017) Three (3) Years after Completion
Served population	735,268	779,518
Rural Water Supply Coverage	58.9%	62.5%

(2) Qualitative Effect

The qualitative effect of the project is listed as below.

i) To reduce the morbidity risk of water associated disease
ii) To reduce the time and labor load for women and children to deliver water
iii) To improve the abilities of HPMs

ATTACHMENTS

Member List of the Study Team

<First Field Survey>

Name	Assignment	Organization	Period
Dr. Katsuhito Yoshida	Team Leader	Visiting Senior Advisor, JICA	Aug. 14 - 25, 2011
Mr. Kiyofumi Takashima	Project Coordinator	Deputy Director, Water Resources Management Division II, Water Resources and Disaster Management Group, Global environment Department, JICA	Aug. 14 - 25, 2011
Mr. Soichiro Yumoto	Chief Consultant/Water Supply Plan	Team Leader, Overseas Department, Tokyo Engineering Consultants Co., Ltd.	Aug. 11 - Sep. 12, 2011
Mr. Shinichi Iseki	Deputy Chief Consultant/Hydrogeology	Manager, OYO International Corporation	Aug. 11 - Sep. 12, 2011
Mr. Masahiro Kawachi	Water Supply Facility Design	Overseas Department, Tokyo Engineering Consultants Co., Ltd.	Aug. 11 - Sep. 12, 2011

<Second Field Survey>

Name	Assignment	Organization	Period
Mr. Kohei Sato	Team Leader	Director, Grant Aid Management Division 3, Financing Facilitation and Procurement supervision Department, JICA	Oct. 12 - 21, 2011
Dr. Katsuhito Yoshida	Groundwater Development	Visiting Senior Advisor, JICA	Oct. 12 - 21, 2011
Mr. Toshikazu Watanabe	Project Coordinator	Water Resources Management Division II, Water Resources and Disaster Management Group, Global environment Department, JICA	Oct. 12 - 21, 2011
Mr. Soichiro Yumoto	Chief Consultant/Water Supply Plan	Team Leader, Overseas Department, Tokyo Engineering Consultants Co., Ltd.	Oct. 8 - Dec. 9, 2011
Mr. Shinichi Iseki	Deputy Chief Consultant/Hydrogeology	Manager, OYO International Corporation	Oct. 8 - Dec. 9, 2011
Mr. Iwao Hamada	Geophysical Survey/Trial Drilling Supervision	Overseas Department, Tokyo Engineering Consultants Co., Ltd.	Oct. 8 - Dec. 9, 2011
Mr. Masahiro Kawachi	Water Supply Facility Design	Overseas Department, Tokyo Engineering Consultants Co., Ltd.	Oct. 8 - Dec. 9, 2011
Mr. Ichiro Tanaka	Environmental and Social Consideration/Operation and Maintenance Plan	General Manager, OYO International Corporation	Oct. 8 - Dec. 9, 2011
Mr. Matasaburo Tsukuda	Construction and Procurement Planning/Cost Estimate	Overseas Department, Tokyo Engineering Consultants Co., Ltd.	Oct. 19 - Dec. 17, 2011

<Explanation of Draft Report>

Name	Assignment	Organization	Period
Mr. Toshio Murakami	Team Leader	Visiting Senior Advisor, JICA	Sep. 2 - 8, 2012
Mr. Toshikazu Watanabe	Project Coordinator	Water Resources Management Division II, Water Resources and Disaster Management Group, Global environment Department, JICA	Sep. 2 - 8, 2012
Mr. Soichiro Yumoto	Chief Consultant/Water Supply Plan	Team Leader, Overseas Department, Tokyo Engineering Consultants Co., Ltd.	Sep. 2 - 16, 2012
Mr. Matasaburo Tsukuda	Construction and Procurement Planning/Cost Estimate	Overseas Department, Tokyo Engineering Consultants Co., Ltd.	Sep. 2 - 16, 2012

Attachment - 2

Itinerary of Survey

<First Field Survey>

Date		JICA Member	Mr. Yumoto	Mr. Iseki	Mr. Kawach
Aug. 11	(Thu)		TYO - BKK		TYO - BKK
Aug. 12	(Fri)		BKK - EBB、 Report to JICA Uganda Office		- EBB、 Report to JICA Uganda Office
Aug. 13	(Sat)		Data Arrangement		Data Collections
Aug. 14	(Sun)	TYO - DXB	Preparation of Specification for Local Consultants		
Aug. 15	(Mon)	DXB - EBB	Explanation of Inception Report to MOWE		
Aug. 16	(Tue)	Discussion on Inception Report(MOWE), Kampala - Gulu			
Aug. 17	(Wed)	Workshop (7 District Local Governments), discussion with USAID			
Aug. 18	(Thu)	Site Reconnaissance (Lamwo and Kitgum Districts)			
Aug. 19	(Fri)	Site Reconnaissance (Agago and Pader Districts)			
Aug. 20	(Sat)	Site Reconnaissance (Amuru and Nwoya Districts), Gulu - Kampala			
Aug. 21	(Sun)	Preparation of M/, Team Meeting			Kampala - Gulu
Aug. 22	(Mon)	Discussion with MOWE on M/D			Field Survey （Social Condition Survey）
Aug. 23	(Tue)	Visit OPM,UNICEF Discussion, Discussion on and Signing of M/D			
Aug. 24	(Wed)	Report to Embassy and JICA Office, EBB - DXB	Report to JICA Uganda Office		
Aug. 25	(Thu)	Arr. at TYO	Kampala - Gulu		
Aug. 26	(Fri)		Field Survey (RGC、District Local Government, Water Offices)	Field Survey (RGC、Existing Water Supply Facilities)	Field Survey (RGC Existing Water Supply Facilities
Aug. 27	(Sat)				
Aug. 28	(Sun)				
Aug. 29	(Mon)				
Aug. 30	(Tue)				
Aug. 31	(Wed)				
Sep. 1	(Thu)				
Sep. 2	(Fri)				
Sep. 3	(Sat)				
Sep. 4	(Sun)				
Sep. 5	(Mon)				
Sep. 6	(Tue)				
Sep. 7	(Wed)		Report to Gulu FO, Gulu - Kampala		
Sep. 8	(Thu)		Discussion with MOWE		
Sep. 9	(Fri)		Report to JICA Uganda Office		
Sep. 10	(Sat)		EBB - ADD		
Sep. 11	(Sun)		ADD - BKK		
Sep. 12	(Mon)		BKK - TYO		

<Second Field Survey>

Date		JICA Member	Mr. Yumoto	Mr. Iseki	Mr. Hamada	Mr. Kawachi	Mr. Tanaka	Mr. Tsukuda
Oct. 8	(Sat)		TYO - BKK					
Oct. 9	(Sun)		BKK - EBB					
Oct. 10	(Mon)		Report to JICA Uganda Office, Discussion with MOWE					
Oct. 11	(Tue)		Preparation of Specification for Local Consultant					
Oct. 12	(Wed)	TYO - DXB	Discussion with MOWE					
Oct. 13	(Thu)	DXB - EBB	Preparation of Specification for Local Consultant					

Date		JICA Member	Mr. Yumoto	Mr. Iseki	Mr. Hamada	Mr. Kawachi	Mr. Tanaka	Mr. Tsukuda
Oct. 14	(Fri)	Discussion with MOWE, Kampala - Gulu, Discussion with Gulu FO			Preparation of Specification for Local Consultant			
Oct. 15	(Sat)	Site Reconnaissance (RGCCs and Villages)			カンパラ→グル		Data Collection	
Oct. 16	(Sun)	Site Reconnaissance (RGCCs and Villages)					Kampala - Gulu	
Oct. 17	(Mon)	Workshop (7 District Local Governments), Explanation on Results of Selection Gulu - Kampala						
Oct. 18	(Tue)	Discussion on M/D (MOWE)						
Oct. 19	(Wed)	Signing of M/D (MOWE)				Documentation on Contract with Local Consultants		TYO - BKK
Oct. 20	(Thu)	Report to Embassy and JICA Office, EBB - DXB	Preparation of Specification for Local Consultant					BKK - EBB
Oct. 21	(Fri)	Arr. at TYO						
Oct. 22	(Sat)							Data Collection for Cost Estimate
Oct. 23	(Sun)							
Oct. 24	(Mon)		Preparation of Specification for Local Consultant	Kampala - Gulu				
Oct. 25	(Tue)		Kampala - Gulu	Gulu FO 挨拶		Kampala - Gulu		Kampala - Gulu
Oct. 26	(Wed)		Field Survey (RGCs)	Geophysical Survey, Trial Drilling, etc.	Field Survey (Trial Drilling, Pump-up Test, etc.)	Field Survey (Topographic Survey RGCs)	Field Survey (RGCs, Preparation for Stakeholder Meeting)	Field Survey (RGCs, Topographic Survey, etc.)
Oct. 27	(Thu)							
Oct. 28	(Fri)							
Oct. 29	(Sat)							
Oct. 30	(Sun)							
Oct. 31	(Mon)							
Nov. 1	(Tue)							
Nov. 2	(Wed)							
Nov. 3	(Thu)		Discussion with Gulu FO, Gulu - Kampala					
Nov. 4	(Fri)		Report to JICA Uganda Office					
Nov. 5	(Sat)		Kampala - Gulu					
Nov. 6	(Sun)		Field Survey (RGCs)					
Nov. 7	(Mon)							
Nov. 8	(Tue)							
Nov. 9	(Wed)							
Nov. 10	(Thu)							
Nov. 11	(Fri)							
Nov. 12	(Sat)							
Nov. 13	(Sun)							
Nov. 14	(Mon)							
Nov. 15	(Tue)							
Nov. 16	(Wed)		Stakeholder Meeting			Preparation for Stakeholder Meeting		

Date		JICA Member	Mr. Yumoto	Mr. Iseki	Mr. Hamada	Mr. Kawachi	Mr. Tanaka	Mr. Tsukuda
Nov. 17	(Thu)		(C.Kilak, Adilang, Kitgum Matidi, Awere, Unyama, Koch Goma)			Stakeholder Meeting （C.Kilak)		
Nov. 18	(Fri)					Stakeholder Meeting （Adilang)		
Nov. 19	(Sat)					Preparation for Stakeholder Meeting		
Nov. 20	(Sun)							
Nov. 21	(Mon)							
Nov. 22	(Tue)					Stakeholder Meeting (Kitgum Matidi)		
Nov. 23	(Wed)					Stakeholder Meeting (Awere)		
Nov. 24	(Thu)					Stakeholder Meeting (Unyama)		
Nov. 25	(Fri)					Stakeholder Meeting (Koch Goma)		
Nov. 26	(Sat)					Field Survey (RGC, Topographic Survey)	Field Survey (RGCs, Stakeholder Meeting)	
Nov. 27	(Sun)		Gulu - Kampala, Report to JICA Uganda Office					
Nov. 28	(Mon)		Kampala - Gulu	Gulu - Kampala			Gulu - Kampala	
Nov. 29	(Tue)		Data Collection	Data Collection in MOWE			Data Collection in MOWE	
Nov. 30	(Wed)							
Dec 1	(Thu)		Gulu - Kampala, Report to JICA Uganda Office			Gulu - Kampala, Report to JICA Uganda Office		
Dec 2	(Fri)		Discussion with MOWE on Technical Notes			Discussion with MOWE on Technical Notes		
Dec 3	(Sat)		Data Arrangement			Data Arrangement		
Dec 4	(Sun)							Gulu - Kampala
Dec 5	(Mon)				Gulu - Kampala			Data Collection for Cost Estimate, etc.
Dec 6	(Tue)		Report to JICA Uganda Office					
Dec 7	(Wed)		EBB - NBO					
Dec 8	(Thu)		NBO - BKK					
Dec 9	(Fri)		BKK - TYO					
Dec 10	(Sat)							
Dec 11	(Sun)							
Dec 12	(Mon)							
Dec 13	(Tue)							
Dec 14	(Wed)							
Dec 15	(Thu)							EBB - NBO
Dec 16	(Fri)							NBO - BKK
Dec 17	(Sat)							BKK - TYO

<Explanation of Draft Report>

Date		JICA Member	Mr. Yumoto	Mr. Tsukuda
Sep. 2	(Sun)	TYO - DXB	TYO - BKK	
Sep. 3	(Mon)	DXB - EBB	BKK - EBB	
Sep. 4	(Tue)	Meeting in JICA Uganda Office, Discussion with MOWE, Meeting with OPM		
Sep. 5	(Wed)	Discussion with MOWE on M/D		

Date		JICA Member	Mr. Yumoto	Mr. Tsukuda
Sep. 6	(Thu)	Discussion with MOWE on M/D, Signing of M/D		
Sep. 7	(Fri)	Report to Embassy and JICA Office		
		EBB - DXB	Data Collection	
Sep. 8	(Sat)	Arr. at TYO	Discussion with MOWE	
Sep. 9	(Sun)		Data Collection	
Sep. 10	(Mon)		Supplemental Data Collection in MOWE	
Sep. 11	(Tue)			
Sep. 12	(Wed)			
Sep. 13	(Thu)			
Sep. 14	(Fri)		EBB - NBO	
Sep. 15	(Sat)		NBO - BKK	
Sep. 16	(Sun)		BKK - TYO	

List of Officials Concerned in Uganda

Name	Organization
1. Ministry of Water and Environment	
Betty Bigombe	Minister of State for Water
Richard Cong	Acting Director, DWD
Sottie M. Bomukama	Former Director, DWD
Aaron M. Kabirizi	Commissioner, Rural Water Supply Deptartment, DWD
Tushabe Aus-Ali	Ass. Commissioner, Planning & Development, DWD
Mukama Daoud	Sanitation Coordinator, DWD
Robert Mutiibwa K.	Principal Water Officer, Rural Water Supply Deptartment, DWD
Erisa Kyeyune	Hydrogeologist, DWD
Enangu Moses	Drilling Staff, DWD
Katumba Willy	Borehole Maintenance Supervisor, DWD
Senfuma Samuel	Hydrogeologist, DWD
Aloet Eria	Hydrogeologist, DWD
Bisoborwa Paul	Social Scientist, DWD
Nanjobe Uniah	Social Scientist, DWD
Mugeiga Kato	Social Scientist (Environment), DWD
Leofrida Oyella	Pirncipal Personal Officer, DWD
Kirya Richard	Finance, DWD
Robert A. K. Mulema	Water and Sanitation Engineer, Focal Point Officer, TSU-2
Nakalyango Caroline	Senior Water Officer, DWRM
Pule Johnson	Senior Hydrogologist, West Nile Water Management Zone, DWRM
Richard Matua	Manager, Water and Sanitation Development Facility-North (WSDF-N), DWRM
Oketcho Pokomol	Community Mobilization Specialist,Water and Sanitation Development Facility-North (WSDF-N)
Oyo Samuel	Project Engineer, Water and Sanitation Development Facility-North (WSDF-N)
John Semujju	Monitoring & Evaluation Specialist, Water and Sanitation Development Facility-North (WSDF-N)
Michael S. Z. Nkalubo	Commissioner, Meteorological Dept., DEA
Lubega Fortunata	Meteorologist, Data Processing, Meteorological Dept., DEA
2. Office of the Prime Minister	
Pius Bigirimana	Permanent Secretary
Flavia Waduwa	Under Secretary, Pacification and Development
Benon M. Kigenyi	Principal Assistant Secretary
Maxwell Chrysolite Kamanyire	Pregramme Coordinator
Mayanja Gonzaga	Ass. Commissioner, Northern Uganda
Kenneth Bagarukayo	Programme Manager, Northern Uganda Data Center
Benard Odur	Monitoring & Evaluation Officer, Northern Uganda Data Center
3. Uganda Bureau of Statistics	
Alfred Musanial	Senior Officer
4. Minidtry of Education and Sports	

Name	Organization
Edison Tusiime	Statisticain

5. Amuru District Local Government

Martin Kisule	Chief Administrative Officer
Donato Oola Olam	
Raymond Luwnta	District Engineer
Okello Louis P'Abur	Sennior Engineer
Payolem Robinson	Ag. District Water Officer
Oyo Samson Ayonic	District Planning Fiicer
Komakech Simon	Mechanical Section

6. Pader District Local Government

Omonda Grandfield	Chief Administrative Officer
Oryema Evaristo	Deputy Chief Administrative Officer
Obali Obote Charles	District Water Officer
Oceng David	Ass. District Water Officer
Yuka Helken	Secretary

7. Gulu District Local Government

Abdallah Kiganda	Chief Administrative Officer
Ogwany Bernard	Deputy Chief Administrative Officer
Olal Obang A.	District Engineer
Nyeko Samuel	Ag. District Water Officer
Mecak S. Patrick	Ass. District Water Officer
Chris Otin	District Planning Officer

8. Agago District Local Government

Kisembe Grace	Chief Administrative Officer
Olyel Raymond	District Water Officer
Kamay Kenneth	Ass. District Water Officer

9. Kitgum District Local Government

Charles Otai	Chief Administrative Officer
Oola Eugine	District Planning Officer
Bon Gomes Paatrick	District Engineer
Ortem Peter Olena	District Water Officer
Oryema Charles	Ass. District Water Officer
Picho Omunga Willy	Senior Engineer Roads
Oola Eugene	District Planning Officer

10. Lamwo District Local Government

Mwayita Bruno	Chief Administrative Officer
Akena Leonard	District Engineer
Ojara John Bosco	Water Technician
Onywaronga Albon	District Planner
Okwera Augustine	Senior Road Inspctor

11. Nwoya District Local Government

Otto Langoya	Chief Administrative Officer
Nyeko Gedffrey	District Engineer/Districct Water Officer

Name	Organization
Auna Michael Ogaba	District Health Inspecctor

12. UNICEF

Prakash Lamsal	Water, Sanitation & Hygine Specialist
Samuel Madul	Water & Env. Sanitation Officer

13. UNHCR

Elena Del Fabbro	Associate Field/Program Officer, Sub-office Gulu

14. US Agency for International Development (Uganda)

Casey M. Hoins	Special Projects Engineer, USAID (Uganda)
Komakech Gerald	Mission Engineer, USAID (Uganda)

15. Oxfam

David Bennett	Programme Manager - Kitgum, Kitgum Field Office

16. Enviro-Care & Management Limited

Arygaruku Martin	Pricipal Consultant, Certified and Registered Environmental Practitioner

17. Embassy of Japan

Junji Yamazaki	Counsellor, Deputy Head of Mission
Ryo Tokunaga	Head, Economic Cooperation Section
Shugo Shinohara	Coordinator for Economic Cooperation
Kanoko Nishimitsu	Resercher/Advisor, Economic Cooperation Section

18. Japan International Cooperation Agency (JICA), Uganda Office

Seki Tetsuo	Former Chief Representative
Hoshi Hirofumi	Chief Representative
Hiroyuki Egashira	Representative
Yutaka Araki	Representative
Yoshiharu Nakamura	Project Formulation Advisor, Gulu Office
Kazumi Nakamura	Project Formulation Advisor, Gulu Office
Emmanuel Pacoto	Field Coordinator, Gulu Office
Kenneth Lukwiya	Field Coordinator, Gulu Office