MINISTRY OF WATER AND ENVIRONMENT
REPUBLIC OF UGANDA

THE PREPARATORY SURVEY REPORT
FOR
THE PROJECT FOR RURAL WATER SUPPLY PHASE III
IN LAKE KYOGA BASIN, EASTERN UGANDA
IN
THE REPUBLIC OF UGANDA

MARCH 2017

JAPAN INTERNATIONAL COOPERATION AGENCY

OYO INTERNATIONAL CORPORATION
TEC INTERNATIONAL CO., LTD.

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Summary

1. Country Profile

(1) Land and Natural Conditions

The Republic of Uganda (hereinafter referred to as “Uganda”) is the inland country with the population of 36.86 million (in 2016) located in north of the African continent. The land area is measured to be only 197,000 km2 out of the whole area of 241,000 km2, because the water surface areas of lakes such as Lake Victoria accounts for much.

The target sites of the Project for Rural Water Supply Phase III in Lake Kyoga Basin, Eastern Uganda in the Republic of Uganda (herein after refer to as “the Project” are geographically located in the east part of Uganda, and studded in Serere, Pallisa, Kibuku, Iganga and Luuka Districts. The terrain is roughly flat and the elevation changes from 1,080m to 1,130m, and declines from east to west. The rivers are meandering due to the flatness and often accompany wetlands. The geology consists of Granites (Granite, Granodiorite, and Gneiss) or Schist produced during Precambrian or Paleozoic Cambrian period.

The climate of the southern part of Lake Kyoga basin is classified as tropical monsoon climate, while the other part of the basin is classified as savannah climate. It is hot and windy throughout the year. In southern part of Lake Kyoga basin, there are high rainfalls from April to May and October to November, while low rainfalls from December to January. On the other hand, in the northern part, there are higher rainfalls from March to November than the other months, but the difference is lesser than that in the southern part.

(2) Socio-Economics

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, put it into practice from fiscal year 2010/2011[1]. And the government revised it as NDP II and is putting it into practice from 2015/16. 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 GDP (Gross Domestic Products) of Uganda amounts to US$24.3 billion, and the GDP per capita US$725 (2016, calculated from the Statistical Abstract, Uganda Bureau of Statistics). The GDP composition of industrial structure is; primary: 23.5%, secondary: 19.8% and tertiary: 48.8%. 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, electric and telecommunication equipment, iron and steel, and medicine.

[1] Expression of Ugandan fiscal year; 2010/11 expresses a period July 2010 to June 2011.

2. Background, Progression and Outline of the Project

(1) Overall Goal

Uganda has been implementing the Second National Development Plan (2015 / 16 - 2019 / 20) (NDP II), following the National Development Plan (2010 / 11 - 2014 / 15) (NDP). The theme of the plan is "Strengthening Uganda's Competitiveness for Sustainable Wealth Creation, Employment and Inclusive Growth", and it aims to achieve middle income status by 2020. Under this policy, the rural water supply sector is aiming to improve the rural water supply coverage as a development indicator from 65% (2012/13) to 79% (2019/20).

In addition, in a Rural Growth Centre[2] (RGC) where the population is concentrated in rural area as a trading center, water qualities of even their boreholes equipped with hand pumps are being concerned about getting pollution. The Government of Ugandan formulated "Long-term Strategy for Investment Planning, Implementation and Operation & Maintenance of Water Supply and Sanitation in Rural Growth Centres, 2005" (RGC strategy), and is promoting for RGCs to use piped water supply systems instead of hand pump wells to cope with this issue.

(2) Current Condition and Challenges

The target sites of the Project are located in five (5) districts, namely, Serere, Pallisa, Kibuku, Iganga and Luuka in the eastern part of Uganda. These districts originally composed of three (3) districts; those are Soroti, Pallisa and Iganga. The each district was divided to two (2) districts under Uganda's decentralization policy. The decentralization has resulted in lack of human resources in the relevant divided districts, and their administrative functions have become weak. The water sector in Uganda also is not the exception in this point so that the existing water supply facilities are not as well maintained as expected.

In addition, an area with high population such as RGCs, even though it is located in rural area, has following issues

- Due to the large number of users of the same water source, the water fetching time has been prolonged, and this hinders women's social advancement and the improvement of literacy rate of women and children who are the main actors of the labor and
- Contamination of groundwater sources is progressing in some areas. The contamination is beginning to threaten the health of villagers lived in the areas.

Therefore, construction of new piped water supply facilities with safe water sources is sought as a counter measure against these issues.

(3) Background and Outline of the Project

In Uganda, the urban water supply coverage is high as 75%, but the rural water supply coverage is still remaining low as 64% in spite of its large population lived in rural area, which reaches about 82% of the total population in 2010. In addition, the difference in the water supply coverage among district is also remarkable in the rural areas.

Lake Kyoga basin occupy around 25% of the total land area and 30% of the total population of Uganda, however, the average water supply coverage is only around 57% and lower than that of

[2] A RGC is a kind of trading centre with population from 500 to 5,000 which generated spontaneously around crossing of main roads or along main roads in rural area.

total rural areas (65%).

At the same time, rural areas have population concentrated parts called RGCs those have a lot of public facilities and commercial/industrial facilities. The water supply coverage of these RGCs is 10% to 40% lower than that of the other rural parts according to the result of the development study. Therefore, improvement of water supply coverage in such RGCs through construction of piped water supply facilities has been required in order to improve total water supply coverage in rural areas.

To improve such condition, in September 2011, the government of Uganda requested to the government of Japan for the grant for construction of the piped water supply facilities in such prioritized RGCs in selected six (6) districts as the results of “The Development Study on Water Resources Development and Management for Lake Kyoga Basin in the Republic of Uganda”. The contents of the request are shown in below.

a) Construction of piped water supply facilities (20 sites).

b) Technical support for establishment of sustainable O&M systems of the constructed piped water supply facilities above mentioned (Soft component).

c) Procurement of vehicles, computers, GPS, mobile water quality kits, etc.

Based on the background, the government of Japan determined the implementation of this preparatory survey on the premise of applying Japan's Grant Aid.

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

Response to the decision above mentioned, Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the survey team to Uganda twice during the period from May 2015 to May 2016. Since nearly five years have passed from the request, the team reviewed the requested contents from the points of views on duplication of donor assistance, relevance of the requested contents, appropriate project components as Japan's Grant Aid project, and so on. And finally the team conducted an outline design of piped water supply facilities at nine (9) sites including soft component (technical assistance) plan for operation and maintenance of the facilities to be constructed in the Project, and project cost estimation.

In November 2016, JICA dispatched the team to Uganda for explanation of the draft outline design and the Project cost. The team had a series of discussion with the organizations concerned, specifically, the Directorate of Water Development (DWD) in the Ministry of Water and Environment (MOWE), Republic of Uganda. As a result, both sides agreed on the contents of the outline design of the Project and the obligations of both countries.

(1) Facility Plan

The latest proposed outline design and the facilities plan are shown in below tables. The source water of each target site is groundwater, and the water qualities have fulfilled drinking water quality standard (Uganda Standard Potable Water - Specification, 2014) in Uganda. The Project has no procurement of equipment.

Table 1 Design Water Supply

No.	RGC	District	Served Population (Year 2022)	Design Maximum Daily Water Supply (m^3/day)
1	Nambale	Iganga	1,863	50
2	Lambala	Luuka	1,742	47
3	Naigobya	Luuka	1,711	46
4	Kyanvuma	Luuka	3,228	88
5	Kasassira	Kibuku	5,676	271
6	Kameke	Pallisa	1,546	42
7	Kapala	Pallisa	2,735	74
8	Buseta	Kibuku	2,276	61
9	Kidetok	Serere	3,961	108
Total			24,738	787
Average			2,749	87

Table 2 Contents of the Piped Water Supply Facilities to be Constructed

Site Name (RGC)	Contents (Facilities, Quantities)							
	Source Borehole	Solar Power Generation	Stand-by Generator	Elevated Tank	Kiosk	Yard Tap	Transmission Pipe (m)	Distribution Pipe (m)
Nambale	2	1	0	1	6	12	1,301.7	4,265.0
Lambala	1	1	0	1	5	8	483.0	2,338.2
Naigobya	1	0	0	1	7	9	1,035.0	5,367.4
Kyanvuma	1	0	0	1	9	12	4,872.0	5,388.1
Kasassira	1	0	1	1	11	11	1,265.0	6,505.2
Kameke	1	1	0	1	7	11	1,920.0	3,644.2
Kapala	2	0	0	1	7	12	3,003.5	3,523.2
Buseta	1	1	0	1	9	11	862.0	5,583.3
Kidetok	2	0	0	1	9	13	2,802.2	6,294.6
Total	12	4	1	9	70	99	17,544.4	42,909.2

(2) Soft Component Plan

In order to establish operation and maintenance (O&M) structure and strengthen it for water supply facilities to be constructed by this Project, a soft component activity will be implemented.

In Uganda, owner of a small scale piped water supply facility is a relevant sub-county. The Water Supply and Sanitation Boards (WSSBs) composed of a sub-county councilor, sub-county chief and community representatives are responsible for the O&M for the constructed facilities The Project also will follow this system for the O&M of the facilities. Therefore, to strengthen the capacity of the WSSBs on the O&M of the water supply facilities, the soft component plan of this Project aims at the following main points.

Objective 1: Basic activities such as water charge collection are done smoothly and the facilities are operated on financially stable conditions.

Objective 2: The piped water supply facilities constructed under the Project are used cleanly and continuously under proper O&M (inspection and repair)

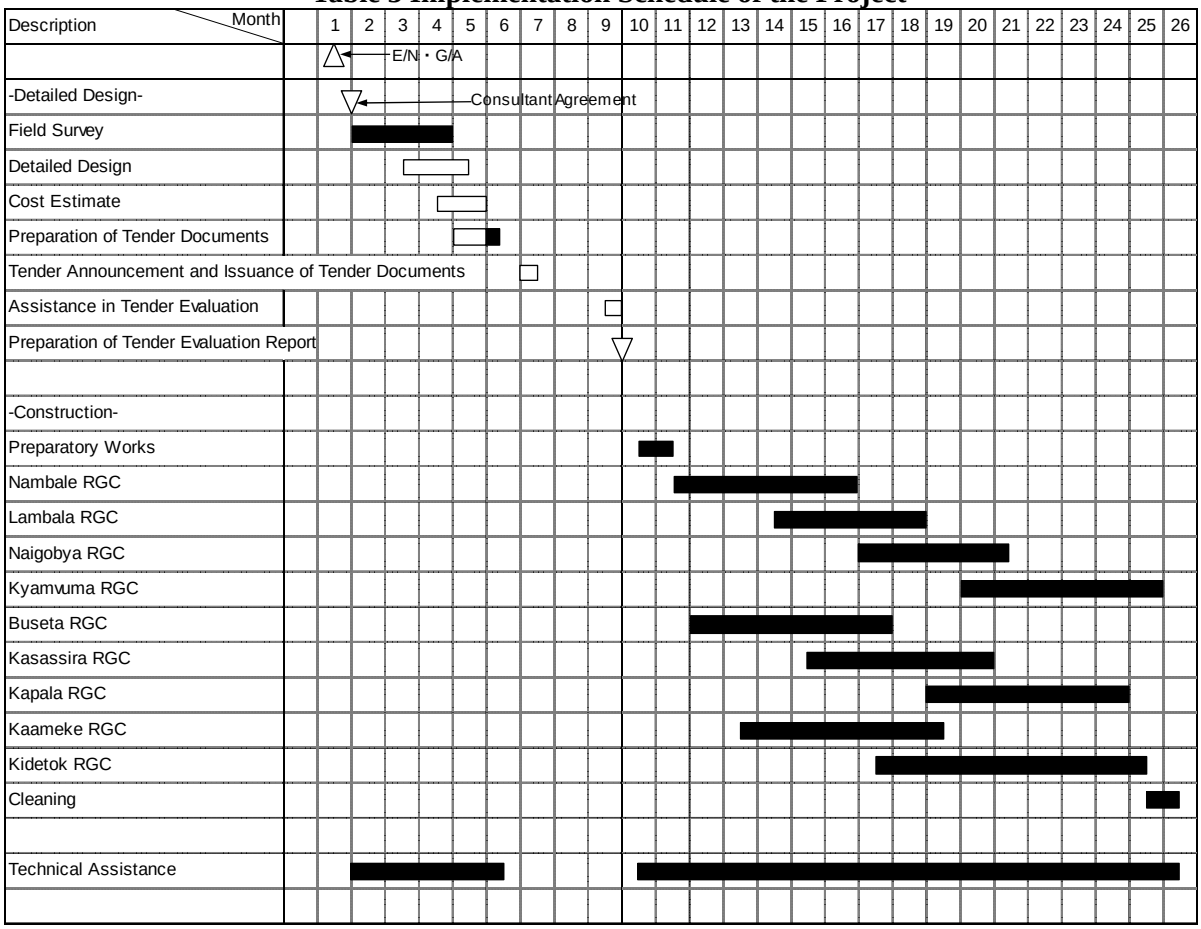
The main contents of the soft component are sensitization and mobilization activities concerning safe water and sanitation for villagers and sub-county officers through workshops, and delivery of basic knowledge and acquiring actual knowledge on O&M of the piped water supply facilities through workshops and On the Job Trainings (OJTs) for the WSSB and Operator.

4. Implementation Schedule and Project Cost

(1) Implementation Schedule of the Project

Implementation Schedule for the Project is shown below.

Table 3 Implementation Schedule of the Project



(2) Project Cost Estimation

When the Project is implemented under Japan's Grant Aid, the Project cost borne by Ugandan side is estimated around 0.2 billion JPY.

5. Project Evaluation

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

(1) Relevance

The Project implementation by Grant Aid is evaluated to be reasonable based on the result of this survey for the following reasons.

1) The Government of Uganda aims at "improving living conditions in rural areas" through safe water supply in the NDP II. The Project can contribute this target.
2) The Government of Uganda is promoting construction of piped water supply facilities to secure safe water supply at densely inhabited RGCs. The implementation of the Project meets the policy.
3) Implementation of the Project contributes to decrease the relevant villagers' burden on water fetching.
4) Positive impacts of the Project are larger than that of zero-option as a result of environmental impact consideration

(2) Effectiveness

1) Quantitative Impacts

Quantitative impact to be expected by implementation of this Project is shown in Table 4.

Table 4 Quantitative Effective Index of the Project

Effective Index	Base Value (2015)	Target Value (2022) Three (3) Years after Completion
Water Supply Volume by the constructed piped water supply facilities[3]	0 m^3/day	581 m^3/day
Water Quality (Turbidity)[4]	N/A	Less or equal 25 NTU

2) Qualitative Impacts

Qualitative impacts to be expected by implementation of the Project are mentioned below.

- Mitigation of burden for fetching water (time)
- Mitigation of water-borne diseases by safe water supply
- Qualitative improvement on O&M of the piped water supply facilities through the inputs of soft component

[3] Effective Index "Water Supply Volume by the constructed piped water supply facilities" refers to the average daily water usage by the relevant RGC residents; the quantity does not include any losses such as water leakage.

[4] As the water source used by the relevant villagers are not specified, the basic value is set as N / A, and the target value is set in comply with Ugandan water quality standard. .

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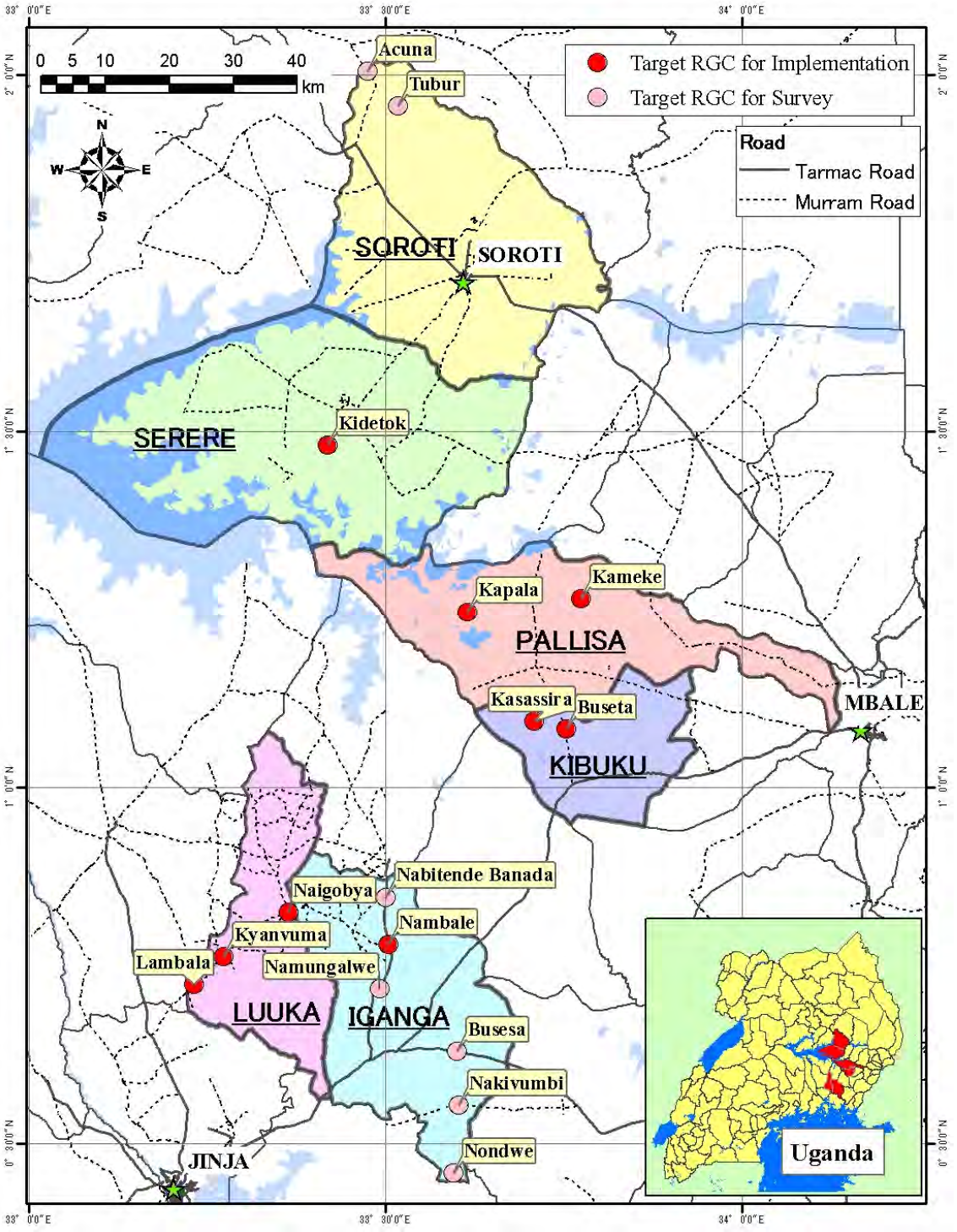
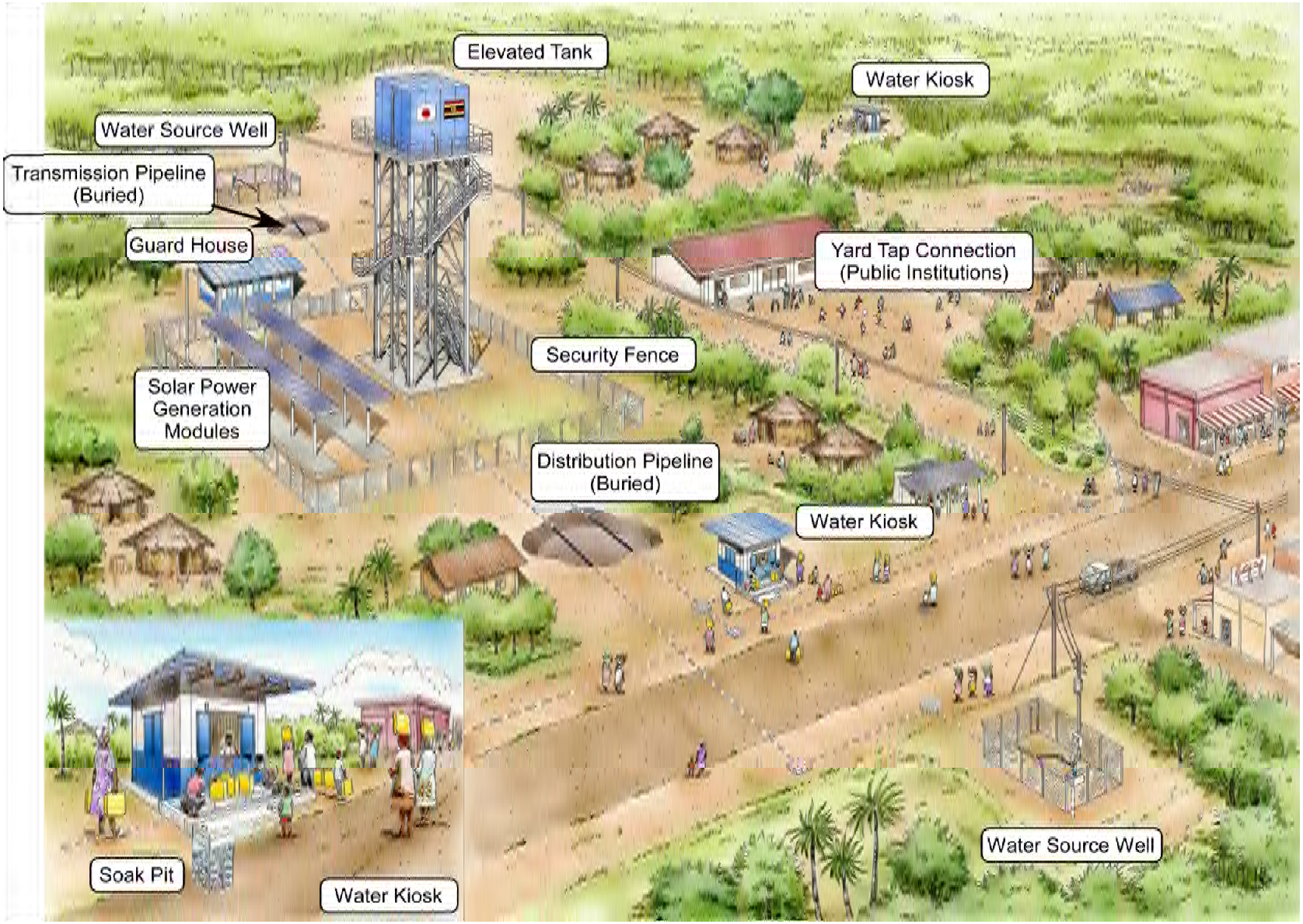


Location Map

Perspective



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Abbreviations

ADB	:	Africa Development Bank
A/P	:	Authorization to Pay
B/A	:	Banking Arrangement
BH	:	Borehole
BOD	:	Biochemical Oxygen Demand
CAO	:	Chief Administrative Officer
CBM	:	Community Based Management
CDA	:	Community Development Assistant
CDO	:	Community Development Officer
COD	:	Chemical Oxygen Demand
C/P	:	Counterpart
DB	:	Database
DHI	:	District Health Inspector
DIP	:	Ductile Iron Pipe
DN		Nominal Diameter
DWD	:	Directorate of Water Development
DWO	:	District Water Office
DWOr	:	District Water Officer
DWRM	:	Directorate of Water Resources Management
EA	:	Environmental Audit
EC	:	Electric Conductivity (µS/m)
EIA	:	Environmental Impact Assessment
E/N	:	Exchange of Note
EO	:	Engineering Officer
EU	:	European Union
G/A	:	Grant Agreement
GIZ	:	Gesellschaft für Internationale Zusammenarbeit
GIP	:	Galvanized Iron Pipe
GPS	:	Global Positioning System
GSP	:	Galvanized Steel Pipe
HA	:	Health Assistant
HC	:	Health Center
HH	:	Household
HDPE	:	High Density Polyethylene
HO	:	Health Officer
HP	:	Hand Pump

HPM	:	Hand Pump Mechanic
HQ	:	Headquarters
ICEIDA	:	Icelandic International Development Agency
JICA	:	Japan International Cooperation Agency
K/A	:	Kiosk Attendant
KfW	:	Kreditanstalt für Wiederaufbau
LC5	:	Local Council 5
LC3	:	Local Council 3
LC1	:	Local Council 1
M/D	:	Minutes of Discussions
MDGs	:	Millennium Development Goals
MOFPED	:	Ministry of Finance, Planning and Economic Development
MOU	:	Memorandum of Understanding
MOWE	:	Ministry of Water and Environment
M/P	:	Master Plan
NDP	:	National Development Plan
NEMA	:	National Environment Management Authority
NGO	:	Non-governmental Organization
NGWDB	:	National Groundwater Database
NTU	:	Nephelometric Turbidity Units
NWSC	:	National Water and Sewerage Corporation
O&M	:	Operation & Maintenance
OD	:	Outer Diameter
ODA	:	Official Development Assistance
OJT	:	On the Job Training
P/O	:	Private Operator
PVC	:	Polyvinyl Chloride
RDC	:	Resident District Commissioner
REA	:	Rural Electrification Agency
RGC	:	Rural Growth Centre
RWSSD	:	Rural Water Supply and Sanitation Department
S/O	:	Scheme Operator
SWL	:	Static Water Level
TDS	:	Total Dissolved Solids
TOR	:	Terms of Reference
TSS	:	Total Suspended Solids
TSU	:	Technical Support Unit

UGX	:	Ugandan Shilling
UMEME		Umeme Company Limited
UNICEF	:	United Nations Children's Fund
UNRA	:	Uganda National Road Authority
U/O	:	Umbrella Organization
UTM	:	Universal Transverse Mercator
UWSSD	:	Urban Water Supply and Sewerage Department
VAT	:	Value Added Tax
VES	:	Vertical Electrical Sounding
WA	:	Water Authority
WHO	:	World Health Organization
WB OP	:	World Bank Operational Policies
WB IRS	:	World Bank Involuntary Resettlement Sourcebook
WMDP	:	Water Management Development Program
WSDF	:	Water Supply Development Facilities
WSDM	:	Water Supply Design Manual
WSC	:	Water and Sanitation Committee
WSIC	:	Water and Sanitation Implementation Committee
WSSB	:	Water Supply and Sanitation Board

Chapter 1 Background of the Project

Chapter 1 Background of the Project

1-1 Background of the Project

As of 2015, in Uganda, the urban water supply coverage is high as 73%, but the rural water supply coverage is still remaining low as 65% in spite of its large population in rural area, which reaches about 82% of the total population. In addition, the differences among the district-wise water supply coverages are also remarkable in rural areas.

Lake Kyoga basin occupy around 25% of the total land area and 30% of the total population, however, the average water supply coverage is only around 57% and lower than that of total rural areas (65%).

At the same time, rural areas have population concentrated parts called Rural Growth Centres （RGCs） those have a lot of public facilities and commercial/industrial facilities. The water supply coverages of these RGCs are 10% to 40% lower than that of the other rural parts.

Therefore, improvement of water supply coverage in such RGCs through construction of piped water supply facilities was required.in order to effectively improve water supply coverage in rural areas.

To improve such condition, in September 2011, the government of Uganda requested to the government of Japan for the grant for construction of the piped water supply facilities in such prioritized RGCs in selected six (6) Districts as the results of The Development Study on Water Resources Development and Management for Lake Kyoga Basin in the Republic of Uganda (the development study[1]). The contents of the request are shown in below.

a) Construction of piped water supply facilities (20 sites).

b) Technical support for establishment of sustainable operation and maintenance (O&M) systems of the constructed piped water supply facilities above mentioned (Soft component).

c) Procurement of vehicles, computers, GPS, mobile water quality kits, etc.

Based on the background, the government of Japan determined the implementation of this preparatory survey on the premise of applying to Japan's Grant Aid.

However, almost five years have passed since the request, the Survey Team studied the project contents from the viewpoints of duplication of the other donor’s assistances, relevance of the Project contents and scale as Japanese grant aid project, and so on. Finally, 9 RGS were selected for implementation of the outline design for the construction of piped water supply facilities and planning technical support program for establishment proper O&M system.

UBOS estimates that 30.08 million people (about 82%) of the total population 36.86 million people live in rural areas as of June 2016. The urban water supply coverage is at 73%, and the rural area's water supply coverage is at 67%. The water supply rates are still low yet.

The target sites of the Project are located in five (5) districts, namely, Serere, Pallisa, Kibuku, Iganga and Luuka in the eastern part of Uganda. These districts originally composed of three (3) districts; those are Soroti, Pallisa and Iganga. The each district was divided to two (2) districts under Uganda’s decentralization policy. The decentralization has resulted in lack of human resources in the relevant divided districts, and their administrative functions have become weak.

[1] The development study made a recommendation that improvement of water supply coverages of RGCs was efficient for improving the national rural water supply coverage due to high population densities of RGCs, and proposed a master plan in which, firstly, districts with high priority were selected ,and secondly, prioritization of RGCs in the selected districts were conducted. The government of Uganda selected 20 RGCs with top priorities and requested the implementation of the Project

The water sector in Uganda also is not the exception in this point so that the existing water supply facilities are not as well maintained as expected.

In addition, an area with high population such as RGCs, even though it is located in rural area, has following issues

- Due to the large number of users of the same water source, the water fetching time has been prolonged, and this hinders women's social advancement and the improvement of literacy rate of women and children who are the main actors of the labor and
- Contamination of groundwater sources is progressing in some areas. The contamination is beginning to threaten the health of villagers lived in the areas.

Therefore, construction of new piped water supply facilities with safe water sources is sought as a counter measure against these issues.

According to the data provided by Umbrella-East (the operation and maintenance support organization), which is in charge of the eastern part of Uganda including the Project sites, there are 91 facilities of piped water supply facilities affiliated with the organization as of April 2015. Among them, 60 facilities are using gravity distribution systems, 27 facilities using submersible motor pumps.

Of these, 75 facilities were in operation, and 13 facilities were facing problems. The main challenge is non-payment of commercial electricity fee and the malfunction of the submersible motor pumps. From the viewpoint of sustainability of the facilities, it was confirmed the importance and necessity of mobilization and sensitization activities for villagers, and education for administrators and operators on O&M of their water supply facilities.

1-2 Natural Condition

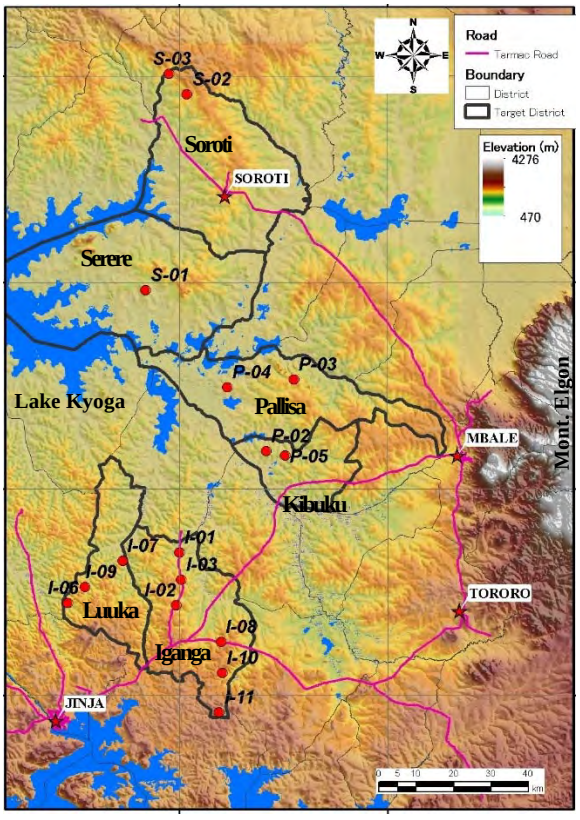
1-2-1 Topography and Geology

(1) Topography

Uganda faces to Lake Victoria in the south and is surrounded by rises of the Great Rift Valleys in the east and west. Huge plain, which is lying between the rises, is tilting towards to the north gradually, and the River Nile, which is flowing down from Lake Victoria as a water source, is flowing to the Republic of South Sudan via Lake Kyoga. Lake Kyoga Basin is located in the eastern part of Uganda and consists of peneplain, hills and mountains as presented in Figure 1.2-1. Its altitude ranges from 1,030m at the exit of Lake Kyoga to 4,321m at the peak of Mt. Elgon. Topography of the Basin is roughly tilted from the east to the west. Most of the rivers in the Basin have swamps because of its gentle slope. Lake Kyoga, whose water area is 1,720 Km^2, is very shallow: average 5.7m in depth. Target areas exist in the peneplain, there are no steep cliff except around isolated rocky hills. The gentle reliefs have swamps and hilly areas to be appeared repeatedly with 1 to 2 km wavelength. Rivers in the area are almost seasonal river. Only rivers flowed from Mt. Elgon to Lake Kyoga are perennial. Most of rivers forms swamps because of the gentle slopes.

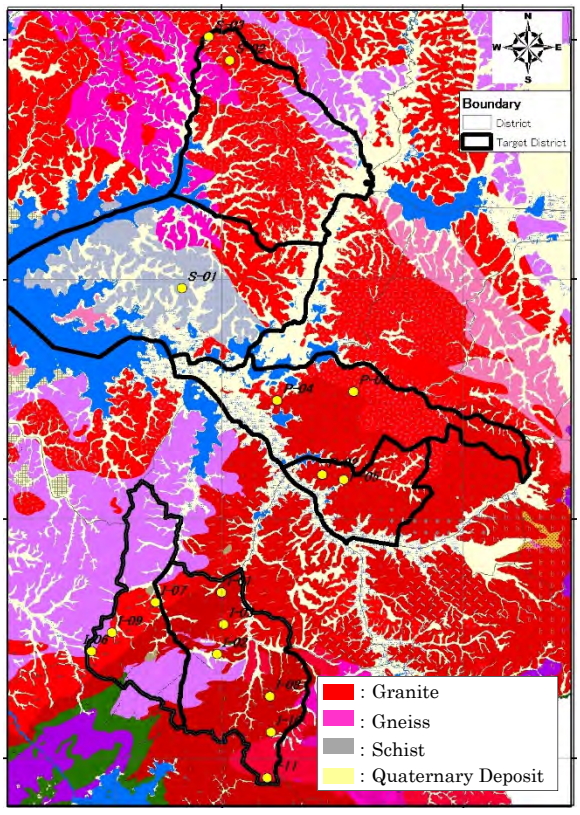
(2) Geology

One of the oldest geological units in the world is distributed in Uganda. Eighty percent of the country comprises Precambrian formations, which were formulated 3 billion to 570 million years ago. These rocks are metamorphosed by orogenic movements, which were activated during Precambrian. Although the geology is classified by the period, types, magnitudes of metamorphism and so on in each area, most of the rocks are classified into Gneisses, Granites and



Source: After "Digital Elevation Model of Shutle Radar Topography Mission data (NASA)"

Figure 1.2-1 Topography of Target Area



Source: After "Geological Map of Uganda"

Figure 1.2-2 Geology of Target Area

Schists. The area has been on the continental crust and never sunk into the ocean except only once when the transgression of Karoo was happened. The volcanic activities began in the middle Tertiary: 23 million years ago concurrently with the formulation of the Great Rift Valley. It formulated some volcanoes in the eastern part of Uganda, for example: Mt. Elgon.

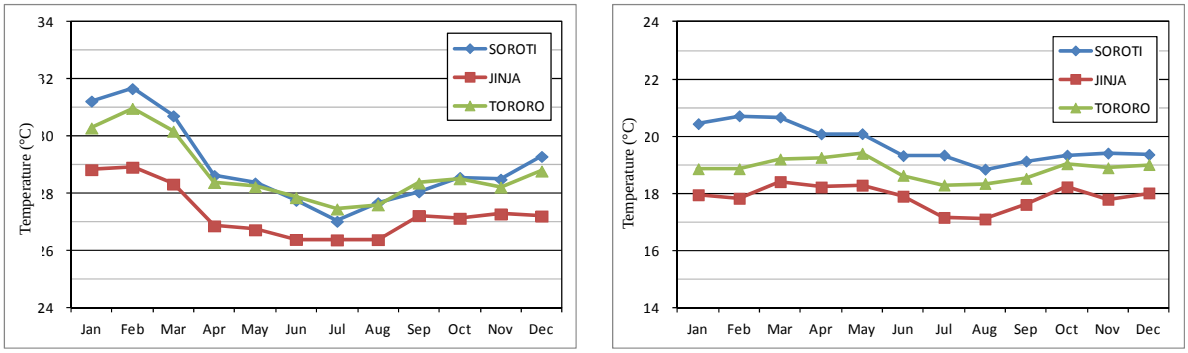
Most of RGCs are on the hilly area in the peneplain. Since cemented laterite with rich iron oxide is distributed in depression areas, infiltration of surface water to underground is disturbed and groundwater recharge is little. It is difficult to estimate geological lineaments because aggregated base rocks are significant and structural geological weak lines are not developed

Geological map in this area is shown in Figure 1.2-2. Red color shows granite: pink color shows gneiss: grey color shows schist: yellow color shows Quaternary sediment.

1-2-2 Climate

(1) Climate and Temperature

Southern part of Lake Kyoga basin is classified as tropical monsoon, while the other part of Lake Kyoga basin is classified as savannah. It is hot and windy throughout the year. Monthly mean temperatures for 10 years (2006 – 2015) in Soroti, Jinja and Tororo district in Lake Kyoga basin are shown in following figure. Regarding maximum temperature, it is hottest on December to February of dry season. There is less variation on minimum temperature than maximum temperature.

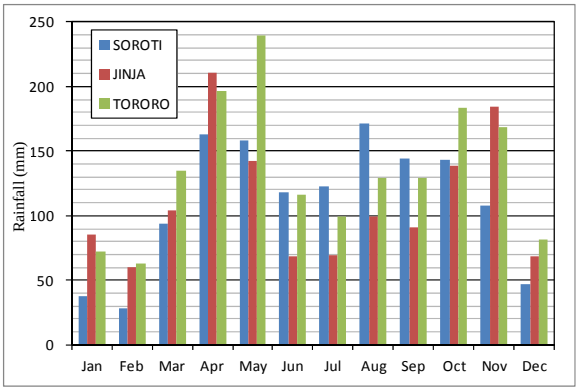


Source: Data from "World Meteorological Organization"

Figure 1.2-3 Monthly mean daily maximum temperature (in the left side), monthly mean daily minimum temperature (in the right side) in Lake Kyoga Basin

(2) Rainfall

Monthly average rainfalls in Soroti and Tororo district (2001 - 2014) and Jinja district (2001 - 2010) are shown in following figure. Annual rainfall is 1,335mm in Soroti district, 1,323mm in Jinja district and 1,614mm in Tororo district. In southern part (Jinja and Tororo district) of Lake Kyoga basin, there are high rainfalls from April to May and October to November, while low rainfalls from December to January. However there is a little rain in dry season. On the other hand, in northern part (Soroti district), rainfall is high from March to November and has rather less variation between rainy and dry season than that in southern part.



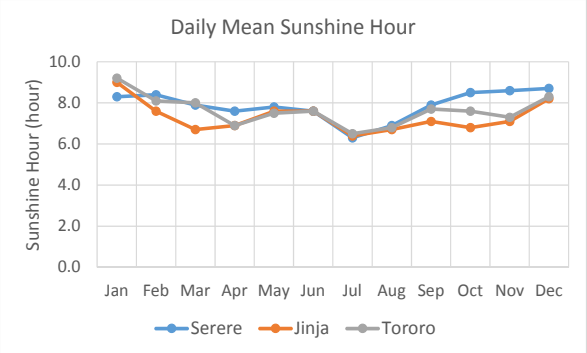
Source: Department of Meteorology

Figure 1.2-4 Monthly mean precipitation in Lake Kyoga basin

Experience during the field survey said that rainy season started from around March (the same as the graph described), and road conditions around target areas went into worse gradually. Rain pours suddenly and heavily with thunders in a short time. It often gets fine weather just after one or two hour-raining, and there are little cases to keep light but long rain. In rainy season, un-paved roads are considered to gradually get into bad condition due to almost everyday raining and traffic of heavy trucks.

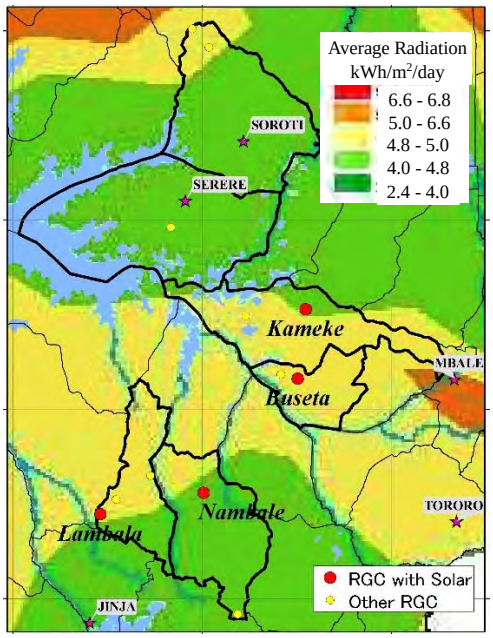
(3) Sunshine Hours / Solar Radiation

Monthly mean daily sunshine hours at Serere, Jinja and Tororo are shown in Figure 1.2-5. Average sunshine hour is 6.4 hours long in July as rainy season, while that is 9.0 hours long in January as dry season. Annual mean sunshine hour is 7.6 hours long. In addition, solar radiation is from 4.8 to 5.0 kWh/m^2/day in the target area (See Figure 1.2-6).



Source: Department of Meteorology

Figure 1.2-5 Monthly mean daily sunshine hour in Lake Kyoga basin



Source: The Renewable Energy Policy for Uganda, Ministry of Energy and Mineral Development

Figure 1.2-6 Solar radiation distribution in the target area

1-2-3 Hydrogeology and Water Quality

To confirm hydrogeological condition and water quality of groundwater in the target area, "pumping test and water quality analysis for existing wells" in the requested RGCs had been conducted in the first field survey period. Additionally, in the second field survey period, "geophysical survey" and "test borehole drilling survey" had been conducted for the selected RGCs according to the result of first field survey.

＜Successful Boreholes Drilled in the Development Study＞

In the development study, 20 boreholes were drilled to investigate hydrogeological condition. Some of the boreholes were drilled in the target RGCs of this Project. Boreholes, which have enough total water yield compared with the water demand of the relevant RGC, can be used for this Project. The list of the boreholes which were drilled in the requested RGCs are shown in the following table with the borehole specifications.

Table 1.2-1 Specifications of boreholes drilled in the Development Study

Code	RGC	District	Borehole No.	DWD No.	Drilled depth (m)	Static Water Level (m)	Safe yield (m^3/h)	pH	TDS (mg/L)	Fe (mg/L)
I-01	Nabitende Banada	Iganga	JTB-1		71	-	-	-	-	-
			JTB-2		101	-	-	-	-	-
I-06	Lambala	Luuka	JTB-7	31481	65	7.13	0.32	6.24	703	0.13
			JTB-8	31483	60	3.6	1.2	6.32	177	0.00
I-07	Naigobya	Luuka	JTB-5		65	-	-	-	-	-
			JTB-6	31485	45	6.8	3.65	5.80	125	0.00
P-03	Kameke	Pallisa	JTB-11	31498	70	3.45	7.2	6.88	237	0.12
			JTB-12	31504	70	3.36	1.8	6.68	177	0.02
S-01	Kidetok	Serere	JTB-17	31509	80	8.64	7.2	6.98	529	0.00
			JTB-18	31510	80	13.2	13.2	7.15	383	0.00
			JTB-19	31513	87	12.42	1.8	6.89	180	0.05
S-03	Acuna	Soroti	JTB-20	31518	50	5.3	0.3	6.88	285	0.04

Boreholes which has required safe yield and water quality are only 4 boreholes, i.e. JTB-6 in Naigobya, JTB-11 in Kameke, JTB-17 and JTB-18 in Kidetok.

These boreholes have been used by the relevant communities after handing over to MOWE from JICA and being equipped with hand pumps. Therefore, these boreholes were not vandalized. The communities agreed to convert the boreholes from the hand pump wells to the water source of the planned water supply systems. However, pumping tests shall be conducted in the detailed design period to confirm their safe yields because 6 years have passed after the construction.

＜Pumping Test and Water Quality Analysis for Existing Wells＞

(1) Purpose

To confirm the hydrogeological condition around the selected RGCs.

(2) Targets of Survey

Selected RGCs for the survey are 14 out of the requested 20 RGCs; 4 RGCs out of 20 were rejected by the reason of duplication of donor assistances, and 2 RGCs out of 20 have already water sources with enough water yield drilled in the development study so that they don't need to conduct the survey. However, one RGC out of the selected 14 RGCs did not accept the implementation of the survey due to the hostile by the community against the survey.

In case of Naigobya RGC, which has one borehole drilled in the development study, the survey was conducted for aiming development of additional water source because the yield of the borehole has no additional room for the water demand even under the condition of usage of commercial power supply.

(3) Contents of Survey

Before starting pumping test, the condition of each selected borehole was confirmed by borehole camera observation, and the boreholes were cleaned by airlifting if necessary. After that step drawdown tests were conducted. The tests were done at 37 existing boreholes. Basically, each step drawdown test has five steps of different pumping volumes with one hour observation per one step.

Safe yield of each borehole was defined as 0.8 times of critical yield which was estimated by the step drawdown test.

In case that the safe yield exceeded 2.0 m^3/hr, constant rate test (12 hours) and recovery test were

conducted. For water quality analysis, water samplings were done during the step drawdown tests or constant rate tests. Items of the analysis were 17, which are temperature, pH, electrical conductivity, coliform, color, turbidity, TDS (Total Dissolved Solid), TSS (Total Suspended Solid), hardness, magnesium, chloride, fluoride, Iron, sulfate, nitrite, nitrate, ammonium, manganese, arsenic, sodium, and potassium. Table 1.2-2 shows important items of the results of pumping test and water quality analysis. Boreholes with large yields were found in Kyanvuma(I-09), Kapala(P-04), Buseta(P-05). On the other hands, some boreholes have groundwater which water quality exceeded Ugandan water quality standard (Uganda Standard Potable Water - Specification, 2014) in the items of coliform and TSS.

Table 1.2-2 Result of Pumping Test and Water Quality Analysis

Values under water quality items are showing Ugandan water quality standard. Yellow cells are showing over the standard.

No.	Code	RGC Name	District	Existing BH No.	Depth (m)	Static Water Level (m)	Safe Yield (m^3/hr)	pH	Coliform (No./ 100mL)	TDS (mg/L)	TSS (mg/L)
								5.5-9.5	0	1500	0
1	I-01	Nabitende Banada	Iganga	I-01-EX01	48.3	9.8	2.3	6.25	1	250	0
				I-01-EX02	48.0	10.10	1.9	6.37	1	310	0
				I-01-EX04	47.5	6.33	<2.0	6.06	7	180	0
				I-01-EX06	49.0	8.70	<2.0	6.03	0	260	0
				I-01-EX09			1.7	6.07	0	130	6
2	I-02	Namungalwe	Iganga	I-02-EX02	53.9	7.6	1.6	6.75	0	200	2
				I-02-EX04	30.0	11.3	3.2	6.20	0	100	0
				I-02-EX05B	40.2	11.1	2.0	6.10	0	200	0
3	I-03	Nambale	Iganga	I-03-EX01	25.6	8.80	<2.0	5.86	0	120	0
				I-03-EX02	50.0		1.7	5.76	0	120	1
4	I-06	Lambala	Luuka	I-06-EX02	45.0	5.60	1.6	6.00	0	180	0
				I-06-EX04	49.3	5.50	<2.0	5.98	0	110	0
5	I-07	Naigobya	Luuka	I-07-EX02	30.5	9.30	2.2	5.87	0	230	0
				I-07-EX04	62.7	9.70	2.0	6.02	0	180	0
6	I-08	Busesa	Iganga	I-08-EX01	32.7	6.70	2.3	5.83	>50	160	1
				I-08-EX02	42.8	11.10	3.7	5.71	0	120	0
				I-08-EX03	66.1	12.78	<2.0	6.00	0	210	0
				I-08-EX05	39.4	7.50	<2.0	6.01	0	160	1
				I-08-EX06	39.6	11.98	<2.0	6.08	>50	130	0
7	I-09	Kyanvuma	Luuka	I-09-EX04	31.2	10.30	7.2	5.52	0	120	0
				I-09-EX06	63.7	10.60	2.1	5.95	0	-	0
8	I-10	Nakivumbi	Iganga	I-10-EX03		15.40	<2.0	6.01	0	200	0
9	I-11	Nondwe	Iganga	I-11-EX01	32.2	16.28	2.2	-	2	-	0
				I-11-EX03	39.1	13.39	<2.0	5.37	0	160	0
10	P-02	Kasassira	Kibuku	P-02-EX03	44.4	8.1	3.04	5.89	0	200	0
				P-02-EX04	67.9	7.6	<2.0	6.11	0	380	2
				P-02-EX05	49.3	6.0	1.68	5.57	0	730	0
				P-02-EX06	42.0	7.2	2.56	6.37	0	730	0
11	P-04	Kapala	Pallisa	P-04-EX01	38.2	5.9	5.2	6.67	23	300	1
				P-04-EX03	54.2	4.6	<2.0	6.44	0	430	0
				P-04-EX05	56.5	9.5	3.92	5.95	0	200	0
12	P-05	Buseta	Kibuku	P-05-EX02	58.5	6.1	<2.0	6.24	0	260	1
				P-05-EX03	58.4	3.9	8.0	6.26	0	490	0
				P-05-EX05	47.0	4.6	2.2	5.95	0	310	1
				P-05-EX06	31.7	10.0	8.0	6.02	0	410	0
				P-05-EX07	>32.4	5.8	8.0	6.99	0	710	0
13	S-02	Tubur	Soroti	S-02-EX02	20.0	4.2	<2.0	5.86	0	90	2

＜Groundwater Development Potential (Successful Rate of Borehole) ＞

Sub-county wise successful rate of borehole was calculated from the yield data of the National Groundwater Database which was formulated by Directorate of Water Resource Management, Ministry of Water and Environment, test borehole drilling results of the development study and

the results of pumping tests in this Survey. These data were arranged as accumulate curve of frequency distribution against water yield, and the successful rate was recognized as the probability of occurrence of boreholes with yield of 2.5m^3/hr and more.

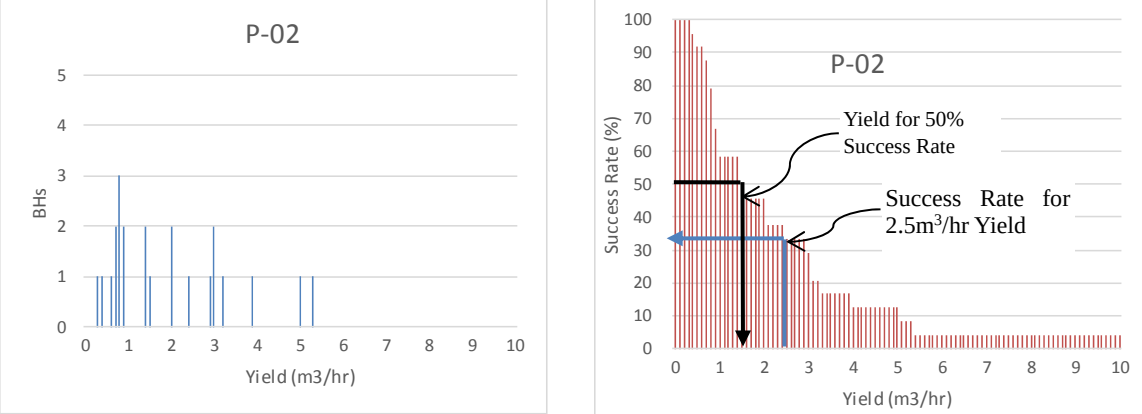


Figure 1.2-7 Estimation of Successful rate of Borehole

(Left graph shows distribution of number of boreholes with the relevant yield, right graph is an example of estimation of successful rate from the accumulate curve.)

Table 1.2-3 shows the average depth, average static water level, average yield, maximum yield, its standard deviation and successful rate in case of yield 2.5m^3/hr.

Table 1.2-3 Hydrogeological Condition in each RGC and Successful Rate of Borehole

Code	RGC	Sub-county	Average Drilling Depth (m)	Average SWL (m)	Average Yield (m^3/h)	Max Yield (m^3/h)	Standard Deviation	Success Rate for 2.5m^3/hr Yield (%)
I-01	Nabitende Banada	Nambale	53.6	12.4	3.12	8.00	2.64	46.2
I-02	Namungalwe	Namungalwe	55.0	11.1	2.40	11.00	2.96	20.8
I-03	Nambale	Nambale	59.3	17.5	4.30	12.00	3.75	50.0
I-06	Lambala	Irongo	60.2	9.2	1.12	1.60	0.36	0.0
I-07	Naigobya	Bukooma	63.6	18.5	1.99	6.12	1.84	20.0
I-08	Busesa	Ibulanku	57.4	7.9	5.22	9.25	3.71	80.0
I-09	Kyavuma	Irongo	58.3	12.4	2.77	18.23	4.59	13.3
I-10	Nakivumbi	Igombe	60.8	13.6	2.45	8.15	2.33	40.0
I-11	Nondwe	Makuutu	51.7	12.1	1.77	4.71	1.44	22.2
P-02	Kasasira	Kasassira	55.5	10.4	3.10	28.52	5.59	33.3
P-03	Kameke	Kameke	68.4	8.0	2.51	10.20	2.63	35.3
P-04	Kapala	Gogonyo	58.2	9.0	2.35	6.90	2.06	33.3
P-05	Buseta	Buseta	58.0	9.6	3.10	8.00	2.56	39.1
S-01	Kidetok	Pingire	66.2	10.0	5.09	13.20	3.94	66.7
S-02	Tubur	Tubur	64.3	8.8	1.61	5.56	1.62	20.0
S-03	Acuna	Tubur	64.3	8.1	1.40	5.56	1.29	0.0

＜Geophysical Survey＞

(1) Purpose

To determine the drilling points and to estimate its drilling depth by exploring the detailed geological structure.

(2) Targets of Survey

7 RGCs (Nambale, Lambala, Kyanvuma, Nondwe, Kasassira, Kapala and Buseta): These 7 RGCs out of the selected 12 RGCs in the first field survey have no water sources for the Project.

(3) Contents of Survey

Table 1.2-4 shows the quantities of geophysical survey.

Table 1.2-4 Quantities of Geophysical Survey

No.	Code	RGC Name	District	County	Sub-county	Line Length (m)	Exploration Depth (m)	Measurement Lines
1	I-03	Nambale	Iganga	Kigulu	Nambale	500	100	4
2	I-06	Lambala	Luuka	Luuka	Irongo	500	100	4
3	I-09	Kyanvuma	Luuka	Luuka	Irongo	300	100	2
4	I-11	Nondwe	Iganga	Bugweri	Makuutu	500	100	4
5	P-02	Kasassira	Kibuku	Kibuku	Kasassira	500	100	4
6	P-04	Kapala	Pallisa	Pallisa	Gogonyo	300	100	2
7	P-05	Buseta	Kibuku	Kibuku	Buseta	300	100	2
8	I-11	Nondwe	Iganga	Bugweri	Makuutu	500	100	3
9	P-02	Kasassira	Kibuku	Kibuku	Kasassira	500	100	4
10	I-07	Naigobya	Luuka	Luuka	Bukooma	500	100	1
2 Dimensional Resistivity Survey: Total								30
No.	Code	RGC Name	District	County	Sub-county	Line Length (m)		Measurement Points
11	P-02	Kasassira	Kibuku	Kibuku	Kasassira	200		2
12	I-07	Naigobya	Luuka	Luuka	Bukooma	200		2
Horizontal Electrical Profiling: Total								4
No.	Code	RGC Name	District	County	Sub-county	Exploration Depth (m)		Measurement Points
13	P-02	Kasassira	Kibuku	Kibuku	Kasassira	120		11
14	I-07	Naigobya	Luuka	Luuka	Bukooma	120		2
Vertical Electrical Sounding: Total								13

The results of geophysical survey by each RGC were shown in Annex 11 (3). Basically, low resistivity zone in the cross section of resistivity distribution is considered to have priority. Drilling points were determined in reference with the results of resistivity survey in consideration with additional information such as spring positions, existing boreholes, geological map, etc. The determined drilling points were shown in the following table.

Table 1.2-5 Candidate Drilling Points decided by the Results of Geophysical Survey etc.

Code	RGC	Priority	UTM-E (m)	UTM-N (m)	Elevation (m)	Expected Depth (m)
I-03	Nambale	1	557077	85941	1107	80
		2	556878	86027	1105	80
I-06	Lambala	1	525640	80002	1074	70
		2	526675	80288	1084	70
I-09	Kyanvuma	1	530037	84475	1123	80
		2	530220	84292	1119	80
I-11	Nondwe	1	568597	50179	1185	100
		2	567999	52794	1157	100
P-02	Kasassira	1	579005	120630	1077	100
		2	578426	120888	1079	100
P-04	Kapala	1	566851	137939	1056	80
		2	566711	137809	1052	80
P-05	Buseta	1	582972	120041	1076	70
		2	582892	119923	1077	70

Code	RGC	Priority	UTM-E (m)	UTM-N (m)	Elevation (m)	Expected Depth (m)
I-11	Nondwe	3	568631	50187	1178	80
		4	568579	50211	1176	80
		5	566769	51702	1185	100
P-02	Kasassira	3	577717	121540	1068	80
		4	579052	121584	1061	80
		5	579028	121487	1065	80

＜Test Borehole Drilling＞

(1) Purpose of Survey

To assure water sources for piped water supply systems, and to confirm the potential as water source. The result shall be basic information for the design of piped water supply systems.

(2) Targets of Survey

7 RGCs (Nambale, Lambala, Kyanvuma, Nondwe, Kasassira, Kapala and Buseta): These 7 RGCs out of the selected 12 RGCs in the first field survey have no water sources for the Project.

(3) Contents of Survey

20 test borehole drillings were conducted in the selected 7 RGCs.

After drilling, pumping test and water quality analysis had been conducted except dry borehole. The results of drilling and pumping tests are shown in Table 1.2-6. A Safe yield was calculated as 80% of a critical yield which was estimated from step drawdown test. Negative value in the row of static water level shows flowing artesian well in which the water level is higher than the ground level.

Table 1.2-6 Result of Test Borehole Drilling (Water Level, Yield)

Code	RGC	ID	DWD No.	UTM-E (m)	UTM-N (m)	Elevation (m)	Drilling Depth (m)	Static Water Level (m)	Safe Yield (m^3/hr)
I-03	Nambale	I-03-NBH-1	53149	557077	85941	1107	80.23	12.17	15.0
		I-03-NBH-2	53150	556878	86027	1105	70.85	10.00	2.6
I-06	Lambala	I-06-NBH-1	53198	525640	80002	1074	66.29	-1.30	28.0
		I-06-NBH-2	53199	526675	80288	1084	66.01	-1.82	40.0
I-09	Kyanvuma	I-09-NBH-1	53176	530037	84475	1123	73.42	9.45	2.0
		I-09-NBH-2	53162	530220	84292	1119	74.75	10.50	0.5
I-11	Nondwe	I-11-NBH-1	53167	568597	50179	1185	102.52	2.20	3.1
		I-11-NBH-2	53215	567999	52794	1157	61.40	6.40	1.0
		I-11-NBH-3	53213	568631	50187	1178	65.78	5.75	3.0
		I-11-NBH-4	53212	568579	50211	1176	83.30	1.90	9.0
		I-11-NBH-5	53214	566769	51702	1185	65.16	14.02	0.52
P-02	Kasassira	P-02-NBH-1	53164	579005	120630	1077	109.78	6.00	0.8
		P-02-NBH-2	53165	578426	120888	1079	102.74	8.60	2.6
		P-02-NBH-3	53211	577717	121540	1068	61.37	6.00	0.5
		P-02-NBH-4	53200	579052	121584	1061	87.47	9.45	2.1
		P-02-NBH-5	53169	579028	121487	1065	83.22	10.30	2.0
P-04	Kapala	P-04-NBH-1	53148	566839	137935	1056	79.93	7.05	8.0
		P-04-NBH-2	53166	566703	137901	1052	79.27	6.85	2.6
P-05	Buseta	P-05-NBH-1	53168	582972	120041	1076	70.81	11.20	22.7
		P-05-NBH-2	53216	582892	119923	1077	91.91	Dry borehole	

The results of water quality analysis are shown in Table 1.2-7 and Table 1.2-8. There are no items which is higher than Uganda water quality standard.

Table 1.2-7 Result of Test Borehole Drilling (Water Quality 1)

Values under water quality items are showing Ugandan water quality standard.

Code	RGC	pH	EC (μS/cm)	Color (PtCo)	Turbidity (NTU)	TDS (mg/L)	TSS (mg/L)	Hardness (mg/L)	Calcium Ca^{2+} (mg/L)	Magnesium Mg^{2+} (mg/L)	Bi-carbonate (mg/L)	Chloride Cl^- (mg/L)
	Standard	5.5-9.5	2500	50	25.0	1500	0.0	600	150	100	500	250
I-03	Nambale	6.08	231	2	0.6	130	0	84	20.0	8.2	96	10.7
		6.29	449	2	0.5	238	0	170	40.0	16.8	188	17.5
I-06	Lambala	6.15	529	8	1.0	275	0	220	48.0	24.0	244	25.0
		6.14	411	10	1.8	216	0	166	36.0	18.2	178	16.5
I-09	Kyanvuma	6.06	492	5	0.9	258	0	210	52.0	19.2	218	22.5
		6.10	367	0	0.1	193	0	160	40.0	14.4	172	18.5
I-11	Nondwe	6.38	422	0	0.2	223	0	155	40.0	13.2	172	18.1
		6.39	410	9	1.3	216	0	178	40.0	18.7	178	19.5
		6.11	376	4	0.7	203	0	162	40.0	14.9	172	19.3
		6.20	400	2	0.5	212	0	168	40.0	16.3	176	18.7
		6.19	360	12	1.6	191	0	168	40.0	16.3	174	16.5
P-02	Kasassira	6.74	660	9	1.3	342	0	236	56.0	23.0	276	19.8
		6.44	602	7	0.9	313	0	230	52.0	24.0	264	23.5
		6.37	485	11	2.3	255	0	180	40.0	19.2	210	19.5
		6.24	976	5	0.8	500	0	275	60.0	30.0	302	35.5
		6.14	823	13	2.2	424	0	266	56.0	30.2	266	31.5
P-04	Kapala	6.38	470	6	0.9	246	0	160	40.0	14.4	184	19.5
		6.78	283	6	0.9	152	0	136	32.0	13.4	158	12.5
P-05	Buseta	6.19	857	2	0.5	441	0	244	60.0	22.6	268	32.5

Table 1.2-8 Result of Test Borehole Drilling (Water Quality 2)

Values under water quality items are showing Ugandan water quality standard.

Code	RGC	Fluoride F^- (mg/L)	Iron (mg/L)	Sulfate SO_4^{2-} (mg/L)	Nitrate (mg/L)	Coliform (CFU /100mL)	Temp. (degree Celsius)	Nitrite (mg/L)	Ammonia NH_4 (mg/L)	Arsenic As (mg/L)	Sodium Na^+ (mg/L)	Potassium K^+ (mg/L)
	Standard	1.5	0.3	400	45	0	–	0.003	0.5	0.01	200	100
I-03	Nambale	0.18	0.009	4	0.02	0	23.90	0.000	0.00	<0.001	11.50	2.70
		0.29	0.008	7	0.03	0	24.00	0.000	0.00	<0.001	13.60	2.70
I-06	Lambala	0.33	0.060	8	0.03	0	23.80	0.000	0.00	<0.001	20.40	3.90
		0.29	0.058	7	0.03	0	23.50	0.000	0.00	<0.001	14.90	3.30
I-09	Kyanvuma	0.31	0.024	9	0.04	0	23.90	0.000	0.002	<0.001	22.20	4.10
		0.26	0.004	6	0.02	0	23.70	0.000	0.00	<0.001	18.60	3.70
I-11	Nondwe	0.29	0.007	7	0.02	0	23.80	0.000	0.00	<0.001	15.20	3.30
		0.26	0.049	6	0.03	0	23.70	0.000	0.00	<0.001	14.90	3.60
		0.29	0.049	7	0.03	0	23.80	0.000	0.00	<0.001	15.70	3.20
		0.30	0.014	6	0.03	0	23.80	0.000	0.00	<0.001	16.40	3.80
		0.28	0.007	6	0.03	0	23.60	0.000	0.00	<0.001	17.90	3.30
		0.32	0.076	6	0.04	0	23.70	0.000	0.00	<0.001	13.00	3.10
P-02	Kasassira	0.31	0.046	10	0.03	0	23.90	0.000	0.001	<0.001	20.60	4.70
		0.29	0.023	9	0.03	0	24.00	0.000	0.00	<0.001	19.50	4.70
		0.31	0.053	7	0.03	0	23.60	0.000	0.01	<0.001	15.80	3.20
		0.33	0.009	18	0.03	0	23.70	0.000	0.00	<0.001	22.80	4.90
		0.30	0.056	14	0.03	0	23.70	0.000	0.00	<0.001	18.50	3.90
P-04	Kapala	0.26	0.029	7	0.04	0	23.80	0.000	0.00	<0.001	16.50	3.80
		0.38	0.013	4	0.02	0	23.70	0.000	0.00	<0.001	12.80	2.20
P-05	Buseta	0.18	0.009	13	0.03	0	23.50	0.000	0.00	<0.001	25.10	5.00

(4) Handover of the boreholes

Protected borehole after drilling

Each drilled borehole was protected by metallic casing and cap welded to the casing. Basement was protected by concrete. All of boreholes were handed over to MOWE. MOWE has responsibility to maintain the boreholes safe until the site hand-over for the construction of the piped water supply facilities. The recommended usages of the boreholes were shown in Table 1.2-9. Basically, in case that the safe yield of borehole was more than 2.5 m^3/hr, it would be considered to use as water source of the piped water supply system. In case that the safe yield was less than 2.5 m^3/hr and more than 0.5 m^3/hr, it would be considered to use as hand pump well. If the safe yield was less than 0.5 m^3/hr, it would be used as monitoring well of groundwater level and water quality. However, although the safe yield was enough for hand pump well, if it will be recognized to disturb wide use of constructed piped water supply systems, it will be used as monitoring well.

Table 1.2-9 Recommended Usage of Test Boreholes

Code	RGC	ID	DWD No.	Safe Yield (m^3/hr)	Usage
I-03	Nambale	I-03-NBH-1	53149	15.0	Water Source for the Project
		I-03-NBH-2	53150	2.6	Water Source for the Project
I-06	Lambala	I-06-NBH-1	53198	28.0	Water Source for the Project
		I-06-NBH-2	53199	40.0	Water Source for the Project send to Kyanvuma
I-09	Kyanvuma	I-09-NBH-1	53176	2.0	Monitoring Well
		I-09-NBH-2	53162	0.5	Monitoring Well
I-11	Nondwe	I-11-NBH-1	53167	3.1	Handpump Well
		I-11-NBH-2	53215	1.0	Handpump Well,
		I-11-NBH-3	53213	3.0	Water Source for the Project
		I-11-NBH-4	53212	9.0	Water Source for the Project
		I-11-NBH-5	53214	0.52	Handpump Well
P-02	Kasassira	P-02-NBH-1	53164	0.8	Monitoring Well
		P-02-NBH-2	53165	2.6	Water Source for the Project
		P-02-NBH-3	53211	0.5	Monitoring Well
		P-02-NBH-4	53200	2.1	Monitoring Well
		P-02-NBH-5	53169	2.0	Handpump Well
P-04	Kapala	P-04-NBH-1	53148	8.0	Water Source for the Project
		P-04-NBH-2	53166	2.6	Water Source for the Project
P-05	Buseta	P-04-NBH-1	53168	22.7	Water Source for the Project
		P-04-NBH-2	53216	Dry borehole	Monitoring Well

(5) Water Source of Kyanvuma RGC

The safe yields of drilled two boreholes in Kyanvuma RGC were not reach 2.5m^3/hr. However, both of two boreholes drilled in Lambala RGC, those are about 6km away from Kyanvuma RGC, have yield of more than 20m^3/hr. Therefore, one of the two boreholes (I-06-NBH-2) can be used for the water source of Kyanvuma RGC.

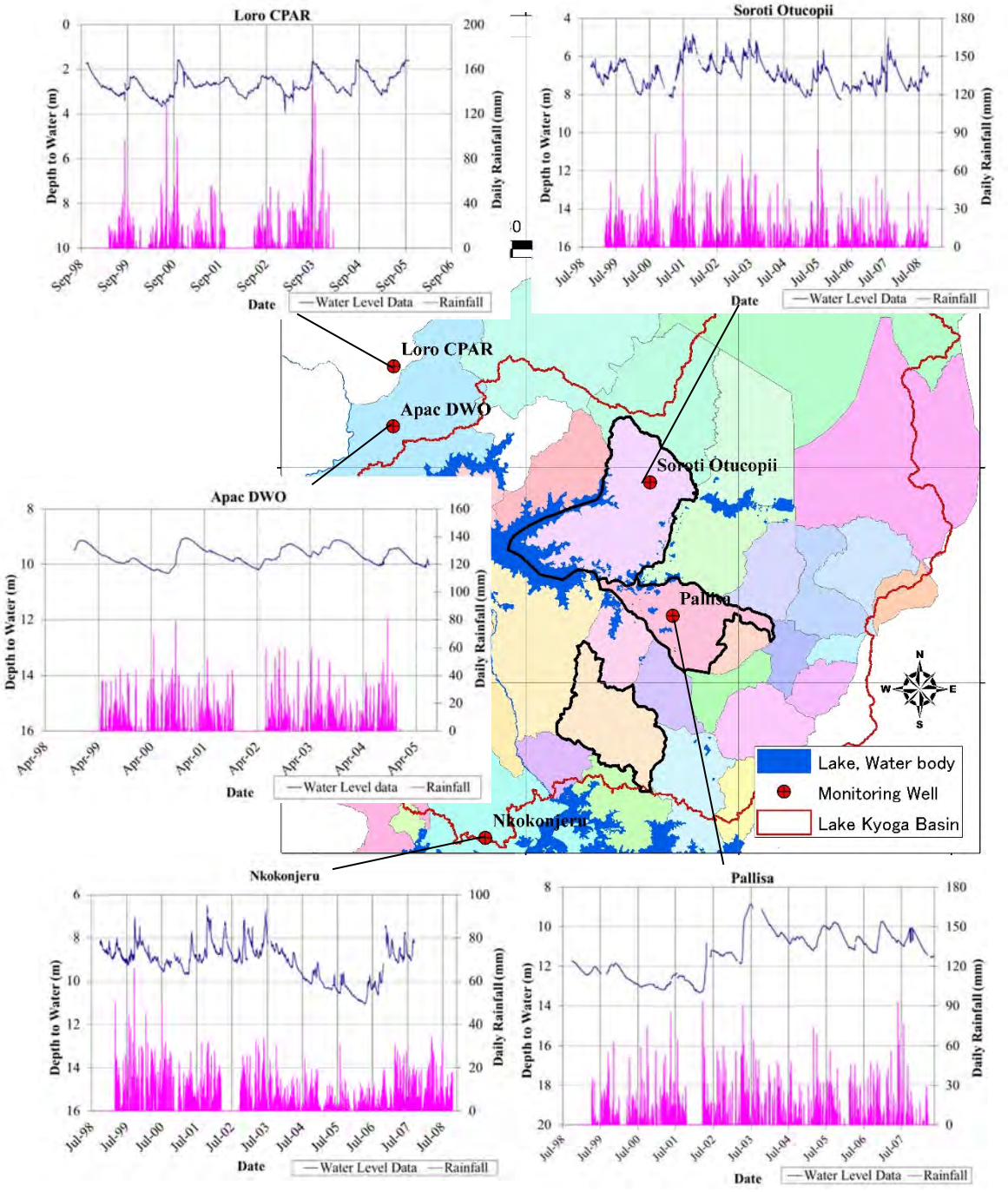
(6) Use of Existing Borehole for Kasassira RGC

Five boreholes were drilled in Kasassira RGC. The safe yield of one borehole was 2.6m^3/hr, but other four boreholes have less than 2.5m^3/hr yield. However, the Survey Team found an existing borehole with high yield in Naghonga village where is neighbor of Kasassira RGC. The safe yield

was confirmed more than 17.3m^3/hr by pumping test. Since the water demand of Kasassira RGC is 15.1m^3/hr, the safe yield is satisfied the demand for Kasassira RGC. But the diameter of the borehole is only 5 inches so that the borehole shall be enlarged to 6 inches diameter in the detailed design stage.

＜Seasonal Change of Groundwater Level＞

MOWE is monitoring groundwater level at 8 boreholes in and around Lake Kyoga Basin. Figure 1.2-8 shows the groundwater level data in several years of 5 monitoring wells which are near the target RGCs. The result said that the groundwater level fluctuation is approximately within 2m.



Source: Groundwater level monitoring data (Directorate of Water Resource Management)

Figure 1.2-8 Seasonal Fluctuation of Groundwater Level in Lake Kyoga Basin

1-2-4 Geotechnical Condition

＜Topographic and Geotechnical Survey＞

(1) Purpose of Survey

To obtain the basic data for designing of water supply facility.

(2) Targets of Survey

Selected 12 RGCs after first field survey

(3) Contents of Survey

Following three items were conducted as topographic survey;

1) Setting of the benchmarks for topographical references,
2) Longitudinal leveling survey for pipelines design from water source through elevated tank to Kiosks, and
3) Plane-table survey for the lands of elevated tanks and solar power generation facilities.

Following three items were conducted as geotechnical survey;

1) Dynamic cone penetration test to grasp geotechnical condition for pipeline installation,
2) Standard penetration test to confirm the bearing capacities of the lands for elevated tanks and solar power generation facilities, and
3) Dynamic cone penetration test at the swamps where the pipeline across.

Quantities of each item are shown in the following table.

Table 1.2-10 Quantities of Topographic Survey and Geotechnical Survey

Item / RGC	Topographic Survey			Geotechnical Survey		
	1) Setting of Benchmark (Site)	2) Longitudinal leveling for pipe line (m)	3) Plane-table survey (m^2)	1) Dynamic Cone Penetration Test for Pipeline (Nos)	2) Standard Penetration Test for the area of Elevated Tank (Nos)	3) Dynamic Cone Penetration Test for Swamp area (Nos)
Nambale	1	4,957.50	900	5	1	0
Lambala	1	2,607.37	1,300	5	2	1
Naigobya	1	4,912.51	400	4	1	0
Kyanvuma	1	9,194.00	808	8	1	0
Lambala-Kyanvuma	1	-	-	-	-	1
Nondwe	1	11,390.58	900	6	1	1
Kasassira	1	7,459.75	900	5	1	0
Kameke	1	5,535.69	884	5	1	0
Kapala	1	6,390.42	700	5	1	0
Buseta	1	5,434.63	900	5	1	0
Kidetok	1	8,920.58	900	5	1	0
Tubur	1	9,667.65	400	19	2	2
Acuna	1	20,722.40	6,800	8	1	2
Total	13	97,193.08	15,792	80	14	7

Figure 1.2-9 shows the results of standard penetration tests. The result says that some counter measures are necessary against soft formations at Nambale, Naigobya, Kasassira, Kidetok, because N-values of the formation are less than 10 at some depths.

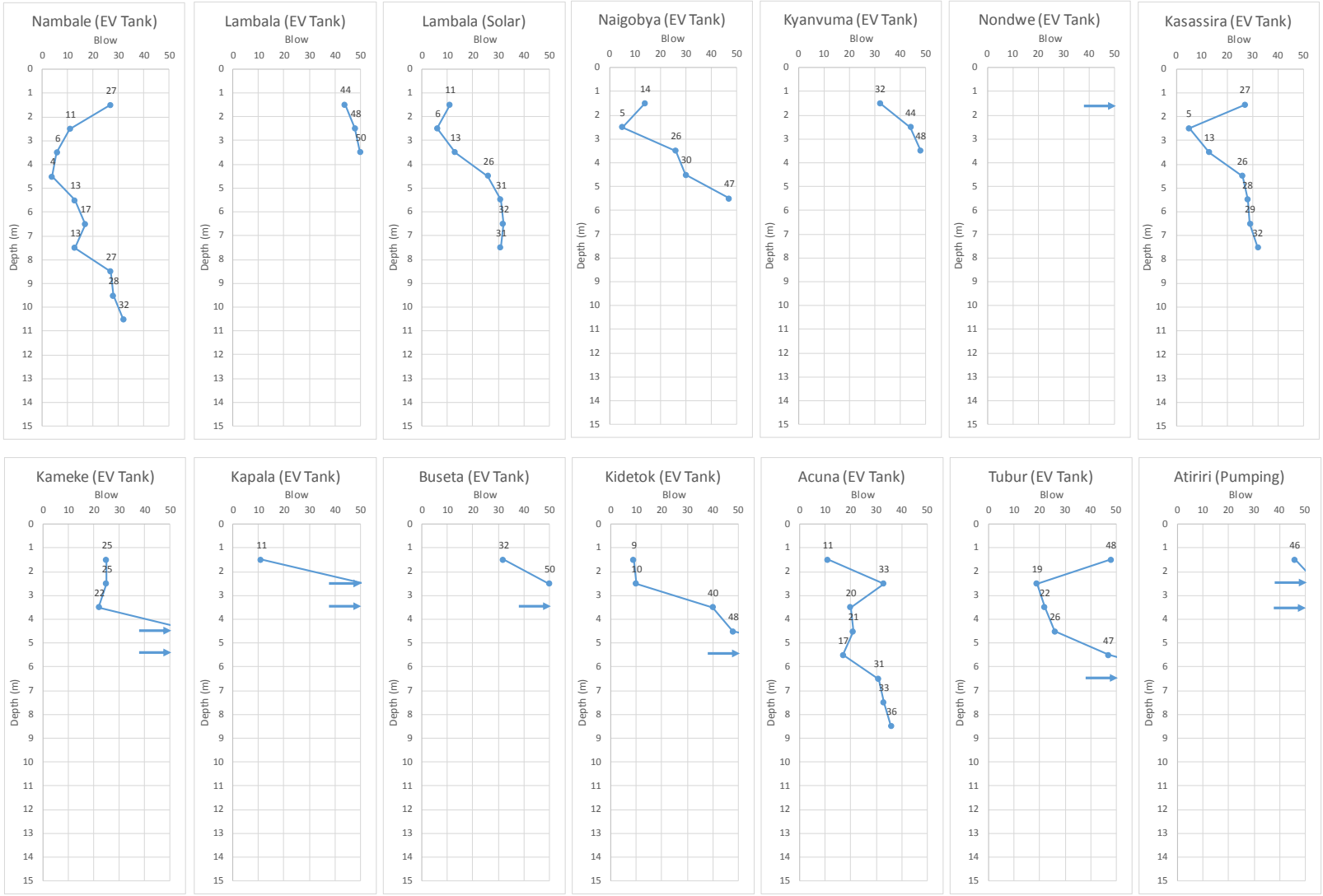


Figure 1.2-9 Result of Standard Penetration Test in the area of Each Elevated Tank

1-3 Social conditions

1-3-1 Priority evaluation of target RGCs

＜Results of the First Social Survey＞

(1) Purpose of Survey

Social condition survey was conducted with the objective of collecting necessary information to prioritize for selecting RGCs. Indicators for prioritization are (a) safe water supply coverage, (b) number of public, educational and commercial facilities, (c) expected safe yield of a borehole and its success rate, (d) population in target year, (e) water served population per well, (f) presence of commercial electricity, and (g) safe yield of the test borehole at the time of the development study.

(2) Target RGC of Survey

Of the 20 RGCs requested, 16 RGCs excluding 4 RGCs, which confirmed duplication of donor assistance, etc., were examined. The target RGCs for the survey are shown in Table 1.3-1.

Table 1.3-1 Target RGC for the Survey

No.	RGC	Code	District	County	Sub-county	UTM-E	UTM-N	Altitude (m)
1	Nabitende B.	I-1	Iganga	Kigulu North	Nambale	555650	93787	1090
2	Namungalwe	I-2	Iganga	Kigulu	Namungalwe	554468	79607	1126
3	Nambale	I-3	Iganga	Kigulu	Nambale	556076	86140	1109
4	Lambala	I-6	Luuka	Luuka	Irongo	525712	79878	1077
5	Naigobya	I-7	Luuka	Luuka	Bukooma	540456	91171	1073
6	Busesa	I-8	Iganga	Bugweri	Ibulanku	566722	69529	1098
7	Kyanvuma	I-9	Luuka	Luuka	Irongo	530321	84213	1129
8	Nakivumbi	I-10	Iganga	Bugweri	Ibulanku	567039	61252	1115
9	Nondwe	I-11	Iganga	Bugweri	Makuutu	566172	50708	1221
10	Kasassira	P-2	Kibuku	Kibuku	Kasassira	578281	121015	1080
11	Kameke	P-3	Pallisa	Agule	Kameke	586003	139993	1123
12	Kapala	P-4	Pallisa	Pallisa	Gogonyo	568421	137778	1067
13	Buseta	P-5	Kibuku	Kibuku	Buseta	583724	119623	1069
14	Kidetok	S-1	Serere	Kasilo	Pingile	546298	163480	1103
15	Tubur	S-2	Soroti	Soroti	Tubur	557636	216178	1091
16	Acuna	S-3	Soroti	Soroti	Tubur	552793	221674	1097

Since RGC is not an administrative unit, clear boundaries are not set. Therefore, prior to the social condition survey, the Survey Team visited each target RGC, met with the relevant sub-county chief and RGC representatives, and confirmed the boundary of the RGC. After that, the social condition survey was conducted in the confirmed boundary of the RGC.

(3) Contents of Survey

i) Water supply coverage

Firstly, the RGC was divided into several blocks with the roads etc. as a landmark. Secondly, the number of houses in each block was counted one by one. Finally, the population of each block was estimated by multiplying the number of houses in the block and the average household size, and summed up the population of each block. The sub-county wise average household size in the census data (National Population and Housing Census 2014) was applied to the calculation.

Table 1.3-2 Population within Confirmed Boundary of each Target RGC

No.	RGC	Code	District	Total No. of HHs Counted	Population Per HH*	Population of RGC
1	Nabitende B.	I-1	Iganga	2,726	5.0	13,630
2	Namungalwe	I-2	Iganga	4,058	4.9	19,884
3	Nambale	I-3	Iganga	304	5.0	1,520
4	Lambala	I-6	Luuka	277	5.4	1,496
5	Naigobya	I-7	Luuka	272	5.4	1,469
6	Busesa	I-8	Iganga	1,227	5.0	6,135
7	Kyanvuma	I-9	Luuka	508	5.4	2,772
8	Nakivumbi	I-10	Iganga	570	5.0	2,850
9	Nondwe	I-11	Iganga	859	5.4	4,369
10	Kasassira	P-2	Kibuku	809	5.4	4,369
11	Kameke	P-3	Pallisa	197	6.2	1,221
12	Kapala	P-4	Pallisa	360	6.0	2,160
13	Buseta	P-5	Kibuku	292	6.0	1,752
14	Kidetok	S-1	Serere	604	6.1	3,020
15	Tubur	S-2	Soroti	275	5.7	1,568
16	Acuna	S-3	Soroti	181	5.7	1,032

*: Household size by Sub-county is referred from "National Population and Housing Census 2014"

The water sources identified in each RGC are as shown in the table below. Boreholes are the main water sources for villagers in the RGC.

Table 1.3-3 Water Source in RGC

No.	RGC	Code	District	a. Borehole (functioning)	b. Borehole (non-functioning)	c. Shallow well	d. Protected Springs	e. Unprotected Spring	f. Dam/Valley Tank	g. River	h. Other
1	Nabitende B.	I-1	Iganga	10	3	4	0	0	0	0	0
2	Namungalwe	I-2	Iganga	13	4	8	0	1	0	0	1
3	Nambale	I-3	Iganga	2	0	0	0	1	0	0	0
4	Lambala	I-6	Luuka	2	2	3	0	2	0	0	0
5	Naigobya	I-7	Luuka	3	0	2	0	0	0	0	0
6	Busesa	I-8	Iganga	7	0	5	0	0	0	0	WHT
7	Kyanvuma	I-9	Luuka	3	1	3	0	0	0	0	WHT
8	Nakivumbi	I-10	Iganga	5	0	2	3	0	0	0	0
9	Nondwe	I-11	Iganga	2	2	1	0	2	0	0	0
10	Kasassira	P-2	Kibuku	4	0	0	0	0	0	0	0
11	Kameke	P-3	Pallisa	4	0	0	0	0	0	0	0
12	Kapala	P-4	Pallisa	2	0	2	0	0	0	0	0
13	Buseta	P-5	Kibuku	4	1	1	0	0	0	0	0
14	Kidetok	S-1	Serere	10	5	1	0	0	0	0	0
15	Tubur	S-2	Soroti	0	1	0	0	0	0	0	WHT
16	Acuna	S-3	Soroti	1	1	0	0	1	0	0	0

Note) WHT: Rain Water Harvest Tank,

The water supply coverage of each RGC is defined as the ratio of the population covered by existing water supply facilities to the population of the target year (2022). The existing water supply facilities which are not currently operating and unprotected springs are not considered for the calculation. MOWE has assumed that served population of one borehole equipped with hand pump or one protected shallow well is 300 persons, and served population of one protected spring is 200 persons (Sector Performance Report, 2015).

The calculated water supply coverages in 2022 are shown in Table 1.3-4. For the priority evaluation of the target RGCs, the score from 5 to 0 points, which express the degree of necessity of water supply facilities, is allocated in inverse proportion to the calculated water supply

coverage of 0% to 100%. The calculated score (points) is shown in the rightmost column of the table.

Table 1.3-4 Calculation of Safe Water Supply Coverage

No.	Code	Name	Pop. (2015)	Pop. Growth Rate (%)	Pop. (2022)	Funct. BHs	Shallow Wells	Protected Springs	Served Pop.	Safe Water Coverage (2022) (%)	Point
1	I-1	Nabitende B.	13,630	2.95	16,706	10	4	0	4,200	25	3.7
2	I-2	Namungalwe	19,884	2.95	24,372	13	8	0	6,300	26	3.7
3	I-3	Nambale	1,520	2.95	1,863	2	0	0	600	32	3.4
4	I-6	Lambala	1,496	2.20	1,742	2	3	0	1,500	86	0.7
5	I-7	Naigobya	1,469	2.20	1,711	3	2	0	1,500	88	0.6
6	I-8	Busesa	6,135	2.95	7,520	7	5	0	3,600	48	2.6
7	I-9	Kyanvuma	2,772	2.20	3,228	3	3	0	1,800	56	2.2
8	I-10	Nakivumbi	2,850	2.95	3,493	5	2	3	2,700	77	1.1
9	I-11	Nondwe	4,639	2.95	5,686	2	1	0	900	17	4.2
10	P-2	Kasassira	4,369	3.81	5,676	4	0	0	1,200	21	3.9
11	P-3	Kameke	1,221	3.43	1,546	4	0	0	1,200	78	1.1
12	P-4	Kapala	2,160	3.43	2,735	2	2	0	1,200	44	2.8
13	P-5	Buseta	1,752	3.81	2,276	4	1	0	1,500	66	1.7
14	S-1	Kidetok	3,020	3.95	3,961	10	1	0	3,300	83	0.8
15	S-2	Tubur	1,568	3.58	2,006	0	0	0	0	0	5.0
16	S-3	Acuna	1,032	3.58	1,320	1	0	0	300	23	3.9

(Note) The population growth rate adopted the prefecture-based rate of increase from the population census results conducted in 2014.

ii) Number of public, administrative and commercial facilities

Table 1.3-5 shows the number of educational, administrative, medical, and commercial facilities confirmed in the social condition survey.

The total number of these facilities is used for priority evaluation of the RGCs, but the number of business facilities are counted with 1/10 weights of the real number. The score is set to 0 point at minimum and 5 points at maximum number of the facilities, and the score is allocated in proportion to the weighted total number of facilities.

Table 1.3-5 Number of Educational Facilities, Administrative Facilities, Medical and Commercial Facilities of RGC

No.	Code	Name	District	Public School	Private School	Admin. Facilities	Medical Facilities	Business Facilities	Calculation	Point
1	I-1	Nabitende B.	Iganga	3	5	4	6	210	39.0	4.4
2	I-2	Namungalwe	Iganga	3	5	6	3	274	44.4	5.0
3	I-3	Nambale	Iganga	1	4	2	1	31	11.1	1.3
4	I-6	Lambala	Luuka	1	3	1	0	44	9.4	1.1
5	I-7	Naigobya	Luuka	1	4	2	1	16	9.6	1.1
6	I-8	Busesa	Iganga	4	4	4	2	48	18.8	2.1
7	I-9	Kyanvuma	Luuka	1	5	2	4	182	30.2	3.4
8	I-10	Nakivumbi	Iganga	3	1	2	1	88	15.8	1.8
9	I-11	Nondwe	Iganga	1	7	2	2	86	20.6	2.3
10	P-2	Kasassira	Kibuku	2	1	4	4	50	16.0	1.8
11	P-3	Kameke	Pallisa	0	4	2	4	36	13.6	1.5
12	P-4	Kapala	Pallisa	3	4	4	4	50	20.0	2.3
13	P-5	Buseta	Kibuku	0	5	2	4	71	18.1	2.0
14	S-1	Kidetok	Serere	2	5	1	5	50	18.0	2.0
15	S-2	Tubur	Soroti	2	5	3	4	61	20.1	2.3
16	S-3	Acuna	Soroti	0	2	1	1	19	5.9	0.7

iii) Expected safe yield and borehole success rate

The water demand of each RGC was calculated by multiplying per capita water consumption and the population including seasonal variation and loss. The results are shown in below table with necessary borehole safe yields as water source under the condition of 18 hours submersible pump operation.

Table 1.3-6 Water Demand for RGC

No.	Code	Name	District	Pop. (2022)	Average Day Demand (m^3/day)	Max. Day Demand (x1.3) (m^3/day)	Loss (UFW, +5%)	Operation hour	Necessary yield (m^3/hr)
1	I-1	Nabitende B.	Iganga	16,706	585	760	798	18	44.3
2	I-2	Namungalwe	Iganga	24,372	1,219	1,584	1,663	18	92.4
3	I-3	Nambale	Iganga	1,863	37	48	50	18	2.8
4	I-6	Lambala	Luuka	1,742	35	45	47	18	2.6
5	I-7	Naigobya	Luuka	1,711	34	44	46	18	2.6
6	I-8	Busesa	Iganga	7,520	263	342	359	18	20.0
7	I-9	Kyanvuma	Luuka	3,228	65	84	88	18	4.9
8	I-10	Nakivumbi	Iganga	3,493	70	91	95	18	5.3
9	I-11	Nondwe	Iganga	5,686	199	259	272	18	15.1
10	P-2	Kasassira	Kibuku	5,676	199	258	271	18	15.1
11	P-3	Kameke	Pallisa	1,546	31	40	42	18	2.3
12	P-4	Kapala	Pallisa	2,735	55	71	74	18	4.1
13	P-5	Buseta	Kibuku	2,276	46	59	61	18	3.5
14	S-1	Kidetok	Serere	3,961	79	103	108	18	6.0
15	S-2	Tubur	Soroti	2,006	40	52	55	18	3.0
16	S-3	Acuna	Soroti	1,320	26	34	35	18	2.0

(Note) Per Capita Consumption: Population 5,000 or less 20ℓ/ day / person
Population 5,000 - 20,000 35ℓ/ day / person
Population 20,000 or more 50ℓ/ day / person
Peak Day Factor: 1.3 (Water Supply Design Manual 2nd Edition, according to MOWE)
Unaccounted for Water (UFW): 5%

Success rate of a borehole of each RGC was obtained from the analysis of NGWDB and the result of pumping test explained in the section 2.2. Good yield boreholes drilled in the development study and existing boreholes of good yield tested in the first field survey can be recognized as “confirmed boreholes”. Yields to be developed in the second field survey for each RCG are obtained by the calculation that the yields of the confirmed boreholes are subtracted from the necessary yield. Additionally, estimated yields of 50% success rate were calculated for each RGC (refer to Figure 1.2-7). Numbers of necessary boreholes to be drilled were calculated from the yield. The boreholes which were drilled in the development study will be used for the production wells of the Project. In case of the confirmed existing boreholes, since the Project cannot use the relevant existing well due to the structural issues, etc., new boreholes will be drilled around the existing boreholes. Therefore one borehole was added to the number of necessary boreholes.

This number of necessary boreholes is used for the parameter of "Expected safe yield and its success rate". Scores for the evaluation were allocated according to the number of necessary boreholes, minimum number was given 10 points, and maximum number was given zero point. However, since Tubur is planned to connect NWSC network, this parameter is allocated full score in the evaluation.

Table 1.3-7 Number of Necessary Wells Obtained from Required Pumped Water

No.	Code	RGC	Necessary yield (m^3/hr)	Reserved wells	Reserved Yield (m^3/hr)	Missing Yield (m^3/hr)	Yield with a success rate of 50% (m^3/hr)	Number of necessary production wells	Point
1	I-01	Nabitende B.	44.3	-	0.0	44.3	2.2	21	7.5
2	I-02	Namungalwe	92.4	-	0.0	92.4	1.1	85	0.0
3	I-03	Nambale	2.8	-	0.0	2.8	4.0	1	9.9
4	I-06	Lambala	2.6	-	0.0	2.6	1.0	3	9.6
5	I-07	Naigobya	2.6	JTB-6	3.7	0.0	1.9	0	10.0
6	I-08	Busesa	20.0	-		20.0	3.7	6	9.3
7	I-09	Kyanvuma	4.9	EX-04	7.2	0.0	1.1	1	9.9
8	I-10	Nakivumbi	5.3	-	0.0	5.3	2.4	3	9.6
9	I-11	Nondwe	15.1	-	0.0	15.1	1.0	16	8.1
10	P-02	Kasassira	15.1	EX-03	3.0	12.0	1.5	9	8.9
11	P-03	Kameke	2.3	JTB-11	7.3	0.0	1.2	0	10.0
12	P-04	Kapala	4.1	EX-01	5.2	0.0	1.4	1	9.9
13	P-05	Buseta	3.5	EX-03	8.0	0.0	2.0	1	9.9
14	S-01	Kidetok	6.0	JTB-18	13.2	0.0	4.8	0	10.0
15	S-02	Tubur	3.0	-	0.0	3.0	0.9	0	10.0
16	S-03	Acuna	2.0	-	0.0	2.0	1.1	0	10.0

iv) Population of the target year

The population of the target year (2022) is calculated the current population obtained as a result of the social condition survey multiplied by the district population growth rate described in the population census conducted in 2014.

If the population was less than 1,000, point was given 0. If it was between 1,000 and 1,999, point was given 1. If it was between 2,000 and 2,999, point was given 2. If it was between 3,000 and 3,999, point was given 3. If it was between 4,000 and 4,999, point was given 4. If it was 5,000 or more, point was given 5.

Table 1.3-8 Population of the RGC of the Target Year (2022)

No.	Code	Name	District	Population (2015)	Population. Growth Rate (%)	Population (2022)	Point
1	I-1	Nabitende B.	Iganga	13,630	2.95	16,706	5.0
2	I-2	Namungalwe	Iganga	19,884	2.95	24,372	5.0
3	I-3	Nambale	Iganga	1,520	2.95	1,863	1.0
4	I-6	Lambala	Luuka	1,496	2.20	1,742	1.0
5	I-7	Naigobya	Luuka	1,469	2.20	1,711	1.0
6	I-8	Busesa	Iganga	6,135	2.95	7,520	5.0
7	I-9	Kyanvuma	Luuka	2,772	2.20	3,228	3.0
8	I-10	Nakivumbi	Iganga	2,850	2.95	3,493	3.0
9	I-11	Nondwe	Iganga	4,639	2.95	5,686	5.0
10	P-2	Kasassira	Kibuku	4,369	3.81	5,676	5.0
11	P-3	Kameke	Pallisa	1,221	3.43	1,546	1.0
12	P-4	Kapala	Pallisa	2,160	3.43	2,735	2.0
13	P-5	Buseta	Kibuku	1,752	3.81	2,276	2.0
14	S-1	Kidetok	Serere	3,020	3.95	3,961	3.0
15	S-2	Tubur	Soroti	1,568	3.58	2,006	2.0
16	S-3	Acuna	Soroti	1,032	3.58	1,320	0.0

(Note) The population growth rate adopted the district wise growth rate from the population and housing census 2014.

v) Population Served by One Borehole

It shows the number of population of RGC in the target year divided by the number of necessary boreholes obtained in (c). Points were allocated according to the population per borehole; the maximum number was given 5 points.

Table 1.3-9 Population Served by One Borehole

No.	Code	Name	District	Population (2022)	No. of BH	Population/well	Point
1	I-1	Nabitende B.	Iganga	16,706	21	796	0.7
2	I-2	Namungalwe	Iganga	24,372	85	287	0.0
3	I-3	Nambale	Iganga	1,863	1	1,863	2.1
4	I-6	Lambala	Luuka	1,742	3	581	0.4
5	I-7	Naigobya	Luuka	1,711	1	1,711	1.9
6	I-8	Busesa	Iganga	7,520	6	1,253	1.3
7	I-9	Kyanvuma	Luuka	3,228	1	3,228	4.0
8	I-10	Nakivumbi	Iganga	3,493	3	1,164	1.2
9	I-11	Nondwe	Iganga	5,686	16	355	0.1
10	P-2	Kasassira	Kibuku	5,676	9	631	0.5
11	P-3	Kameke	Pallisa	1,546	1	1,546	1.7
12	P-4	Kapala	Pallisa	2,735	1	2,735	3.3
13	P-5	Buseta	Kibuku	2,276	1	2,276	2.7
14	S-1	Kidetok	Serere	3,961	1	3,961	5.0
15	S-2	Tubur	Soroti	2,006	1	2,006	2.3
16	S-3	Acuna	Soroti	1,320	1	1,320	1.4

vi) Availability of commercial power supply

As a result of the field survey, it was found that commercial power supply is available for all surveyed target RGCs.

vii) Yield of the test boreholes in the development study

Number of test boreholes in the development study and its safe yields are shown in the table below (RGC-wise).

If there is no test borehole drilled, it was given zero point. If there are test boreholes but the yield are not enough for the demand, it was given 2 points. If there are test boreholes with enough yields for the demand, it was given 5 points.

Table 1.3-10 Yield of the Test Borehole in the Development Study

No.	Code	Name	District	Number of Test BHs (Nos.)	Total Yield of Test BH (m^3/hr)	Point
1	I-1	Nabitende B.	Iganga	2	0.00	0.0
2	I-2	Namungalwe	Iganga	-	-	0.0
3	I-3	Nambale	Iganga	-	-	0.0
4	I-6	Lambala	Luuka	2	1.20	2.0
5	I-7	Naigobya	Luuka	2	3.65	5.0
6	I-8	Busesa	Iganga	-	-	0.0
7	I-9	Kyanvuma	Luuka	-	-	0.0
8	I-10	Nakivumbi	Iganga	-	-	0.0
9	I-11	Nondwe	Iganga	-	-	0.0
10	P-2	Kasassira	Kibuku	-	-	0.0
11	P-3	Kameke	Pallisa	2	9.00	5.0

No.	Code	Name	District	Number of Test BHs (Nos.)	Total Yield of Test BH (m^3/hr)	Point
12	P-4	Kapala	Pallisa	-	-	0.0
13	P-5	Buseta	Kibuku	-	-	0.0
14	S-1	Kidetok	Serere	3	20.20	5.0
15	S-2	Tubur	Soroti	-	-	0.0
16	S-3	Acuna	Soroti	1	0.30	0.0

(4) Result of Prioritization

Scoring was done taking social condition survey results and hydrogeological conditions into account, and prioritized. However, since the commercial power supply mentioned in (f) was available at all RGCs, it was excluded from the evaluation items.

Table 1.3-11 RGC Prioritization

Code	Name	(a) Water supply coverage	(b) Public facilities etc.	(c) Necessary borehole number	(d) Population of target year	(e) Population per well	(g) Borehole of the development study	Overall score	Rank
I-1	Nabitende B.	3.7	4.4	7.5	5.0	0.7	0.0	21.4	4
I-2	Namungalwe	3.7	5.0	0.0	5.0	0.0	0.0	13.7	16
I-3	Nambale	3.4	1.3	9.9	1.0	2.1	0.0	17.7	12
I-6	Lambala	0.7	1.1	9.6	1.0	0.4	2.0	14.8	15
I-7	Naigobya	0.6	1.1	10.0	1.0	1.9	5.0	19.6	10
I-8	Busesa	2.6	2.1	9.3	5.0	1.3	0.0	20.3	6
I-9	Kyanvuma	2.2	3.4	9.9	3.0	4.0	0.0	22.5	2
I-	Nakivumbi	1.1	1.8	9.6	3.0	1.2	0.0	16.8	13
I-	Nondwe	4.2	2.3	8.1	5.0	0.1	0.0	19.7	9
P-2	Kasassira	3.9	1.8	8.9	5.0	0.5	0.0	20.2	8
P-3	Kameke	1.1	1.5	10.0	1.0	1.7	5.0	20.4	5
P-4	Kapala	2.8	2.3	9.9	2.0	3.3	0.0	20.3	7
P-5	Buseta	1.7	2.0	9.9	2.0	2.7	0.0	18.3	11
S-1	Kidetok	0.8	2.0	10.0	3.0	5.0	5.0	25.9	1
S-2	Tubur	5.0	2.3	10.0	2.0	2.3	0.0	21.6	3
S-3	Acuna	3.9	0.7	10.0	0.0	1.4	0.0	15.9	14

However, in the process of the survey, it has been proved that I-02 Namungalwe and I-08 Busesa have a water supply plan utilizing NWSC's water source and existing water supply pipeline, and those plans have already been formulated. Therefore, these 2 RGCs were decided to be excluded from the target RGCs.

Also, when carrying out the pumping test of existing wells, residents in the 3 RGCs of I-01 Nabitende Banada, I-09 Nakivumbi, S-03 Acuna, strongly opposed to the implementation of the tests. It is decided to exclude it from the target as it would become an obstructive factor for the implementation of the Project.

However, Acuna and Tubur utilizes NWSC’s existing water supply network as their water sources in the design idea so that one transmission pipeline from the water source to Acuna and Tubur can be used until the branch point. This can make the efficiency and economic effect of the Project higher. In the discussion on this issue at the minutes at the beginning of the second field survey, both side agreed that Acuna remained in the list of target RGCs.

1-3-2 Pre-Sensitization activities for community

(1) Background

There were several target RGCs where villagers refused to conduct the pumping tests of existing wells or carried out hostile activities in the first field survey. The background of the opposition is that the existing wells are used under free of charge condition for some villagers. .Even when the pumping test could actually be carried out, there were many cases that the riser pipes and cylinders were corroded. In other words, they have not maintained the facility well. It also turned out that villager'' understanding towards piped water supply facilities was also insufficient.

Meanwhile, in the second field survey, it is necessary to carry out surveys related to design, such as geophysical survey, test drilling survey, topographic survey, geotechnical survey, etc. on site. In addition, lands provision from the relevant community with written consent form is necessary to design and construct the piped water supply facilities. Therefore, cooperation of villagers of target RGC is more indispensable than that in the first field survey, which is crucial for the Project. For this reason, Pre-Sensitization activities were conducted at the beginning of the second field survey for the target RGC of the second survey, which were selected through the priority evaluation and consultation with the MOWE. A second field survey was conducted after the relevant RGC agreed to accept the construction of the piped water supply facility.

(2) Purpose of the Activity

The purpose of this activity is shown below.

- Villagers of selected RGCs recognize the need for safe water and sanitation
- Villagers of selected RGCs participate in various activities necessary for the Project implementation from the outline design stage
- Villagers of selected RGCs establish the Water and Sanitation Implementation Committee so that the Project can proceed smoothly
- Understand the structure of decision making within the selected RGCs and identify opinion leaders and influential people
- Through this activity, villagers of selected RGCs agree to accept the Project implementation

Here in Uganda, normally, a Project Implementation Committee (PIC) would be established to support the smooth implementation of a project just after the implementation of the project is decided, but since it was still in the survey stage, an executive committee called Water and Sanitation Implementation Committee (WSIC) that supports the smooth implementation of the survey would be established.

(3) Target RGC for the Activity

12 RGCs were selected through discussion with MOWE at the start of the second field survey are the following.

Table 1.3-12 Survey Target RGC after the Second Field Survey

No.	RGC	Code	District	Population of RGC (2015)	Population of RGC (2022)
1	Nambale	I-3	Iganga	1,520	1,863
2	Lambala	I-6	Luuka	1,496	1,742
3	Naigobya	I-7	Luuka	1,469	1,711
4	Kyanvuma	I-9	Luuka	2,772	3,228
5	Nondwe	I-11	Iganga	4,369	5,686
6	Kasassira	P-2	Kibuku	4,369	5,676
7	Kameke	P-3	Pallisa	1,221	1,546
8	Kapala	P-4	Pallisa	2,160	2,735

No.	RGC	Code	District	Population of RGC (2015)	Population of RGC (2022)
9	Buseta	P-5	Kibuku	1,752	2,276
10	Kidetok	S-1	Serere	3,020	3,961
11	Tubur	S-2	Soroti	1,568	2,006
12	Acuna	S-3	Soroti	1,032	1,320

(4) Contents of the Activity

Before starting Pre-Sensitization activities, MOWE and the Survey Team agreed on the followings.

- Pre-Sensitization activities would be carried out by the government of Uganda.
- The Team would hire a local consultant dedicated to Pre-Sensitization and would support the Pre-Sensitization activities conducted by the government of Uganda.

Specific detailed activities are shown in Table 1.3-13.

Table 1.3-13 Pre-Sensitization Activities for Confirming Acceptance of Construction of Piped Water Supply Facility (Per 1 RGC)

Activity No.	Items	Stakeholders	Main contents	Required days
1	Prior consultation 1	MOWE	• Preparation of explanatory materials and agreement documents	
2	Prior consultation 2	MOWE, DWO, Sub-County	• Explain to the relevant officials of the local government (district, sub-county) to gain understanding. Schedule adjustment.	0.5 days
3	Request to selected RGCs on having discussions in the relevant communities if the RGC accepts the Project	MOWE, DWO, Sub-County, RGC representative, LC1 Chairperson, WSC	• Explain to the representatives of RGC and villages, the existing Water and Sanitation Committees (WSCs) to gain their understanding. After that, explanation and discussion with the community will be done mainly by representatives of the RGC and villages, and existing WSC in the following activities.	0.5 days (One week after activity 2)
4 5 6	Confirmation of the discussion status on intention to accept construction of piped water supply facilities (1), (2), (3)	MOWE, DWO, Sub-County, RGC representative, LC1 Chairperson, WSC Member of the communities	• Hygiene education for the community, the significance of safe water. Explanation on the purpose of the Project, discussion about it and questions. • Meeting will be held every week until the community is satisfied. • Make records on the contents and results of the discussion, and confirm with RGC representative and LC1 Chairperson whether significant discussion was actually made. • Elect members of WSIC in case of acceptance of the Project. The WSIC is focused on coordination work such as provision of lands.	0.5 days (One week after activity 3)
7	Confirmation of intention to accept construction of piped water supply facilities	MOWE, DWO, Sub-County, RGC representative, LC1 Chairperson, WSC, WSIC	• Confirmation of intention to accept the Project and the written consent form among MOWE, RGC representative, LC1 Chairperson, and Sub-county • RGCs for which acceptance intention is not indicated are excluded from the target RGC list. • If some communities in the RGC do not indicate willingness to accept the Project, the community is excluded from the water supply area. As a result, when the target area for water supply becomes too small, the RGC itself is excluded from the target	0.5 days (One week after activity 6)

Activity No.	Items	Stakeholders	Main contents	Required days
			RGC list. • When the intention to accept the Project is indicated, explain the schedule of geophysical survey, test drilling etc. and request cooperation on future survey. .	

Regarding the activities 4, 5, 6, the number of times actually discussed at each RGC and the questions / opinions raised are summarized in Table 1.3-14.

Table 1.3-14 Number of Questions and Opinions exchanged in Activity 4, 5, 6

Items	Descriptions	I-03 Nambale	I-06 Lambala	I-07 Naigobya	I-09 Kyanvuma	I-11 Nondwe	P-02 Kasassira	P-03 Kameke	P-04 Kapala	P-05 Buseta	S-01 Kidetok	S-02 Tubur	S-03 Acuna	Total
	Number of Meetings	4	3	3	7	5	6	8	4	4	15	6	6	71
Question	Water fee (O & M and management cost)	4	1	2	2	2	6	8	4	3	3	5	6	46
	Contribution to be paid by the community	0	1	1	0	0	0	0	0	0	4	0	0	6
	Project cost	2	0	0	0	0	0	2	1	0	0	2	0	7
	Compensation for land	0	2	2	1	0	0	3	1	1	2	1	4	17
	Impact on the existing well (for example, it will not be broken)	0	0	0	0	1	1	0	0	1	0	0	0	3
	Allocation of facilities (Kiosk etc.)	0	0	1	0	0	0	1	0	0	1	0	1	4
	Siting of test borehole	4	0	0	0	1	0	0	0	0	1	0	0	6
	Responsibility of Community	0	0	0	0	0	0	2	0	1	0	3	0	6
	House connection	0	0	1	1	3	3	5	1	0	7	2	0	23
	Incentive to community	0	0	0	0	0	1	0	1	0	0	0	0	2
	Job opportunity	0	0	0	2	1	0	3	0	0	0	0	0	6
	Possibility to expand water supply area	0	0	0	0	2	0	1	2	2	2	0	0	9
	Water yield (enough or not?)	0	0	0	0	0	0	2	0	0	0	1	0	3
	Project schedule	0	0	0	0	3	0	3	0	0	5	0	4	15
	Others	0	0	1	4	0	0	2	1	0	4	1	0	13
Opinion and requests	Use Contribution for Land Compensation	0	0	0	0	0	0	0	0	0	1	0	0	1
	Should use solar panel	0	0	0	0	0	0	2	0	0	0	0	0	2
	Use Commercial Electricity instead of Solar (because of weather condition)	0	0	0	0	0	0	0	0	0	0	2	0	2
	Improve Accessibility to Fetch Water	0	0	0	0	0	0	0	0	1	0	0	0	1
	Ensure Safe Water	0	0	0	0	0	0	3	0	0	0	0	0	3
	Avoid interfering with existing water sources and land	0	0	1	0	0	0	4	0	0	1	0	0	6

Ultimately, agreement was reached at all RGCs and the Water and Sanitation Implementation Committee was formed. Contents of the agreement document are shown below.

Basic agreement clauses
a. (In case of newly drilled boreholes) That a water supply facility whose source is (are) borehole(s) is proposed to be built in the RGC for the benefit of the community. (In case of NWSC transmission line) That a water supply facility whose source is connected to a nearby NWSC transmission pipeline is proposed to be built in the RGC for the benefit of the community. (In case of existing boreholes drilled under the previous development study of Japan International Cooperation Agency (JICA)) That a water supply facility whose source is (are) the existing JICA borehole(s) is proposed to be built in the RGC for the benefit of the community.

b. The facility will deliver water to users via an elevated tank and a network of distribution pipes leading to a number of water points (to be established) will be built in the RGC.
c. The RGC will avail the land which is necessary for the construction of various parts of the water supply facility including production wells, transmission and distribution pipelines, elevated tanks and water points.
d. The water supply facilities will be constructed using a grant from the government of Japan to the Government of Uganda and will be implemented under the Ministry of Water and Environment MOWE, if the provision of Japanese grant aid is determined between the governments of Japan and Uganda.
e. That to make detailed plans for the proposed water supply facilities, a Japanese team will need to examine and carry out test drilling at various points in the RGC, leaving the existing boreholes intact at after this exercise. Such investigation will involve drilling at more than one site.
f. That subsequent to this survey, the community being the beneficiaries, will be required to cooperate so as to make the outline design for the construction of the facility smooth.
g. That after the construction, the RGC and the communities therein, being the beneficiaries of the water supply facility will operate and maintain the facility.
h. That communities and entire RGCs that choose not to cooperate with the project shall be excluded from the project.

Draft agreement clauses on the content of cooperation by the community mainly
a. If the project constructs piped water supply facilities, the RGCs will bear the O&M cost and properly operate and maintain the facilities in the long run. b. Members of the community will cooperate in the planning and management of their water supply scheme. c. The RGC and the communities therein will co-operate with the Local Authorities and the Survey Team of JICA (the Team) in provision of security for the facilities installed and or in use by the Team. d. The RGCs in which boreholes constructed in the previous JICA development study have to be used for the production wells has to consent to the utilization of those boreholes. e. The RGCs in which production wells have to be constructed near the existing boreholes have to agree to change the water source from the existing one to the new piped water supply system. The existing boreholes may be interfered with the new boreholes drilled near the existing ones. f. The RGCs in which test borehole drilling will be conducted have to agree to the implementation of the geophysical survey and test drilling survey. g. The RGCs have to agree with the implementation of other necessary surveys including topographical surveys and a social survey. h. The RGCs have to understand that where there is insufficient water yield from the water sources, the size of the water supply facility may have to be reduced. i. The community of the RGC will form a Water and Sanitation Implementation Committee (WSIC) to coordinate and direct the activities of the community after this acceptance. j. The RGCs have to assure the understandings of their decision on acceptance to all of the communities in RGC.

1-3-3 Social condition survey

＜Results of the Socio-economic Survey in the Second Field Survey＞

The socio-economic survey in the second field survey (second social condition survey), based on the results of Pre-Sensitization Activities, began from January 2016. Household survey was planned to interview against a total of 400 households, and actual responses were total of 409 households. Besides that, surveys against representatives of villages, the existing WSCs, and public health centers were conducted. They were structured interview.

Table 1.3-15 Distribution of Respondents in the Second Socio-economic Survey

Code	RGC	District	Total No. of HHs Counted	Respondents of HH Survey	Respondents of Village Leaders	Respondents of WSCs	Respondents of HCs (including HC3 at sub-county)
I-3	Nambale	Iganga	304	30	1	3	1
I-6	Lambala	Luuka	277	22	2	2	1
I-7	Naigobya	Luuka	272	22	3	7	1
I-9	Kyanvuma	Luuka	508	44	2	4	0
I-11	Nondwe	Iganga	859	70	2	5	1
P-2	Kasassira	Kibuku	809	66	6	6	1
P-3	Kameke	Pallisa	197	16	2	3	1
P-4	Kapala	Pallisa	360	29	3	2	1
P-5	Buseta	Kibuku	292	24	3	7	1
S-1	Kidetok	Serere	604	49	3	6	1
S-2	Tubur	Soroti	275	22	1	2	1
S-3	Acuna	Soroti	181	15	2	2	0
Total			4,938	409	30	49	10

(1) Purpose of Survey

To collect information necessary for examination and formulation of water supply plan and operation and maintenance plan, evaluation of project and baseline data.

(2) Target RGC of Survey

It covers 12 RGCs which expressed their acceptance of the Project in Pre-Sensitization activities.

(3) Contents of Survey

i) Outline of respondents

The respondents in the household survey totaled 409 households, and the outline of respondents is as follows.

Interview survey was conducted to men and women alternatively, in order to equalize the ratio of respondents' male and female. Final ratio was 49.4% men and 50.6%women. Also, in order to obtain broad response on rich and poor, considerable measures were done, for example, asking LC1 chairperson to introduce the poor and the wealthy people, judging rich and poor by the quality of houses. The proportion of age is distributed from 15 years old to 60 years old and more portions of the 30s. Female respondents are younger than men.

Table 1.3-16 Gender Ratio and Age Proportion of Respondents

Age	Total		Male		Female		Ratio of Male to Female (Female=100)
	Number	Composition Ratio (%)	Number	Composition Ratio (%)	Number	Composition Ratio (%)	
15-20	12	2.9	2	1.0	10	4.8	20.0
21-30	121	29.6	43	21.3	78	37.7	55.1
31-40	121	29.6	58	28.7	63	30.4	92.1
41-50	80	19.6	45	22.3	35	16.9	128.6
51-60	47	11.5	33	16.3	14	6.8	235.7
60+	28	6.8	21	10.4	7	3.4	300.0
Total	409	100	202 (49.4%)	100	207 (50.6%)	100	97.6

The income distribution of respondents is shown in Figure 1.3-1. According to this survey, the minimum annual income is 140,000 UGX, the maximum annual income is 30,000,000 UGX, and the simple average of annual income is 4,722,321 UGX. The lower 20% of income distribution is less than 1,110,000 UGX, it is regarded as poor, and the top 20% will be 7,560,000 UGX, which can be regarded as wealthy people.

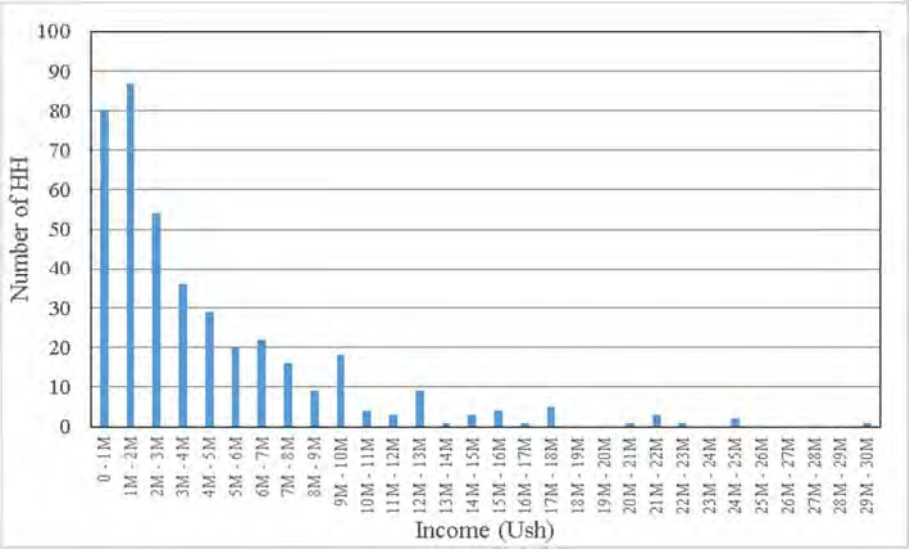


Figure 1.3-1 Distribution of Annual Income of Respondents

The average size of households in the survey was 7.8 on average, which was different from the average size of households in the area (5.6 persons) by the result of census[1].

The average number of adults in a household is 1.4 in both male and female, and cases where children aged 18 and older are not independent may also be included. It may also be presumed that even respondents count the number of people living on the same compound as the number of households. As fatherless families and motherless families are also found in the answers, it can be seen that more than two households live together in one compound, judging by the figure that 1.4 adult males and females in each household.

More than half of respondents, including peasants, are farmers. 13% of women responded are housewives, but more than 17% are doing some kind of business. The proportion is more than men. As for other questions, "Yes" for the question "Whether women are earning income" is 64%, which is not known up to what percentage of household income, but it turns out that women also play a part in livelihood. Even though it is not in the data, it is almost a woman who sells agricultural products such as vegetables that we saw during the survey in the target areas, and it seems that women are often sales staff in farmers.

Table 1.3-17 Occupation of Respondents

	Male		Female		Total	
Occupation	Number	%	Number	%	Number	%
Farmers	44	21.8	69	33.3	113	27.6
Peasant	66	32.7	49	23.7	115	28.1
Housewife	1	0.5	28	13.5	29	7.1
Trader	32	15.8	35	16.9	67	16.4

[1] Calculated from the result of household size for each sub-county of Uganda Population and Housing Census 2014

Occupation	Male		Female		Total	
	Number	%	Number	%	Number	%
Health worker	9	4.5	10	4.8	19	4.6
Teacher	23	11.4	12	5.8	35	8.6
Religious worker	2	1.0	0	0.0	2	0.5
Driver	3	1.5	0	0.0	3	0.7
Police Personnel	4	2.0	1	0.5	5	1.2
Technician	6	3.0	0	0.0	6	1.5
Student	1	0.5	1	0.5	2	0.5
Others	11	5.4	2	1.0	13	3.2
Total	202	100	207	100	409	100

ii) Gender

If main role of adult male and female and minors in one household is asked, 70% of the male answers "providing basic needs for the family" and female does "preparing food or cooking" accounts for 68%. In minors, "fetching water" is the most frequent answer for boy and girl, 36% and 34%, respectively, and there is no difference between males and females. However, as a matter of fact, women are often responsible for fetching water, but they are considered within the task of "preparing food or cooking ", and it is considered that water fetching is not regarded as the main role of women.

Table 1.3-18 Role of Men, Women and Children in Household

Roles	Men		Women		Boys		Girls	
	Number	%	Number	%	Number	%	Number	%
Providing basic needs for the family	286	69.9	36	8.8	0	0.0	0	0.0
Providing security for the family	37	9.0	0	0.0	0	0.0	0	0.0
Meeting the financial needs of the family	7	1.7	0	0.0	0	0.0	0	0.0
Preparing food or cooking	0	0.0	278	68.0	0	0.0	65	15.9
Looking after children or babies	0	0.0	53	13.0	0	0.0	7	1.7
Physical care of family members and general household	32	7.8	27	6.6	0	0.0	0	0.0
Looking after the livestock of the household	7	1.7	0	0.0	74	18.1	1	0.2
Cleaning home and compound	0	0.0	0	0.0	64	15.6	33	8.1
Fetching water	1	0.2	6	1.5	149	36.4	139	34.0
Washing clothes	0	0.0	5	1.2	3	0.7	13	3.2
Washing utensils	0	0.0	0	0.0	20	4.9	64	15.6
Collecting firewood	0	0.0	0	0.0	3	0.7	15	3.7
Digging, gardening, cultivation	0	0.0	0	0.0	5	1.2	0	0.0
Nothing	6	1.5	0	0.0	36	8.8	22	5.4
Others	0	0.0	1	0.2	2	0.5	0	0.0
None	33	8.1	3	0.7	53	13.0	50	12.2
Total	40	9.8	15	3.7	271	66.3	303	74.1

Conversely, for the question "Person to fetch water?", The answer that female including girl is the most and ratio is more than 70%. There was no great difference between rainy season and dry season.

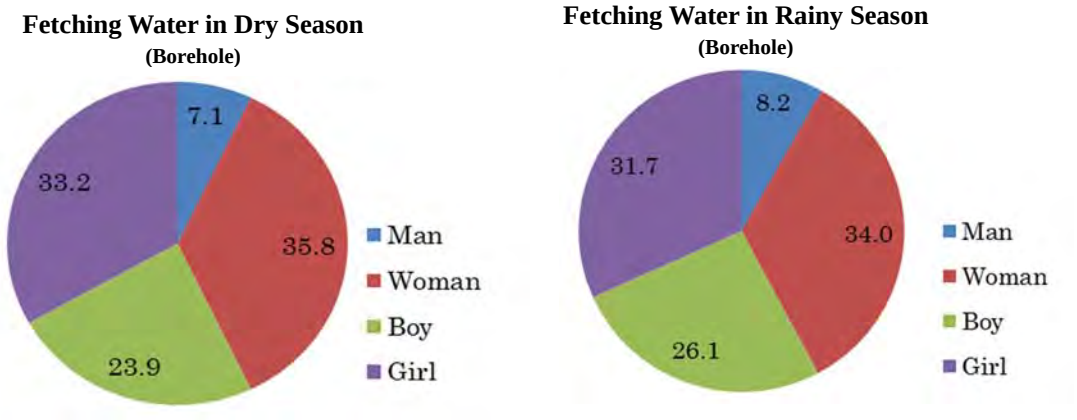


Figure 1.3-2 Person who is Primarily Responsible for Fetching Water among Family

In Uganda, primary school is 7 years, secondary school is 4 years, and after that advance level, or vocational training schools etc., follows. In this survey, the enrollment rate, holdover rate and graduation rate of primary school and secondary school by gender were interviewed. According to this result, although there are many female entering primary school, the proportion of female who are repeated same level is high, and it turns out that female are slightly less able to graduate. The rate to advance to Advance Level is very low.

Table 1.3-19 Enrollment Rate, Holdover Rate and Graduation Rate in RGC

	Enrollment rate (%)		Holdover rate (%)		Graduation rate (%)	
school	Male	Female	Male	Female	Male	Female
Primary school	66.8	73.5	27.2	34.8	36.1	35.2
Secondary school Ordinary level	30.1	44.2	11.9	16.9	18.2	27.3
Secondary school Advanced level	0.6	2.5	0.1	0.7	0.5	1.9

Although the influence of holdover rate and graduation rate is not clear, but the literacy rate has a remarkable difference between male and female. Even in mother tongue, the literacy rate of female remains at 40%. The English literacy rate is even lower, 34%

Table 1.3-20 Literacy Rate by Gender

Language	Male (%)	Female (%)
Vernacular	53.8	40.5
English	47.6	34.5

When I asked if there is an influence of water fetching on employment opportunities of female and school attendance of children, 53% answered "There is influence" as a whole, it is about half, but if answer is categorized into income classes, the rate of answering that there is an influence is high in the higher social class. In fact, women who are employed in jobs other than agriculture has high ratio in high-income people, and it is understood that incomes of the household are higher because women are working. Regarding the influence on the attendance of children's schools, there is little difference on income classes, but the proportion that answered "affected" is 60% higher than that for women.

Table 1.3-21 Existence of Influence on Water Work by Women's Work and Children's School

	Total		Social Class					
			Low		Medium		High	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Women's work	53.3	46.7	35.7	64.3	63.6	36.4	80.0	20.0
Children's school	63.3	36.7	64.3	35.7	63.6	36.4	60.0	40.0

As for the influence of water fetching on the work of women, there are "to be late for work", "to require more time to work", "to cause lower back pain, etc. to become unable to work", etc., By reducing the time for fetching water, employment opportunities for women is expected to increase. Also, as influences of water fetching, "falling school attendance rate", "getting late / absent more", "being tempted by opposite sex in water source", etc. were raised.

iii) Water and health

Most of the water sources used is deep wells, but the use of rainwater gathering using the roof of the house etc. is generalized, which has no need for water fetching work. During the rainy season, 75% of households utilize rainwater as well.

Table 1.3-22 Water Sources Used (multiple answers allowed)

Water source	Dry season (%)	Rainy season (%)
Borehole	92.91	86.55
Shallow well, hand dug well	11.00	6.85
Protected spring	11.00	4.40
Natural spring water	13.45	5.13
Rainwater Harvesting	0.00	74.82
Dam, Valley Tank	0.24	0.24
A river	1.47	0.24

When asking the residents what they feel about concerns on water and health, 84% of people answered, "There are too many people using the same water source." It is a considerably high figure, compared with "the water source is far". This is considered to be synonymous with long waiting time.

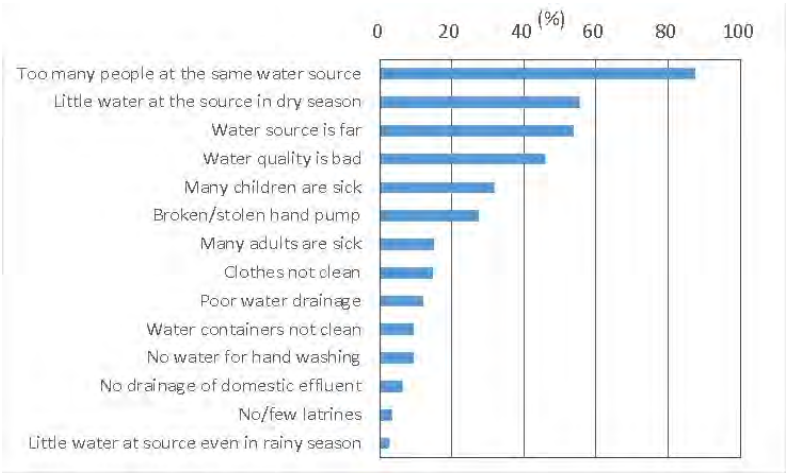


Figure 1.3-3 Problems with Water and Health in RGC

The actual water fetching time and the distance to the water source are summarized in Table 1.3-23. It is common that water is fetched about 5 times a day, but it turns out that the number of times of water pumping and the time it takes would be reduced in the rainy season. This is consistent with the use of rainwater as described above. In other words, rain that has fallen on the roof of the house is often collected, and by using it, the number of times of fetching water from the well will decrease. In addition, water fetching time is decreasing in the rainy season when the number of water fetching decreases and congestion at the

well decreases. On average, it takes almost two hours for water fetching in the dry season, but it takes less than 50 minutes in the rainy season. For this reason, it is considered that much of the water fetching time is the waiting time. In fact, there are many cases where many jerrycans are waiting in line for wells during dry seasons. In the dry season, it can be calculated that people send in fetching water five times a day, which requires two hours at each time and that people spend 10 hours a day on water. However, since water is fetched not only by women but also by boys and girls, it seems that it is not that they spend 10 hours alone. The distance to the water sources on average is less than 150 m, which is almost unchanged between rainy season and dry season.

Table 1.3-23 Number of Times of Water Pumping per Day, Reciprocating Distance, Round-trip Time (Borehole)

Code	RGC	Dry Season (Borehole)			Rainy season (Borehole)		
		No of trips /day	Distance for round trip (m)	Time for round trip (min)	No of trips /day	Distance for round trip (m)	Time for round trip (min)
I-03	Nambale	6.9	270.0	103.5	4.0	338.9	31.9
I-06	Lambala	3.2	660.7	74.7	1.9	615.0	58.9
I-07	Naigobya	4.7	321.1	101.6	2.5	316.6	37.5
I-09	Kyanvuma	4.5	174.0	117.4	3.3	172.5	57.3
N-11	Nondwe	3.5	358.7	126.7	3.2	343.9	68.1
P-02	Kasassira	4.4	224.4	142.7	3.3	234.9	52.0
P-03	Kameke	4.3	420.6	159.4	3.6	368.7	43.3
P-04	Kapala	5.6	292.5	120.9	4.2	282.9	52.9
P-05	Buseta	5.4	204.2	86.5	3.2	204.2	26.2
S-01	Kidetok	5.4	264.1	76.5	4.6	271.5	31.1
S-02	Tubur	4.8	270.5	105.7	3.9	260.0	50.2
S-03	Acuna	5.6	179.3	78.0	4.5	172.7	30.7
Averages		4.8	282.5	112.7	3.6	278.2	48.6

Although the amount of water used increases slightly in the rainy season, it can be figured out that the amount of water used per person is about 20 liters per day. This is a value that well matches the per capita water consumption used in the “Water Supply Design Manual” by MOWE.

Table 1.3-24 Water Usage in Dry Season and Rainy Season

ID	RGC	Dry season		Rainy season	
		Water usage per household (Jerrycans/day)	Water usage per person (Liters/cap/day)	Water usage per household (Jerrycans/day)	Water usage per person (Liters/cap/day)
I-03	Nambale	8.1	24.0	8.5	25.9
I-06	Lambala	5.1	19.1	6.2	23.3
I-07	Naigobya	7.1	20.6	8.2	23.4
I-09	Kyanvuma	6.2	18.6	7.0	21.6
N-11	Nondwe	6.3	18.4	7.7	23.8
P-02	Kasassira	7.4	19.8	8.0	21.4
P-03	Kameke	6.1	18.5	6.9	21.8
P-04	Kapala	8.6	20.3	9.1	21.5
P-05	Buseta	5.8	17.3	6.5	20.0
S-01	Kidetok	9.5	23.6	10.6	27.6
S-02	Tubur	7.4	22.6	8.1	24.8
S-03	Acuna	8.7	22.2	8.7	22.0
Average		7.2	20.3	8.1	23.3

Table 1.3-25 shows the number of patients with water-borne disease. This is the total number of patients in the Health Centers to which the applicable RGC belongs, and the figure is divided into rainy season and dry season. Malaria is overwhelmingly found. As for water-borne diseases, the number of patients increases in the rainy season as a whole. This is because many living organisms which mediate disease such as mosquitoes or bacteria can be propagated easily in the rainy season. Additionally, the wastewater is not properly treated, and the spread of the wastewater along with the flow of rainwater also cause of increasing diseases in the rainy season. It will be possible to reduce the disease by enforcing hand washing with safe water. Respiratory diseases increase especially during the dry season because of dust.

Table 1.3-25 Distribution of Water-borne Diseases

Disease	Number of patients per season	
	Rainy season	Dry season
Malaria/fever	27,040	22,043
Diarrhea	3,100	1,709
Skin disease	2,159	1,099
Respiratory diseases	3,175	7,759
Worms	3,073	1,638
Eye disease/infection	967	739
Intestinal infection	258	376
Typhoid	22	15
Dysentery	91	23

Number of 20 liter jerrycan used a day at a health center was asked. In addition, as design guidelines of MOWE, there is a method of calculating the water usage amount according to the number of beds of the health facility. Comparing with the result of interview and the result of calculation, the amount actually used which is the result of interview is fewer. In cases of Kasassira and Kapala which more amounts are used actually is where wells are located in the compounds of health centers. If the piped water supply facility is constructed and there is a tap in the compounds, it will be possible to increase the amount of water used and to enhance the health service.

Table 1.3-26 Water Use Situation of Health Center

RGC	HC type	Current situation of water use			Water demand	
		Number of Jerrycan used a day (/day)	Water consumption per person (Liters/cap./day)	Amount of water currently used (Liter/day)	Number of beds	Water demand calculated from the number of beds (Liters/day)
Nambale	HC3	10	20	200	15	1,050
Lambala & Kyanvuma	HC3	15	10	300	10	700
Naigobya	NGO	20	19	400	8	560
Nondwe	HC2	7	35	140	4	200
Kasassira	HC3	50	18	1,000	6	420
Kameke	HC3	30	6	600	12	840
Kapala	HC3	101	15	2,020	10	700
Buseta	HC3	10	25	200	8	560
Kidetok	HC3	50	5	1,000	50	3,500
Tubur & Acuna	HC3	100	17	2,000	20	1,400

iv) Sanitation

About 95% of households have toilet facilities. Even households which do not have toilets often use the neighbors' toilets jointly or use public toilets.

Table 1.3-27 Presence or Absence of Toilet

Social Class	With toilet		No toilet	
	Count	%	Count	%
Low income group	71	87.65	10	12.35
Middle income bracket	234	95.12	12	4.88
High income group	80	97.56	2	2.44
Total	385	94.13	24	5.78

The type of the most popular toilet is a simple dug hole, and the VIP with the ventilation hole increases as income gets higher. There are still few flush toilets, and there is no place to have an Ecosan toilet individually.

Table 1.3-28 Type of Toilet and Possession Rate by Income

Social Class	Traditional pit		Ventilated Improved Pit (VIP)		Flush Toilet		Ecosan Toilet	
	Count	%	Count	%	Count	%	Count	%
Low income group	65	80.2	6	7.4	0	0.0	0	0.0
Middle income bracket	185	75.2	48	19.5	0	0.0	0	0.0
High income group	49	59.8	31	37.8	1	0.7	0	0.0
Total	299	77.7	85	22.1	1	0.3	0	0.0

Also, when the ease of use of the toilet was asked, about 81% said it was easy to use. But the rests have problems, for examples, "did not have roofs or doors", "walls are low, can be seen from the surroundings", "the floor is damp and dirty", "the floor is weak", etc.

Regarding sanitation, after the toilet about 88% and before the meal about 92% they wash their hands. However, using Tippy Tap is only 2%, mostly using water from container for water transport such as jerrycan. Also, 76% said they have water at their washing facilities and 86% said they have soap. Tippy Tap is sometimes broken or stolen by children and animals. There are also cases that people worry that children would drink Tippy Tap water.

Using Tippy Tap

v) Income and expenditure

Table 1.3-29 shows a table comparing annual income for each RGC. Together with the average annual income for the entire RGC, income groups were divided into the poor (lower 20%), the middle class (middle 60%), and the wealthier (top 20%) to find the average annual income for each. The thresholds for low-income and middle-income were 1,110,000 UGX, and the threshold for middle-income and high-income was 7,560,000 UGX. Using this threshold, the average value of each income group was calculated for each RGC, divided by 12 months to obtain the average monthly income, and 5% of the average monthly income was set as the payable amount for water. Payable amount per jerrycan can be calculated the payable amount for water in a month divided by the number of jerrycans for a household based on the average number of people per household.

Table 1.3-29 Annual Income by Income group for each RGC and Payable Amount

Code	RGC	District	Income group	Average annual income (UGX)	5% of the average monthly income	Number of jerrycan used per month	Payable amount per Jerry (UGX)
I-03	Nambale	Iganga	All Classes	3,402,633	14,178	150.0	94.5
			Low	677,071	2,821		18.8
			Middle	3,761,818	15,674		104.5
			High	10,244,000	42,683		284.6
I-06	Lambala	Luuka	All Classes	3,227,345	13,447	160.5	83.8
			Low	787,500	3,281		20.4
			Middle	3,240,725	13,503		84.1
			High	8,000,000	33,333		207.7
I-07	Naigobya	Luuka	All Classes	4,323,136	18,013	162.0	111.2
			Low	768,750	3,203		19.8
			Middle	3,339,571	13,915		86.7
			High	11,320,000	47,167		291.2
I-09	Kyanvuma	Luuka	All Classes	4,189,314	17,455	162.0	107.7
			Low	850,000	3,542		21.9
			Middle	2,847,721	11,866		73.2
			High	12,422,143	51,759		319.5
I-11	Nondwe	Iganga	All Classes	3,361,646	14,007	162.0	86.5
			Low	709,750	2,957		18.3
			Middle	3,065,515	12,773		78.8
			High	11,411,429	47,548		293.5
P-02	Kasassira	Kibuku	All Classes	4,352,355	18,135	162.0	111.9
			Low	631,905	2,633		16.3
			Middle	3,802,144	15,842		97.8
			High	12,579,273	52,414		323.5
P-03	Kameke	Pallisa	All Classes	4,488,313	18,701	186.0	100.5
			Low	740,000	3,083		16.6
			Middle	3,877,300	16,155		86.9
			High	10,273,333	42,806		230.1
P-04	Kapala	Pallisa	All Classes	6,301,638	26,257	180.0	145.9
			Low	847,500	3,531		19.6
			Middle	3,338,900	13,912		77.3
			High	12,927,400	53,864		299.2
P-05	Buseta	Kibuku	All Classes	7,338,175	30,576	180.0	169.9
			Low	820,000	3,417		19.0
			Middle	3,413,615	14,223		79.0
			High	16,159,900	67,333		374.1
S-01	Kidetok	Serere	All Classes	6,883,482	28,681	183.0	156.7
			Low	569,333	2,372		13.0
			Middle	3,783,462	15,764		86.1
			High	13,853,212	57,722		315.4
S-02	Tubur	Soroti	All Classes	5,880,091	24,500	171.0	143.3
			Low				
			Middle	3,622,667	15,094		88.3
			High	10,717,429	44,656		261.1
S-03	Acuna	Soroti	All Classes	3,934,000	16,392	171.0	95.9
			Low	757,500	3,156		18.5
			Middle	4,298,000	17,908		104.7
			High	13,000,000	54,167		316.8
Average of All RGCs			All Classes	4,722,321	19,676	169.1	116.3
			Low	703,484	2,931		17.3
			Middle	3,430,245	14,293		84.6
			High	12,568,376	52,368		309.6

In Iganga and Luuka districts, annual incomes are lower, while in Pallisa, Kibuku, Soroti and Serere districts, incomes are higher. In Tubur there were no respondents who can be categorized in low income. On average, it is found that the price of water per jerrycan will be about 100 UGX, but for low-income group it will be around 20 UGX. Consideration for low-income group is required in setting water fees.

The annual expenditure is shown in Table 1.3-30. Similarly, comparing by district, annual expenditures are lower in Iganga and Luuka districts, and the people in Pallisa, Kibuku, Soroti and Serere districts have more annual expenditures.

Table 1.3-30 Annual Expenditure by RGC

ID	RGC	District	Sample Number	Minimum (UGX)	Maximum (UGX)	Average (UGX)
I-03	Nambale	Iganga	30	57,000	8,112,000	1,883,665
I-06	Lambala	Luuka	22	252,000	6,270,000	1,993,636
I-07	Naigobya	Luuka	22	156,000	19,578,000	2,483,236
I-09	Kyanvuma	Luuka	44	336,000	11,400,000	2,336,264
N-11	Nondwe	Iganga	70	261,600	15,110,400	1,986,780
P-02	Kasassira	Kibuku	66	156,000	19,548,000	2,625,482
P-03	Kameke	Pallisa	16	300,000	7,500,000	2,552,975
P-04	Kapala	Pallisa	29	372,000	20,340,000	4,134,497
P-05	Buseta	Kibuku	24	336,000	9,480,000	2,990,050
S-01	Kidetok	Soroti	49	204,000	29,803,200	4,721,555
S-02	Tubur	Soroti	22	780,000	8,268,000	3,315,409
S-03	Acuna	Soroti	15	228,000	6,744,000	2,445,480
All RGCs			409	57,000	29,803,200	2,796,185

As for experience of buying water (using water seller), almost half said that they sometimes buy water. However, this depends too much on RGCs. In Nondwe, Kidetok, over 75% of households have experience, and in Buseta, Kasassira, Acuna, the percentage is low.

Table 1.3-31 Existence of Experience of Using Water Seller

ID	RGC	Yes		No	
		Number	%	Number	%
I-03	Nambale	14	46.7	16	53.3
I-06	Lambala	10	45.5	12	54.5
I-07	Naigobya	14	63.6	8	36.4
I-09	Kyanvuma	20	45.5	24	54.5
N-11	Nondwe	55	78.6	15	21.4
P-02	Kasassira	19	28.8	47	71.2
P-03	Kameke	9	56.3	7	43.7
P-04	Kapala	13	44.8	16	55.2
P-05	Buseta	1	4.2	23	95.8
S-01	Kidetok	43	92.0	6	8.0
S-02	Tubur	13	59.1	9	40.9
S-03	Acuna	3	20.0	12	80.0
All RGCs		214	52.3	195	47.7

Water seller is used in "dry season" the most frequently, and the price of one jerrycan is the mostly 200 UGX. The average is 263 UGX, which is quite expensive.

Table 13-32 Frequency of Water Seller Usage a Year, Number and Price

	Min	Max	Average
Times bought water in last year	1	500	77.6
Number of jerrycans per time	1	12	3.5
Price of per jerrycan (UGX)	30	500	263.0

vi) Willingness to pay water and its amount

Looking at the questionnaire results, it seems that there are very few people who regularly pay water fees at present. There are many responses of 1,000 to 2,000 UGX per month, but it can be found many answer that "When the hand pump breaks down." In other words, it means not paying periodically. Of the number of responses 409, 160 people answered that they have not paid so far.

Table 1.3-33 Payment Experience of Water Fee and Willingness to Pay（UGX)

	Min	Max	Average	Mode
First contribution in water use so far	500	40,000	3,453	2,000
Monthly charge for water use so far	167	5,000	1,582	2,000
How much can you pay per jerrycan at new water supply facility	10	300	97.3	100

As for the payable amount if a new water supply facility is built, the average was 97 UGX and the most frequent answer was 100 UGX. However, there were 16 people out of 409 who said they did not intend to pay, and 29 people said they did not know. Breakdown by each RGC is shown in Table 1.3-34. By income groups, the willingness to pay is low in the low income group and high in the high income group. However, the difference is small when compared with the payable amount shown in Table 1.3-29.

Table 1.3-34 Willingness to Pay by RGC

Code	RGC	Willingness to Pay (UGX)								
		Minimum	Maximum	Total Average	Social Class			Number of respondents	"No"	"I don't know"
					Low	Middle	High			
I-03	Nambale	35	300	120.2	56.1	118.2	160.0	30	2	4
I-06	Lambala	25	200	83.8	75.0	73.4	100.0	22	1	1
I-07	Naigobya	20	200	80.0	50.0	72.9	75.0	22	1	2
I-09	Kyanvuma	30	200	88.6	37.5	73.6	100.0	44	1	6
N-11	Nondwe	10	200	93.8	28.8	91.5	57.1	70	0	15
P-02	Kasassira	20	200	101.6	97.4	0.0	95.5	66	5	0
P-03	Kameke	10	200	94.4	66.7	96.0	116.7	16	0	0
P-04	Kapala	35	300	120.2	56.1	118.2	160.0	30	2	4
P-05	Buseta	15	200	95.0	50.0	80.4	100.0	24	2	1
S-01	Kidetok	10	200	103.3	75.0	104.2	105.9	49	1	0
S-02	Tubur	10	300	105.0	-	107.3	100.0	22	0	0
S-03	Acuna	20	100	62.1	37.5	62.0	100.0	15	1	0
All RGCs		10	300	97.3	87.4	98.6	100.9	409	16	29

vii) Current Situation of Water and Sanitation Committee

Total 49 of existing Water and Sanitation Committees (WSC) within the target RGCs responded the questionnaire. The main members of the organization are as shown in Table 1.3-35, and there are security guards and others besides positions listed in the table.

Table 1.3-35 Member Structure of Water and Sanitation Committee

Position	Number of members		Percentage of women (%)	Number of WSCs not holding that position
	Male	Female		
Chairperson	47	2	4.1	0
Vice Chairperson	23	20	46.5	6
Accountant/Treasurer	19	29	60.4	1
Secretary	38	8	17.4	3
Caretaker	32	16	33.3	4
Mobilizer	31	7	18.4	11
Advisor	11	1	8.3	37

In any WSC, executives are decided by voting and other elections. The term of executives has been set to 3 years in the most of WSCs. About gender ratio of executives, male executives are more than female, but in treasurers dealing with money the proportion of female is more than male.

The initial contribution after construction was at least 500 UGX (Acuna), up to 10,000 UGX (Kidetok and Nambale), on average 3,351.4 UGX, but 12 WSCs out of 49 WSCs had not collected the contribution. In addition, as for the maintenance fee, 18 WSCs are regularly collecting every month, 2 WSCs are collecting 100 UGX per jerrycan, but in other 29 WSCs, they collect only when it is broken.

Table 1.3-36 Annual Income and Annual Expenditure of WSC

	Income(UGX)	Expenditure (UGX)
The lowest	0	0
The best	1,100,000	1,100,000
average	207,478	195,559

Manpower	57,673
Fuel	9,878
Maintenance	117,753
Others	10,255
Total	195,559

Annual income and expenditure are shown in Table 1.3-36, but only 2 WSCs of Kidetok and Naigobya have zero revenue. The maximum amount is Kasassira. On average, income and expenditures are around 200,000 UGX, and the maintenance cost is the largest in the expenditures.

viii) Organization in the village

The question asking about participation in some organizations in the village including the WSC, in the overall average 40% of the residents answered that they are participating in some organizations. With regard to the income class of residents, the percentage of people participating is high in the high social classes.

Table 1.3-37 Participation in Residents' Organization

Code	RGC	Total		Social Class (% of "Yes")		
		Yes (%)	No (%)	Low	Medium	High
I-03	Nambale	43.3	56.7	21.4	63.6	60.0
I-06	Lambala	36.4	63.6	50.0	31.3	50.0
I-07	Naigobya	22.7	77.3	25.0	28.6	0.0

Code	RGC	Total		Social Class (% of "Yes")		
		Yes (%)	No (%)	Low	Medium	High
I-09	Kyanvuma	45.5	54.5	75.0	42.4	42.9
N-11	Nondwe	32.9	67.1	6.3	38.3	57.1
P-02	Kasassira	53.0	47.0	42.1	47.2	90.9
P-03	Kameke	43.8	56.3	33.3	30.0	100.0
P-04	Kapala	41.4	58.6	0.0	46.7	50.0
P-05	Buseta	37.5	62.5	33.3	30.8	50.0
S-01	Kidetok	42.9	57.1	0.0	38.5	64.7
S-02	Tubur	31.8	68.2	－	33.3	28.6
S-03	Acuna	13.3	86.7	0.0	10.0	100.0
Average		39.6	60.4	24.7	38.6	57.3

The main organization in the village is a jointly-funded organization called SACCO (Savings and Credit Cooperative Organization), which saves up money and lends it to those who need it. SACCO is organized in every target RGCs.

Table 1.3-38 Resident's Organization in the Village and its Participation Rate

Organization	Social Class		
	Low (%)	Medium (%)	High (%)
Savings and Credit	55.00	64.89	70.21
Social support (Burial, etc.)	25.00	17.02	14.89
Religious	5.00	3.19	2.13
Women Organizations	10.00	5.32	4.26
Others	5.00	6.38	0.00
Water and Sanitation Committees	0.00	3.19	8.51

WSC is one of the village organizations, but among the respondents, there are no members from low-income people. In this Project, three members from the residents will be elected as members of the WSSB, but consideration should be given to participation from low-income people.

1-3-4 Survey on Existing Piped Water Supply Facilities

(1) Purpose of Survey

To find challenges and lessons learnt on O&M of the piped water supply facilities in rural area for further consideration and establishment of sustainable O&M system for the Project.

(2) Targets of Survey

Existing piped water supply facilities around the target area are targets for the survey.

(3) Contents of Survey

Firstly, Interview survey was conducted on the O&M of existing piped facilities at Umbrella East, and selected existing facilities with different O&M structures from existing piped water supply facilities under Umbrella East, and then conducted interview survey at each selected facility sites. There are three structure forms of O&M., which are (1) facilities managed by WSSB and P/O, (2) facilities operated directly by WSSB, and (3) facilities operated by the National Water and Sewerage Corporation (NWSC).

i) O&M operated by WSSB and P/O

P/O entrusts the contract with WSSB and undertakes provision of water supply service, sales, financial affairs and facility management. The contract condition clearly states that P/O does not take operating risk. Although the contract period is basically three years, there are places where P/O with good performance evaluation continues for nine years. Often the allocation of revenues for water supply is 85% to P/O, 5% to WSSB, 10% to facility renewal costs. The breakdown of the operating expenses received by P/O consists of basic expenses (facility operating expenses, personnel expenses, etc.), water fee collection work expenses, O&M expenses of the entire system, new connection fees, water quality analysis related expenses. The rest will be the income of P/O.

The following issues are cited from the responsible P/Os on O&M at the site.

Operational aspect

If the water supply is often stalled due to blackouts or malfunction, efficient facility operation cannot be performed, which leads to high operating costs and results in deterioration of service quality.

- The rise in water fee causes escape of low-income people from the water supply system (escape to spring water, rainwater use, return to hand pump wells, etc.), which leads to a decrease in the served population.
- There is no means of transportation such as cars necessary for O&M, so it is impossible to respond to challenges promptly.
- It is difficult to keep remarkable achievements within a short contract period (3 years).

Financial aspect

- The unreasonable water fee setting and delay/unpaid of water fee payment have become an obstacle to business operation. This leads to unpaid salary for P/O staffs, which results in a decline in labor incentive.

Technical aspect

- No repair / repair tool or parts supply system has been established.

On the other hand, O&Ms of Busia and Masafu schemes are the successful examples.

Busia's P/O has already been contracted for nine years and its performance is highly valued. In addition, good relations with the Town Council are maintained and, mutual support relations are established. It is noteworthy that a high collecting rate of water fee and 19% of revenue (10% in most other P/Os) are funded for repairing, improving and updating major facilities and equipment.

Even if P/O's receipt ratio is 79% of the total revenue, the trust in its operation of the facility can lead to sufficient profit. This makes it possible to operate the water supply system in stable condition. .

Masafu's P/O has participated in capital since the construction stage and has been engaged in its O&M business for seven years now. The P/O always keeps contact with the sub-county, and the performance is highly appreciated. It has made it possible to provide high quality water supply services through good quality of the water supply facilities, few failures, high productivity of water source, stable power supply situation, good facility maintenance, management and other benefits. This result seems to have caused high evaluation to the P/O from users. The high reliability has resulted in smooth operation of the facility through the high water fee collection rate. And most importantly, the person, who is in managerial positions, is intelligent and grasping all the issues related to O&M including financial figures, and always considering improvement of business quality; this will be the greatest strength.

ii) O&M directly managed by WSSB

In some RGC with small scale communities, a WSSB operates and maintains water supply

facilities directly without consigning to P/O. In this O&M form, there are some merits such as "possible water supply work closely related to the relevant communities", "savings of revenue instead of payment to a P/O", and O&M under a long-term water supply strategy".

The served population for this O&M form is 10,000 or less, and typical configuration of a piped water supply facility is usually a compact system such as one water source boreholes, a small water storage tank, a short distribution pipeline length, a small number of connections etc. Although a WSSB is responsible for the O&M of a water supply scheme, the WSSB have to take audits, permission and approval from the relevant sub-county or Town Council.

The issues of a WSSB direct management method can be listed as follows in terms of operational, financial and technical aspects.

Operational aspect

- The number of staff is small, which impedes efficient O&M.
- Due to the absence of technically skilled staff, daily monitoring cannot be done and deterioration of the facility will be accelerated without grasping a sign of failure.

Financial aspect

- Low profitability and low savings.
- Severe financial aspects of sub-county and Town Council, uncertain diversion of savings, etc.
- Difficulties of budget preparation for repairing and updating facilities and equipment.
- High non-revenue water rate resulted in financial challenges.
- Soaring commercial power costs and fuel costs, and unstable power supply conditions are bottlenecks in normal O&M of water supply facilities.

Technical aspect

- Aging of water supply facilities and its deterioration due to insufficient maintenance. .
- Miss matching between equipment resulted in shorten service life and occurrence of serious breakdown of facilities.
- Insufficient technical supports from DWO and U/O.

Among the surveyed community, Namwendwa is facing the deterioration of the facility (leakage of water tank etc.), poor power supply condition and low water pressure; these became obstacles against extension of the water supply scheme. The chairman of the WSSB actively examined business operation for improvement, discussed with sub-county and is taking the first step of the improvement. Through analysis of water supply data, he understood the problems of current water supply scheme, and is making a qualitative improvement plan of the facilities and extension of network in future.

iii) O&M operated by NWSC

NWSC has a strategy to expand the scope of work to provide water supply and sanitation services to district capitals throughout the country and medium to large cities conforming thereto. For the immediate business goals, providing safe water to the district's capital city that has increased to 112 in 2010 and important cities in the regional economy are focused. Even in cities where other entities operated water supply schemes, if it is deemed necessary to qualitatively improve the water supply service, NWSC actively participates in the bidding at the timing of renewal of the contract to try to cultivate the market. In Lake Kyoga basin, a number of medium- and large-scale urban sites that P/O and WSSB have been engaged in the O&M of water supply facilities were transferred to NWSC.

In this survey, O&M status by NWSC was confirmed in Bugiri, Kaliro, and Kamuli. In these cases, improvement of the problems appeared in the former O&M entity both in terms of hardware and software relating to the O&M has become a major issue for NWSC in less than one year after transfer of the O&M.

The main problems confirmed are listed below.

Operational aspect

- Frequent breakdowns due to aged deterioration of water supply facilities and equipment cause difficulty in efficient operation and poor cost effectiveness.

Financial aspect

- It is not profitable in the rural cities, and it is balanced by input of the profit of the largest city, Kampala.

Technical aspect

- Unstable power supply condition imposes a load on pumping equipment, and fuel cost for generators at the time of power outage also presses operating costs, so it is difficult to provide high quality water supply service.
- Accelerated population growth has been seen in recent years, and improvement and renewal of the water supply environment is indispensable as soon as possible.
- After handing over the facilities to NWSC, the following improvement points including the software side were confirmed.
- Improvement of the water supply circumstance is seen under so good technical and financial background that NWSC can independently plan and implement repair of water supply facilities. .
- The supply condition of spare parts has improved, and the maintenance level of the facilities is also improving.
- Improvement of salary payment system and working environment of staffs are progressing, and staff motivation for work is going to high.

Based on the above, the conditions under which the O&M of water supply facilities can be implemented without any problems are enumerated from the viewpoint of management, financial, and facility aspects as follows.

Operational aspect

I. The O&M entity is composed of appropriate personnel including human resources who has enough technical knowledge.
II. The entity has ability to conduct fine O&M.
III. The entity has financial and sales know-how.
IV. Salaries and working environments of staffs have been improved, and staff members have persistent labor motivation.
V. Build a good relationship with Water Authority and always share information.
VI. Stop the unreasonable involvement of Water Authority, diversion of funds, political use etc.
VII. Set appropriate water fee among stakeholders.

Financial aspect

I. It is fundamental that business produces profits.
II. Capability and funds are available for the entity to repair and improve.
III. Financial circumstances of the Water Authority are improved.
IV. Payment and savings of water fees in joint responsibility.
V. Secure savings for repairing, repairing and updating facilities and equipment.
VI. In order to increase the served population of water supply and to improve the collection rate of water fees, educational activities for users are necessary.

Facility side

I. There is no major problem in operation of water supply facilities, and maintenance and management are implemented permanently.
II. Stable power supply is secured.
III. Improve defects in facilities to decrease non-revenue water.
IV. Expand the network and develop plans to expand the business scope.

Table 1.3-39 Result of existing piped water facilities (Operated by WSSB+ Private Operators)

Name of Facility		Busenbatia Water Supply System	Busia Water Supply System	Kasanbira Water Supply Scheme	Masafu Water Supply Scheme	Ngora Water Supply System	Serere Piped Water Scheme	Tiryini & Kibuku Water Supply
O&M organization and		WSSB + P/O	WSSB + P/O	WSSB + P/O	WSSB + P/O	WSSB + P/O	WSSB + P/O	WSSB + P/O
Supplementary information		---	---	---	---	---	---	
Summary of the facility								
	Served population	31,000	60,000	25,000	25,000	30,000	Unknown	19,000
	Water source	3 Deep boreholes	7 Deep boreholes	1 Deep borehole	2 Deep boreholes	Surface water	1 Deep borehole	2 Deep boreholes
	Power supply	Commercial	Commercial	Commercial	Commercial	Commercial (for pumping river water)	Commercial	Commercial
	Power supply condition		---	---	Stable	Unstable	Unstable	
	Stand-by generator	1	Non	Yes	Yes	---	Uninterruptible power supply	Yes, but under broken down
	Number of connections	742	1,934	541	255	Unknown	162	483
	Water fee (UGX/m^3)	2,500	2,119 (Tap: 50UGX/20ℓ)	1,750 (Tap: 100UGX/20ℓ)	2,714 (Tap: 100UGX/20ℓ)	4,835 (Tap: 96UGX/20ℓ)	2,500	2,950 (Tap: 100UGX/20ℓ)
	Collection system of water fee	Users pay directly at P/O's local office.	Users pay at the P/O's local office based on metered usage volumes. Publc tap users pay in cash.	Care taker collects water fee at public tap.	Users pay at P/O's office or at the tap.	Care taker collects water fee at public tap.	Users pay at P/O's office.	Care taker collects water fee at public tap.
	Other issues	---	---	---	---	Constructed by support of UK	---	---
Situation of O&M/Challenges		One borehole is inactive due to no payment of commercial electricity fee	Design pumping volume is sometimes not secured during dry season.	Much water leakage from the elevated tank	Twice pumping per 3 days can supply enough water..	Large storage tank and gravitational distribution system allow water supply at some extents despite of occurrence of power outage.	P/O is in charge of minor repairs, but it is not conducted.	Relationship of mutual tras has been established between WSSB and P/O, and they conduct O&M in good cooperation.
		Some users pay their water fee only after water supply stopped.	Water thefts have happened usually.	P/O is expected only minor repairs.				Financial challenge allows minor repairs only.
Evaluation for the O&M organization		The P/O has not respected the contract contents.	The P/O has been evaluated for its high performance and the contract has maintained since 2006.	The performance is not good.	The P/O provided 10% of facility construction cost, and it has already aintained the facility for seven years. .	The P/O with high technical skills has been conducting highly transparent management.	The P/O's performance is not good. WSSB stopped their contracts every three years.	The P/O is highly transparent and trustworthy.
Company name of P/O		Trandit Ltd.	Jowa Engineering Services Ltd.	Basic Uganda Ltd.	Kol Kabulu Multiple Service	Sankawa Engineering Ltd.	Bisca (U) Ltd.	Mutaka Technical Service Ltd.

Table 1.3-40 Result of existing piped water facilities (Operated by WSSB)

Name of Facility		Blumba Water Supply Project	Kisozi Piped Water Supply Scheme	Nankoma Water Supply Scheme	Namwende Piped Water Scheme	Kiboga Town Water Supply System	Busalamu Water Supply System
O&M organization and Supplementary information		WSSB 6 years in operation	WSSB ---	WSSB Constructed in 2007	WSSB Constructed in 2006	WSSB (Town Council) Constructed in 1999	NGO Constructed in 2014
Summary of the facility							
	Served population	over 1,000	2,500	5,000 ~ 10,000	20,000	15,980	over 3,000
	Water source	1 Deep borehole	1 Deep borehole	1 Deep borehole	1 Deep borehole	2 Deep boreholes	1 Deep borehole
	Power supply	Commercial	Commercial	Generator	Commercial	Commercial	Solar
	Power supply condition	Unstable	Unstable	---	Unstable		
	Stand-by generator	None	None	---	None	Yes	None
	Number of connections	35	75	52 ~ 110	388	148	11
	Water fee (UGX/m^3)	2,200	3000 (Tap: 100UGX/20ℓ)	Tap: 80UGX/20ℓ	Kiosk: 1,300 Institution: 1,300 (Tap: 100UGX/20ℓ)	Kiosk: 2,500 Domestic: 3,000 (Tap: 100UGX/20ℓ)	100UGX/20ℓ
	Collection system of water fee	?	Care taker collects water fee at public tap	Town Agent collects water fee. Care taker collects water fee at publis tap.	Care taker collects water fee at public tap.	Each vendor/user of tap pays water fee to the bank every month.	Care taker sell water in cash.
	Other issues	---	---	---	---	Constructed by Japan Grant	---
Situation of O&M/Challenges		No person with O&M skills in the WSSB so that daily maintenance is weak.	Revenue is so small that cost for renewal of equipment and repairs can not be afforded.	The facility has not been in operation since December 2013 due to broken down of the submersible pump. .	The elevated tank is located in the slum area and garbage is accumulated around the fence of the tank.	Longer pump operation over the design value in order to meet the increasing water demand.	A NGO currently conduct the O&M with training for villagers.
			Only one plumber is working for practical issues so that he can not treat necessary but additional works.	No human resources capable of handling facility in both the WSSB and Sub-county.	Reports on O&M will be submitted to DWO, U/O, WSSB and internal auditor quarterly.	The facility has been well managed financilally, but it is not enough to cover large-scale repairs.	Pre-sensitization brought good effect on smooth collection of the water fees.
Evaluation for the O&M organization		O&M is not enough. Finance balance is also not good, and it results in lack of budget for repairs.	O&M is not enough	O&M is not enough	.The WSSB conducts O&M agressively, especially the chairman has charismatic power.	The WSSB carries out exemplary O&M.	Currently, a NGO conducts O&M, and there are no problems occurred.
Company name of P/O		---	---	---	---		Water Mission

Table 1.3-41 Result of existing piped water facilities (Operated by NWSC)

Name of Facility		Bugiri Urban Water Supply System	Buwumi Town Water Supply System	Kaliro Urban Water Supply System	Kamuli Water Supply System
O&M organization and Supplementary information		NWSC Taking over from P/O (Jan 2015～)	NWSC Taking over from WSSB	NWSC Taking over from P/O (2014～)	NWSC Taking over from P/O (Jun 2015～)
Summary of the facility					
	Served population	31,000	10,000以上	around 40,000	around 10,000
	Water source	3 Deep boreholes	1 Deep borehole	2 Deep boreholes	3 Deep boreholes/ Surface water
	Power supply	Commercial	Commercial	Commercial	Commercial
	Power supply condition	Unstable	---	Unstable and voltage fluctuation remarkable	
	Stand-by generator	Yes	Yes	Yes	Yes
	Number of connections	約 900	137	445	1,680
	Water fee (UGX/m^3)	Kiosk: 1,377 Domestic: 2,236 Institution: 2,752 Commercial: 3,376 (Tap: 100UGX/20ℓ)	Unified price 2,500	Domestic: 2,365 Institution: 2,752 Commercial: 3,376 (Tap: 200UGX/20ℓ)	Domestic: 2,234 Institution: 2,900 Commercial: 3,084 (Tap: 34UGX/20ℓ)
	Collection system of water fee	---	---	---	---
	Other issues	Constructed by China.	In operation from Nov. 2015	Extension plan due to large yield of water source	Constructed by local government in 1962
Situation of O&M/Challenges		The power of the booster pump is weak so that water can not be delivered to the end pipes.	No information because the operation has just started.	A lot of broken down of pumping equipment	The amount of supplied water is insufficient so that the reservoir get into empty in the morning.
		Aging of the facility is progressing, and repair and updating of these are the challenges.	Promotion of change water use from existing water sources such as hand pumps to new facility.		Aging of the facility is progressing.
Evaluation for the O&M organization		At the time operated by P/Os, there were sometiems no transparancy in financial issues. But NWSC has kept transparancy.	The facility is on the stage of test run so tthat no evaluation can be done.	At the time operated by P/Os, there happend no water supply in two months, and delay of the salary payment from 4 to 5 months	The P/O did not keep transparacy on financial balance.
Company name of P/O		MS Kagule Engineering Service Ltd	---	Mutkla Technical Services Ltd.	Kagulu MS Ltd.

1-4 Environmental and Social Considerations

The Project has been categorized as B on “JICA Guidelines for Environmental and Social Considerations (April 2010)” (hereinafter referred to as “JICA Environmental Guidelines”), because of the following reasons.

- The Project does not correspond to large scale project of the water supply sector in JICA Environmental Guidelines.
- The Project sites are not located in a sensitive area, nor has sensitive characteristics under the JICA Environmental Guidelines.
- Potential adverse impacts on the environment by implementation of the Project are not likely to be significant.

Accordingly, the environmental and social considerations survey and Initial Environment Examination (IEE) for the major environmental and social impacts was conducted in the target nine (9) RGCs.

1-4-1 Environmental Impact Assessment

1-4-1-1 Baseline Condition for Environmental and Social Considerations

Baseline information/data on natural and social conditions of the Project sites are already described in the sections above. Additional information/data for the considerations are followings;

- No protected areas and forest reserves in the Project sites.
- No protected or endangered species in the Project sites
- No cultural property, historic monument and heritage in the Project sites
- Soga and Teso are main ethnic groups in the Project site
- Religious groups are mainly Catholics and Protestants of Christianity and Muslim/Muslimah.
- No involuntary resettlement happen by the Project

1-4-1-2 EIA Framework and the Examining Authority in Uganda

EIA framework in Uganda is shown in Figure 1.4-1, and the responsible authority for the environmental examination is National Environment Management Authority (NEMA).

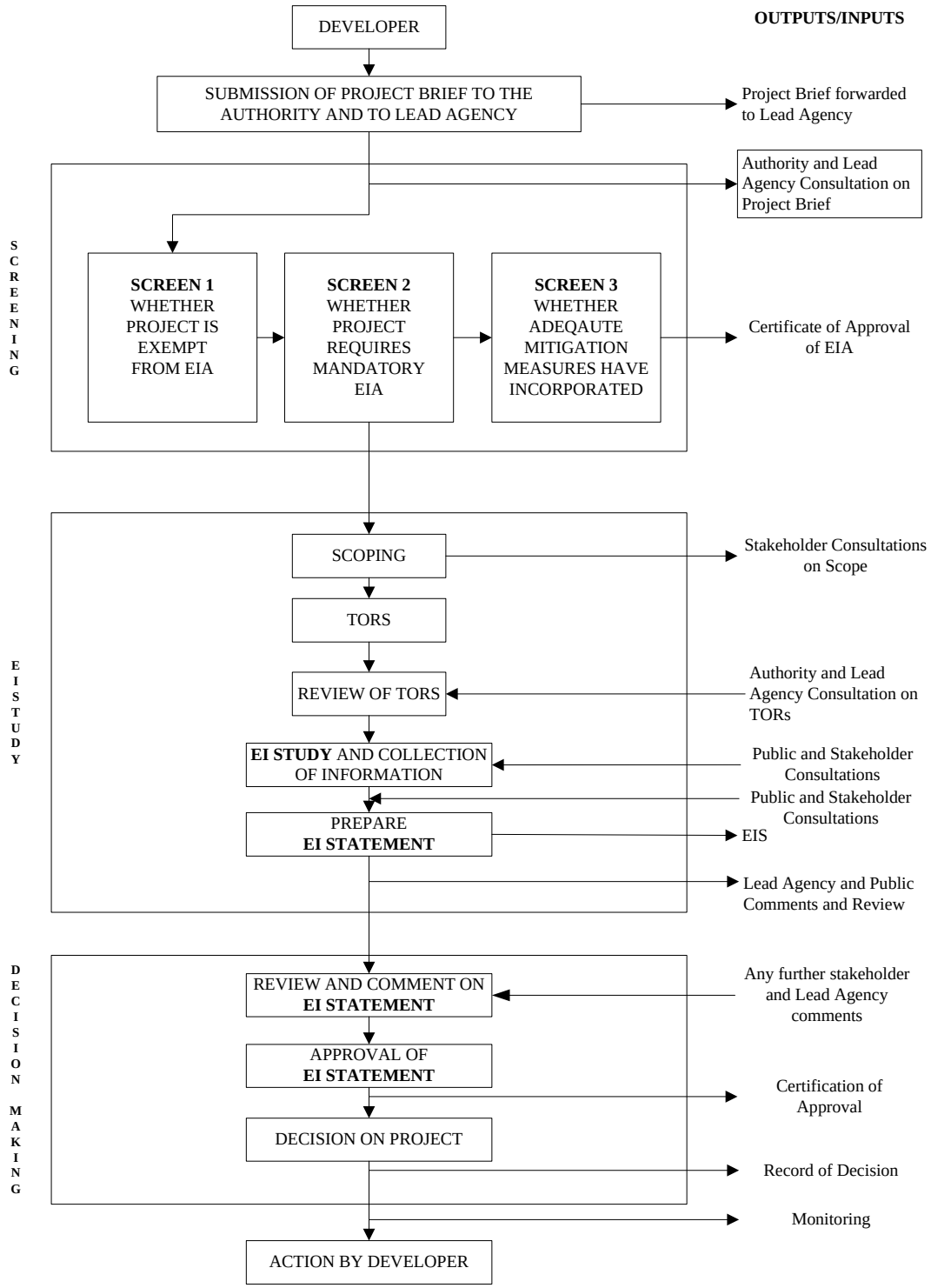


Figure 1.4-1 EIA Framework in Uganda

1-4-1-3 Comparative Consideration of Alternative Plans (Including Zero Option)

The Project intends construction of piped water supply facilities, and the water sources are "groundwater" pumped from deep boreholes that were drilled in the Survey and the development study, and from a deep borehole to be drilled during the detailed design stage.

The water sources are "groundwater" pumped from deep boreholes that were drilled in the Survey and the development study, and from a deep borehole to be drilled during the detailed

design stage. The possible alternative water source except groundwater is surface water, which is around 20 - 30 km far away from the water supply areas of the Project, so that the plan needs additional installation of transmission pipes of this distance.

In addition to this, it is also necessary to construct water purification plants for producing safe water from the transmitted surface water. Therefore, there is little possibility of implementation of this alternative plan due to the high project cost in comparison with the number of beneficiaries.

Accordingly, there is no alternative plan of the Project to be expected, and the plans for comparative consideration are to be "Zero Option" and "implementing the Project". The result of comparative consideration is shown in following table with description of positive and adverse impacts caused by each plan. These Impact items comply with JICA guidelines, and two impact items, which are “Health and Hygiene” of social environment item and “Drought” of a risk of disaster, are added to these items.

Table 1.4-1 Result of Comparative Consideration on Zero Option and Implementing the Project

Impact item			Zero Option		Implementing the Project	
			Impacts	+/-	Impacts	+/-
Pollution	1	Air Pollution	No change		Generation of sand dust from construction vehicles is temporarily anticipated.	-
	2	Water Pollution	No change		No impact is anticipated.	
	3	Waste	No change		Excavation work may produce surplus soil and rocks.	-
	4	Soil Contamination	No change		No impact is anticipated.	
	5	Noise and Vibration	No change		Possibility of temporal generation of noise and vibration during construction of the water supply facilities.	-
	6	Subsidence	No change		No possibility of subsidence due to distribution of bedrock from very shallow depth.	
	7	Odor	No change		No impact is anticipated.	
	8	Sediment	No change		No impact is anticipated.	
Natural Environment	9	Protected Areas	No change		No impact is anticipated.	
	10	Ecosystem	No change		No impact is anticipated.	
	11	Hydrology	No change		Pumping amount of groundwater will increase. If the pumping amount exceeds the safe yields of source boreholes, there may be adverse impact on their surrounding groundwater levels.	-
	12	Topography and Geology	No change		No impact is anticipated.	

Impact item			Zero Option		Implementing the Project	
			Impacts	+/-	Impacts	+/-
Social Environment	13	Resettlement and Land Acquisition	No change		No need of resettlement. Land acquisitions are not required because the communities in target RGCs voluntarily provide necessary lands for the construction of the water supply facilities. However, land use agreement must be obtained from relevant land owners.	-
	14	Poor Classes	Conditions about health and hygiene, and safe water supply for poor classes will be deteriorated.	-	Conditions about health and hygiene, and safe water supply for poor classes will be improved. On the other hand, some poor people may not be able to pay water fee.	+/-
	15	Ethnic Minorities and Indigenous Peoples	No change		No impact is anticipated.	
	16	Local Economy such as Employment and Livelihood, etc.	No change		Livelihoods of the relevant communities' will be improved. On the other hand, income reduction may happen among water sellers.	+/-
	17	Land Use and Utilization of Local Resources	No change		There are few changes of land use because the Project scale is small. Positive impact on utilization of local resources is expected due to utilizing groundwater resources effectively.	+
	18	Water Usage	Condition of safe water supply will be deteriorated.	-	Condition of safe water supply is improved.	+
	19	Health and Hygiene	Condition of health and hygiene will be deteriorated.	-	Condition of health and hygiene is improved.	+
	20	Existing Social Infrastructure and Services	No change		Condition of safe water supply is to be improved. Traffic obstruction may happen during pipe installation works in the construction phase.	+/-
	21	Local Communities and Decision-making Institutions	Trustworthy relationships among communities, local governments and DWD will decrease.	-	Trustworthy relationships among communities, local governments and DWD will increase.	+
	22	Misdistribution of Benefit and Damage	No change		Improvement of access condition to safe water will increase fair distribution of benefit.	+
	23	Local Conflict of Interest	Frequency of competition on water usage among local communities may increase.	-	Frequency of competition on water usage among local communities will decrease. On the other hand, objections could be raised by residents that has used water from existing wells with free of charge or that can't pay water fee.	+/-
	24	Cultural Heritage	No change		No adverse impact on cultural heritage is expected.	

Impact item			Zero Option		Implementing the Project	
			Impacts	+/-	Impacts	+/-
Social Environment	25	Landscape	No change		Few adverse impacts on landscape are expected because of the small scale of the Project.	
	26	Gender	No change		Women and children can save their time for fetching water.	+
	27	Children's Rights	No change		Children can save their time for fetching water.	+
	28	Infectious Diseases such as HIV/AIDS	No change		Opportunity of prevailing infectious diseases such as HIV/AIDS in the relevant communities may increase due to influx of construction workers into the Project site.	-
	29	Working Environment	No change		Occasion of crimes may increase due to inflow of construction workers.	-
Others	30	Accidents	No change		Traffic accidents may happen during construction phase.	-
	31	Trans-boundary Impact and Climate Change	No change		Out of scope	
	32	Drought	No change		Drought damage is reduced.	+

(Legend) +: Positive impact, -: Adverse impact, +/-: Positive and Adverse impact

1-4-1-4 Scoping and TOR on Supplementary Survey for Initial Environmental Examination

In compliance with JICA Environmental Guidelines, the positive/adverse impacts resulting from the Project were estimated with applying the scoping matrix. As a result of the scoping, it was considered appropriate to select the following twelve (12) items.

Table 1.4-2 Scoping Results

	Impact Item
Pollution :	Air pollution, Waste, Noise and vibration (3 items)
Natural Environment :	Hydrology (1 item)
Social Environment :	Land acquisition, Poor Classes, Local Economy such as Employment and Livelihood, etc., Existing social infrastructure and services, Local Conflict of Interest, Infectious diseases such as HIV/AIDS, Working environment (including safety) (7 items)
Others :	Accidents (e.g. traffic accident) (1 tem)

TOR of a supplemental environmental survey was prepared for implementing IEE on the selected impacts items above mentioned. The contents of the TOR are shown in following table.

Table 1.4-3 TOR of the Supplemental Environmental Survey

Impact Item	Survey Item	Survey Method
Air Pollution	1) Environmental standard	1) Collection of existing standards and measured data on air pollution
	2) Impacts during construction	2) Confirmation of items, periods, locations and areas of each construction works, types of construction machineries, locations of machinery operation, and those operating periods
Waste	1) Disposal methods of surplus	1) Field survey and interviews

Impact Item	Survey Item	Survey Method
	soil and rock	
Noise and Vibration	1) Environmental standard 2) Distance from construction site to residential area and public facilities. 3) Impacts during construction	1) Collection of existing standards and measured data on noise and vibration 2) Field survey and interviews 3) Confirmation of contents of construction, field survey
Hydrology	1) Safe yields of source boreholes	1) Collection of existing data and the pumping test result in the Project
Land Acquisition	1) Procedures to provide lands	1) Relevant existing cases and laws
Poor Classes	1) Payable maximum amount of water fee	1) Social survey results in the Project.
Local Economy such as Employment and Livelihood, etc.	1) Experience of purchasing water from water sellers, and times a year, number of jerrycans at a time and the price for one jerrycan	1) Social survey results in the Project
Existing Social Infrastructure and Services	1)Traffic condition in the Project sites and the surroundings	1) Field survey
Local Conflict of Interest	1) Amount of willingness to pay on water fee 2) Payable maximum amount of water fee	1) Social survey results in the Project
Infectious Diseases such as HIV/AIDS	1) Attack rate of infectious disease such as HIV in the Project site	1) Collection of existing data
Working Environment (including safety)	1) Occupational safety measures	1) Collection of similar cases
Accidents (e.g. traffic accident)	1) Distribution of existing residences and public facilities	1) Collection of existing data, field survey

1-4-1-5 Result of Initial Environmental Examination

The impacts on the environment by the Project were examined with regard to the 9 items those were selected through the scoping. This Initial Environmental Examination (IEE) result is shown in the following table.

Table 1.4-4 IEE Results

Impact item			Evaluation at the scoping		Impact assessment based on the survey results		Reasons (phase-wise in the Project)
			Pre-/construction	Operation	Pre-/construction	Operation	
Pollution	1	Air Pollution	C-	D	B-	D	**Construction**: Considering the amount of construction machineries and vehicles, no significant impact on air pollution is anticipated. However, generation of sand dust is anticipated at un-paved road. **Operation**: No impact on air pollution is anticipated.
	3	Waste	C-	D	B-	D	**Construction**: It is anticipated that excavation work will produce surplus soil

Impact item			Evaluation at the scoping		Impact assessment based on the survey results		Reasons (phase-wise in the Project)
			Pre-/construction	Operation	Pre-/construction	Operation	
							and rocks. **Operation**: No impact on waste is anticipated.
	5	Noise and Vibration	B-	D	B-	D	**Construction**: Adverse impact on noise and vibration resulting from construction activities is anticipated to some extent. **Operation**: No impact on noise and vibration is anticipated.
Natural Environment	11	Hydrology	D	C-	D	B-	**Construction**: No activity that affects hydrology is anticipated. **Operation**: The design to use groundwater within safe yields of each borehole was developed. However, if pumping amount exceeds the safe yield, adverse impact on the groundwater level around the Project site and its surrounding is anticipated.
Social Environment	13	Land Acquisition	C-	D	D	D	**Construction**: According to a custom of a rural water supply projects in Uganda, local governments of district and sub-county have to prepare the required lands, and community assists to provide the lands. In accordance with this custom, the lands for the water supply facilities in the Project are provided with free of charge. Additionally it was confirmed that the land provision procedure in the Project complied with the 8 criteria in ”Voluntary Land Donation for Community Projects“ of “Involuntary Resettlement Sourcebook” issued by World Bank. **Operation**: No impact on land acquisition is anticipated.
	14	Poor Classes	D	B+/B-	D	B+/B-	**Construction:** No impact on poor classes is anticipated. **Operation:** It is necessary to develop mitigation measure for setting water fee with consideration for poor classes.
	16	Local Economy such as Employment and Livelihood, etc.	D	B+/B-	D	B+/B-	**Construction:** No impact on local economy such as employment and livelihood etc. is anticipated. **Operation:** It is necessary to develop mitigation measures to prevent income reduction of water sellers.
	20	Existing Social Infrastructure and Services	C-	B+	B-	B+	**Construction**: Volumes of road traffics in and around RGCs are very small so that impacts on existing social infrastructure and services are small. However, pipe installation works sometimes need one-side traffic regulations. **Operation**: No impact on existing social

Impact item			Evaluation at the scoping		Impact assessment based on the survey results		Reasons (phase-wise in the Project)
			Pre-/construction	Operation	Pre-/construction	Operation	
							infrastructure and services is anticipated. Operation of the constructed piped water supply facilities can bring load reduction of water fetching to women and children, and supplied safe water can improve hygiene condition in the target communities.
	23	Local Conflict of Interest	D	B+/B-	D	B+/B-	**Construction:** No impact on local conflict of interest is anticipated. **Operation:** It is necessary to develop mitigation measures for preventing vandalism against piped water supply facilities.
	28	Infectious Diseases such as HIV/AIDS	C-	D	B-	D	**Construction**: It is necessary to develop mitigation measures to prevent increase of infectious diseases patients. **Operation**: No impact on infectious diseases such as HIV/AIDS is anticipated.
	29	Working Environment (including safety)	C-	D	B-	D	**Construction**: It is necessary to develop mitigation measures to prevent occurrences of occupational accidents and crimes. **Operation**: No impact on working environment is anticipated.
Others	30	Accidents (e.g. traffic accident)	C-	D	B-	D	**Construction**: It is necessary to develop mitigation measures to prevent occurrence of traffic accidents. **Operation**: No impact on accidents is anticipated.

A+/- : Significant positive/adverse impact is anticipated.
B+/- : Positive/adverse impact is anticipated to some extent.
C+/- : Extent of impact is unknown (Examination is needed).
D : No impact or negligibly small impact is anticipated.

1-4-1-6 Mitigation Measures

As described above, significant adverse impacts were not anticipated during both construction and operation phase, but small impacts. These small adverse impacts can be mitigated or minimized by implementing mitigation measures during the construction and operation phases. The developed mitigation measures are shown in following table.

Table 1-4.5 Mitigation Measures against Anticipated Adverse Impacts

Adverse Impacts	Proposed Mitigation Measures	Implementing Organizations	Responsible Organizations
Construction Phase			
Air Pollution	<Sand Dust from un-paved road and construction material during the transportation> ・ To reduce dust by sprinkling water ・ To cover truck bed by scattering prevention sheet ・ To set reception for complaints and responses/treatment for those complaints.	Contractor	Implementing Organization

Adverse Impacts	Proposed Mitigation Measures	Implementing Organizations	Responsible Organizations
Waste	<Surplus soil and rocks resulting from excavation works> ・ To ensure disposal of soil and rocks at the pre-determined disposal sites ・ To set reception for complaints and responses/treatment for those complaints.	Contractor	Implementing Organization
Noise and Vibration	<Noise and vibration caused by operation of construction machinery and vehicles> ・ To make drivers to operate machinery carefully, to limit speeds of vehicles at dusty roads, and to do regular maintenance of machinery and vehicle ・ To select low noise machinery. ・ To set reception for complaints and responses/treatment for those complaints.	Contractor	Implementing Organization
Existing Social Infrastructure and Services	<Traffic obstruction by pipe installation works in the road area > ・ To disclose work schedule in advance ・ To instruct driver and worker to keep traffic safety ・ To use jacking method for pipe installation works crossing main paved roads ・ To secure one way traffic for pipe installation works crossing un-paved road. ・ To set reception for complaints and responses/treatment for those complaints.	Contractor	Implementing Organization
Infectious Diseases such as HIV/AIDS	<Infectious disease due to the influx of workers> ・ To conduct sensitization activity for construction workers regarding risk of infectious diseases	Contractor	Implementing Organization
Working Environment	<Occupational accident during construction> ・ To provide safety training and education to workers. ・ To instruct workers to comply with the acts/regulations on working environment ・ To adopt and conduct actual safety measures <Crime by worker> ・ To conduct sensitization activity for workers on crimes.	Contractor	Implementing Organization
Accidents	<Traffic accident by operation of construction machinery and vehicles> ・ To disclose work schedule in advance. ・ To make drivers to operate machinery carefully, to limit speeds of vehicles at dusty roads, and to do regular maintenance of machinery and vehicle ・ To instruct driver and worker to keep traffic safety ・ To set reception for complaints and responses/treatment for those complaints.	Contractor	Implementing Organization
Operation Phase			
Hydrology	<Lowering of groundwater level>		Implementing Organization
	・ The developed plan of the piped water supply facilities allows pumping groundwater only within its safe yield so as	Consultant	

Adverse Impacts	Proposed Mitigation Measures	Implementing Organizations	Responsible Organizations
	not to adversely affect surrounding groundwater. ・ Training for WSSB on O&M of each water supply facility is to be conducted. in order to comply with the plan above mentioned.		
	・ To monitor the amount of pumped water	WSSB	
Poor Classes	・ To set water fee with consideration for poor classes.	WSSB	
Local Economy such as Employment and Livelihood, etc.	・ To employ water sellers as K/As and security guards preferentially.	WSSB	
Local Conflict of Interest	・ To moderate local conflicts by conducting following mobilization and sensitization activities elaborately in soft component: – keeping everyone informed and well-known on necessity of paying water fee, – setting water fee with consideration for poor classes, and – explaining to everyone on countermeasures against vandalism in the Project, and make them understood that the vandalism are not effective.	WSSB	

1-4-1-7 Monitoring Plan

According to the result of IEE, some adverse impacts are anticipated to some extent. Following table shows the monitoring plan developed for these impact items.

Table 1.4-6 Monitoring Plan

Impacts	Item	Monitoring point	Frequency	Responsible organization
Construction Phase				
Air Pollution	Generation status of sand dust by visual inspection	– Construction site	Once per week	Contractor
Waste	Disposal methods of surplus soil and rocks	– Construction site	Once per construction phase	Contractor
Noise	Degree of noise level (Max.)	– Construction site	At appropriate timings during construction, especially when high level noise is generated.	Contractor
Vibration	Degree of vibration level	– Construction site	At appropriate timings during construction, especially when high level vibration is generated.	Contractor
Existing Infrastructure	Generation status of traffic obstruction	– Construction site	Once per week	Contractor
HIV/AIDS	Attack rate	– Nearest Health Center	Once per month	Contractor
Working Environment	Number of occupational accidents and the reasons	– Construction site	Once per week	Contractor
Accidents	Number of traffic accidents and the reasons	– Construction site	Once per week	Contractor
Operation Phase				

Impacts	Item	Monitoring point	Frequency	Responsible organization
Hydrology	Amount of pumped water Amount of pumped water from existing hand pump wells around the water source borehole of the Project.	– Water source boreholes – Existing hand pump wells	Once per month	WSSB
Poor Classes	Purchase status of water by poor classes	– Kiosk	Once per month	WSSB
Local Economy such as Employment and Livelihood, etc.	Employment status of water sellers as K/As and security guard etc.	– Kiosk etc.	Once per month	WSSB
	Water purchasing status from water sellers	– RGC	Once per year	WSSB
Local Conflict of Interest	Occurrence status of vandalism against piped water supply facilities	– Piped water supply facilities	Once per month	WSSB

1-4-1-8 Stakeholder Meeting

DWD held the stakeholder meetings in the 9 RGCs with technical assistance by the Consultant Team.

The contents of the stakeholder meeting in each RGC are outlined as follows.

Table 1.4-7 Contents of Stakeholder Meeting

Organizer	Directorate of Water Development under Ministry of Water and Environment (DWD)
Facilitator	Rural Water Supply and Sanitation Department, Community Development Officer
Participant	District : LC5 Chairperson, CAO, Acting CAO, Member of District Water Office, Sub-County : LC3 Chairperson, Sub-County Chief, LC1 Chairperson, Community
Discussed Items	1) Objective of the stakeholder meeting 2) Purpose and component of the Project 3) Adverse impact anticipated by the Project implementation 4) Roles and responsibilities of the community under the implementation of the Project (Especially the land to be provided for the construction of water supply facilities) 5) Following items were mainly confirmed; ・ Safe water is to be provided in the core area of the target RGC. ・ Water is to be supplied at kiosks and yard taps. Yard taps are set in front of or in the yard of each public facility. ・ Location of the water source, transmission pipes, elevated tank, distribution pipes and kiosks. Location of solar panels if necessary. 6) Designation of members of the Project Implementation Committee 7) Signing on the Memorandum of Understanding 8) As a result of the meeting, basic consensus to implement the Project was obtained.
Other	The Consultant Team assisted to explain the plan of the piped water supply system and answer questions on the plan.

The objection against the Project was not raised in all the meetings. It was found that all the participants including the relevant communities requested to implement the Project promptly.

1-4-2 Land Acquisition and Resettlement

1-4-2-1 Necessity of Land Acquisition and Resettlement

No land acquisition or resettlement is necessary in the Project. The lands required for the Project were provided with free of charge.

(1) Process to provide the Lands in the Project

The process to provide the lands for the Project is as follows.

Step 1: The draft layout plan of the water supply system was developed so that "Public Lands" were preferentially allocated for elevated tank, and "Public Lands" or "Vacant lots" were allocated for the other small facilities. The areas of the required lands were approximately 3m×3m for one borehole, 30m×30m for an elevated tank and 3m×5m for a kiosk.

Step 2: The stakeholders of MOWE, DWO and sub-county including parish chief, LC1 chairperson and persons in the relevant local community looked for the lands that could be provided around planned location of facilities in the draft layout plan.

Step 3: Agreements on land use for the water supply facilities were obtained from each land owner with the witnesses of stakeholders such as officers from MOWE and DWO, sub-county chief, parish chief and LCI chairperson. If refused, the process of Step2 was conducted again. With regard to the land where agreement on land use was obtained, it was confirmed whether the land provision procedure complied with 8 criteria described in "Voluntary Land Donation for Community Projects" in "Involuntary Resettlement Sourcebook, 2004" issued by World Bank.

(2) Criteria and Monitoring Results for Voluntary Land Donation

The activity to provide the lands voluntarily for the Project were monitored whether it complied with the 8 criteria described in above mentioned source book.

The contents of the 8 criteria were shown in the following table. The table also explained the activities for the Project to fulfill the criteria and the supplemental explanations.

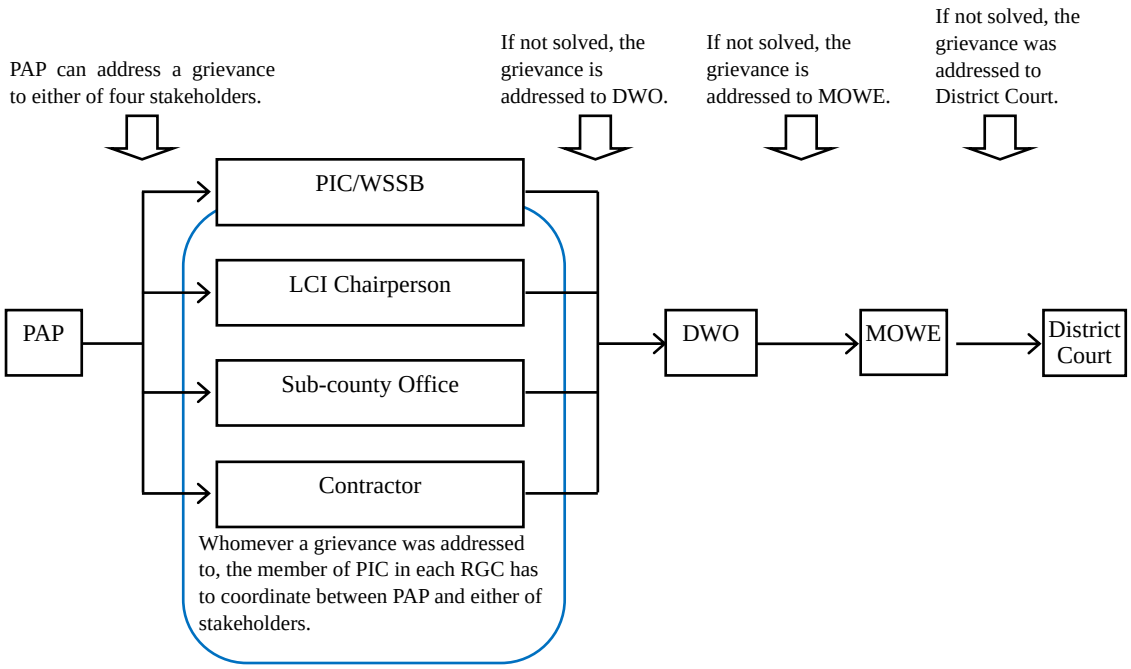
Table 1.4-8 The 8 Criteria on Voluntary Land Donations and Its Applied Situation

No.	Criteria	Activities for the Project	Notes
1.	The infrastructure must not be site specific.	The lands for the water supply facilities were not site specific. The lands were selected with the support of local community in each RGC.	The lands for the water supply facilities were smoothly selected due to enough vacant lots in RGC. The agreements on land use of the relevant land owners were obtained in written form.
2.	The impacts must be minor, that is, involve no more than 10 percent of the area of any holding and require no physical relocation.	Regarding the private land, it was confirmed that the provided area was no more than 10 percent of the owner's property.	It was confirmed by sub-county chief and parish chief who were familiar with the actual situation of local community because there was no public registration of land in rural area at present.

No.	Criteria	Activities for the Project	Notes
3.	The land required to meet technical project criteria must be identified by the affected community, not by line agencies or project authorities (nonetheless, technical authorities can help ensure that the land is appropriate for project purposes and that the Project will produce no health or environmental safety hazards).	The locations of the provided lands were confirmed by the land owners as well as stakeholders of the relevant district and sub-county and LC1 representative.	After the land owners confirm the locations of lands to be provided at each site, the agreements with location map on land use were signed.
4.	The land in question must be free of squatters, encroachers, or other claims or encumbrances.	It was confirmed that there were no squatters, encroachers, or other claims and encumbrances during the field survey in several terms a year.	Same as on the left.
5.	Verification (for example, notarized or witnessed statements) of the voluntary nature of land donations must be obtained from *each* person donating land.	The agreements on land use for the water supply facilities were obtained from the relevant land owners in writing form containing signatures of witnesses.	Same as on the left.
6.	If any loss of income or physical displacement is envisaged, verification of voluntary acceptance of community-devised mitigation measures must be obtained from those expected to be adversely affected.	The lands for the water supply facilities were selected so as not to cause any loss of income or physical displacement.	Same as on the left.
7.	If community services are to be provided under the Project, land title must be vested in the community, or appropriate guarantees of public access to services must be given by the private titleholder.	Provision of community services such as construction of schools and health centers is not planned in the Project.	Not applicable.
8.	Grievance mechanisms must be available.	Grievance mechanism was developed.	It is shown in the following paragraph “Grievance Mechanism”.

1-4-2-2 Grievance Mechanism

Grievance mechanism was developed in order to process complaints resulting from the Project. Grievance mechanism is shown in the following figure.



*Note: PAP: Project Affected Person, PIC: Project Implementation Committee

Figure 1.4-2 Grievance Mechanism

Chapter 2 Contents of the Project

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

2-1-1 Overall Goal and Project Purpose

2-1-1-1 Overall Goal

Uganda formulated "National Development Plan (2010/11 - 2014/15)" (NDP) in April 2010 and decided on a policy to consider the economic growth upon the vision, "A transformed Ugandan society from a peasant to a modern and prosperous country within 30 years." Under the policy, Uganda derived to improve significantly specific socio-economic development indicators associated with transformation, under the theme, "Growth, Employment and Socio-Economic Transformation for Prosperity."

As the successor policy, "Second National Development Plan (2015/16 - 2019/20)" (NDP II) was issued in June 2015. The theme of the plan is "Strengthening Uganda's Competitiveness for Sustainable Wealth Creation, Employment and Inclusive Growth", and it is aim to achieve middle income status by 2020.

Under this policy, one of main objectives is "Enhance human capital development", the rural water supply coverage as a development indicator will be improved from 65% (2012/13) to 79% (2019/20). However, it is still 67% in 2016.

In addition, in a Rural Growth Centre (RGC) where the population is concentrated in rural area as a trading center, water qualities of even their boreholes equipped with hand pumps are being concerned about getting pollution. The Government of Ugandan formulated "Long-term Strategy for Investment Planning, Implementation and Operation & Maintenance of Water Supply and Sanitation in Rural Growth Centres, 2005" (RGC strategy), and is promoting for RGCs to use piped water supply systems instead of hand pump wells to cope with this issue.

2-1-1-2 Project Purpose

The Project aims to improve the water supply coverage at 9 RGCs in 5 districts in Lake Kyoga Basin by constructing piped water supply systems, and the Project will contribute to improvement of living environment through improvement of water supply status.

2-1-2 Outline of the Project

Ugandan government requested to Japanese government to construct 20 water supply schemes in the target area. 11 RGCs out of 20 were rejected by reason of duplication of assistance by other donors and low efficiency. Finally, 9 RGCs were selected for the Project, and piped water supply schemes which use groundwater as water source will be constructed.

Additionally, to ensure effectiveness and sustainability of the constructed schemes, "Soft Component (technical assistance)" will be conducted by the staff of Ministry of Water and Environment (MOWE), Japanese consultant and local consultants. Targets of this activity are the members of Water Supply and Sanitation Board (WSSB), Scheme Operator (S/O) and Kiosk Attendant (K/A) who will be responsible for daily technical and financial management of the piped water scheme, and residents within the water supply service area of this scheme.

Table 2.1-1 Outline of Project

Item	Contents	Outline	
Construction	Construction of piped Water supply systems	1) Nambale RGC	(1) Water Source: 2 boreholes (2) Facility for well BH-1: Discharge: 50m^3/day Total head: 69.0m DC motor submersible pump: 7.25kW BH-2: Discharge: 15.6m^3/day Total head: 57.0m DC motor submersible pump: 1.82kW (stand-by) Riser pipe: Stainless Steel Pipe φ50mm (3) Solar Power Generation Facility Solar Power Module: 8.4kW（200W module x 42） Ancillary: Security light (Solar): 20W x 3 Guard House: 1, Fence (4) Elevated Reservoir Tank Steel Panel (50m^3), Tank bottom height: 20.0m Ancillary: Water level indicator, Drain pipe, Overflow pipe, Flow meter, Lightning rod (5) Kiosk: 6 places 3 taps/kiosk (13L/min), Flow meter, Soak pit Yard Tap (Public facility only): 12 facilities Each 1tap, Water supply pipe, Flow meter, Valve (6) Pipe line Transmission pipe: uPVC, DN160mm: 1,285.5m Distribution/supply pipe: uPVC, DN63mm-110mm: 4,265m
		2) Lambala RGC	(1) Water Source: 1 borehole (2) Facility for well BH-1: Discharge: 47m^3/day Total head: 69.0m DC motor submersible pump: 6.76kW Riser pipe: Stainless Steel Pipe φ50mm (3) Solar Power Generation Facility Solar Power Module: 7.2kW（200W module x 36） Ancillary: Security light (Solar): 20W x 2 Guard House: 1, Fence (4) Elevated Reservoir Tank Steel Panel (47m^3), Tank bottom height: 20.0m Ancillary: Water level indicator, Drain pipe, Overflow pipe, Flow meter, Lightning rod (5) Kiosk: 5 places 3 taps/kiosk (13L/min), Flow meter, Soak pit Yard Tap (Public facility only): 8 facilities Each 1tap, Water supply pipe, Flow meter, Valve (6) Pipe line Transmission pipe: uPVC, DN160mm: 483m Distribution/supply pipe: uPVC, DN63mm-110mm: 2,338m

Item	Contents	Outline	
		3) Naigobya RGC	(1) Water Source: 1 borehole (2) Facility for well BH-1: Discharge: 46m^3/day Total head: 77.0m DC motor submersible pump: 2.2kW Riser pipe: Stainless Steel Pipe φ50mm (3) Elevated Reservoir Tank Steel Panel (69m^3), Tank bottom height: 10.0m Ancillary: Water level indicator, Drain pipe, Overflow pipe, Flow meter, Lightning rod (4) Kiosk: 7 places 3 taps/kiosk (13L/min), Flow meter, Soak pit Yard Tap (Public facility only): 9 facilities Each 1tap, Water supply pipe, Flow meter, Valve (5) Pipe line Transmission pipe: uPVC, DN160mm: 1,035m Distribution/supply pipe: uPVC, DN63mm-110mm: 5,367m
		4) Kyanvuma RGC	(1) Water Source: 1 borehole (2) Facility for well BH-1: Discharge: 88m^3/day Total head: 111.0m DC motor submersible pump: 5.5kW Riser pipe: Stainless Steel Pipe φ50mm (3) Elevated Reservoir Tank Steel Panel (132m^3), Tank bottom height: 15.0m Ancillary: Water level indicator, Drain pipe, Overflow pipe, Flow meter, Lightning rod (4) Kiosk: 9 places 3 taps/kiosk (13L/min), Flow meter, Soak pit Yard Tap (Public facility only): 12 facilities Each 1tap, Water supply pipe, Flow meter, Valve (5) Pipe line Transmission pipe: uPVC, DN160mm: 4,872m Distribution/supply pipe: uPVC, DN63mm-110mm: 5,388m

Item	Contents	Outline	
		5) Kasassira RGC	(1) Water Source: 1 borehole (2) Facility for well BH-1: Discharge: 271m^3/day Total head: 77.0m DC motor submersible pump: 7.5kW Riser pipe: Stainless Steel Pipe φ50mm (3) Elevated Reservoir Tank Steel Panel (271m^3), Tank bottom height: 17.5m Ancillary: Water level indicator, Drain pipe, Overflow pipe, Flow meter, Lightning rod (4) Kiosk: 11 places 3 taps/kiosk (13L/min), Flow meter, Soak pit Yard Tap (Public facility only): 11 facilities Each 1tap, Water supply pipe, Flow meter, Valve (5) Pipe line Transmission pipe: uPVC, DN160mm: 1,265m Distribution/supply pipe: uPVC, DN63mm-110mm: 6,505.2m
		6) Kameke RGC	(1) Water Source: 1 borehole (2) Facility for well BH-1: Discharge: 42m^3/day Total head: 80.0m DC motor submersible pump: 7.02kW Riser pipe: Stainless Steel Pipe φ50mm (3) Solar Power Generation Facility Solar Power Module: 7.2kW（200W module x 36） Ancillary: Security light (Solar): 20W x 3 Guard House: 1, Fence (4) Elevated Reservoir Tank Steel Panel (42m^3), Tank bottom height: 15.0m Ancillary: Water level indicator, Drain pipe, Overflow pipe, Flow meter, Lightning rod (5) Kiosk: 7 places 3 taps/kiosk (13L/min), Flow meter, Soak pit Yard Tap (Public facility only): 11 facilities Each 1tap, Water supply pipe, Flow meter, Valve (6) Pipe line Transmission pipe: uPVC, DN160mm: 1,920m Distribution/supply pipe: uPVC, DN63mm-110mm: 3,644.2m

Item	Contents	Outline	
		7) Kapala RGC	(1) Water Source: 2 boreholes (2) Facility for well BH-1: Discharge: 55.5m^3/day Total head: 77.0m DC motor submersible pump: 3.7kW BH-2: Discharge: 18.5m^3/day Total head: 73.0m DC motor submersible pump: 1.5kW Riser pipe: Stainless Steel Pipe φ50mm (3) Elevated Reservoir Tank Steel Panel (111m^3), Tank bottom height: 15.0m Ancillary: Water level indicator, Drain pipe, Overflow pipe, Flow meter, Lightning rod (4) Kiosk: 7 places 3 taps/kiosk (13L/min), Flow meter, Soak pit Yard Tap (Public facility only): 12 facilities Each 1tap, Water supply pipe, Flow meter, Valve (5) Pipe line Transmission pipe: uPVC, DN160mm: 3,003.5m Distribution/supply pipe: uPVC, DN63mm-110mm: 3,523.2m
		8) Buseta RGC	(1) Water Source: 1 borehole (2) Facility for well BH-1: Discharge: 61m^3/day Total head: 55.0m DC motor submersible pump: 6.99kW Riser pipe: Stainless Steel Pipe φ50mm (3) Solar Power Generation Facility Solar Power Module: 7.2kW（200W module x 36） Ancillary: Security light (Solar): 20W x 2 Guard House: 1, Fence (4) Elevated Reservoir Tank Steel Panel (61m^3), Tank bottom height: 17.5m Ancillary: Water level indicator, Drain pipe, Overflow pipe, Flow meter, Lightning rod (5) Kiosk: 9 places 3 taps/kiosk (13L/min), Flow meter, Soak pit Yard Tap (Public facility only): 11 facilities Each 1tap, Water supply pipe, Flow meter, Valve (6) Pipe line Transmission pipe: uPVC, DN160mm: 862m Distribution/supply pipe: uPVC, DN63mm-110mm: 5,583.3m

Item	Contents	Outline	
		9) Kidetok RGC	(1) Water Source: 2 boreholes (2) Facility for well BH-1: Discharge: 36m^3/day Total head: 91.0m DC motor submersible pump: 3.7kW BH-2: Discharge: 72m^3/day Total head: 91.0m DC motor submersible pump: 5.5kW Riser pipe: Stainless Steel Pipe φ50mm (3) Elevated Reservoir Tank Steel Panel (162m^3), Tank bottom height: 17.5m Ancillary: Water level indicator, Drain pipe, Overflow pipe, Flow meter, Lightning rod (4) Kiosk: 9 places 3 taps/kiosk (13L/min), Flow meter, Soak pit Yard Tap (Public facility only): 13 facilities Each 1tap, Water supply pipe, Flow meter, Valve (5) Pipe line Transmission pipe: uPVC, DN160mm: 2,804m Distribution/supply pipe: uPVC, DN63mm-110mm: 6,294.6m
Soft-Component	Capacity Building of Operation and Maintenance for water supply facilities	・Assist establishing WASSB ・Training and Education for the member of WSSB (Management, etc.) ・Recruitment of Scheme Operator (SO) and Tap Attendants (TA) ・Training and Education for SO (Technical daily check, Collection and management of water fee, Reporting for management, etc.) ・Training and Education for TA (Daily management of Taps and Soak pit, Collection of water fee, Account book) ・Education for residents about water and sanitation	

2-2 Outline Design of the Requested Japanese Assistance

2-2-1 Design Policy

The outline design of the Project is prepared based on the following policies.

2-2-1-1 Basic Policy

i) 20 RGCs presented on the request of the Government of Uganda dated July 2011 for the provision of piped water supply facilities are surveyed and the RGCs of which facilities have been already provided and determined for the implementation are excluded. The remaining RGCs shall be prioritized and those considered to be appropriate for the grant project of Japan are selected for implementation.

ii) The piped water supply facilities shall be provided as requested including water sources, transmission and distribution pipelines, reservoirs (elevated tanks) and service facilities.

iii) Target year of the Project is set for 2022, three (3) years after the expected completion of the Project.

iv) Any private connection is not provided under the Project, and yard tap connections are provided only for the public facilities such as schools, hospitals and churches. The yard tap connection will be furnished with supply pipes, a water meter and a water tap with stand pipe. The pipelines and taps additionally required in the yard of applicant shall be provided by the responsibility of the applicant.

2-2-1-2 Policy for Natural Conditions

i) Since most of the groundwater in the target RGCs was found to have acidic properties as a result of water quality analyses conducted, the pumping equipment and pipe materials shall be the acid resistant.

ii) The average sunshine hour in Lake Kyoga basin is calculated to be 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 for six (6) hour-generation in case the solar power generation system is adopted.

iii) In case that the test boreholes drilled in the previous development study are used for the water sources of the Project facilities, cleaning, removal of dropped objects, aquifer tests and water quality analyses will be conducted in the course of detailed survey in order to confirm the availability and safety of the source water since it has passed five (5) years after drilling of such boreholes.

iv) Since thunderstorms occur frequently in Lake Kyoga basin 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.

2-2-1-3 Policy for Socio-economic Conditions

i) Most of the villagers use the borehole water free of charge, and their awareness on safe water and necessity of compensation for obtaining safe water are considered poor and insufficient. Therefore, in the construction of water supply facilities it is required to provide the villagers with training and education activities to facilitate the awareness revolution of villagers toward the sustainable operation and maintenance of the facilities. Monitoring of the situation of villagers activities is also required to be conducted in the post construction stages at least during the Project implementation period.

ii) 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.

iii) In case the commercial power supply is used for power source, it is indispensable to avoid the suspension of payment for power charge. The operation hour of pump units has to be planned to lift the groundwater up in the time of which tariff rate prepared by UMEME is the lowest in a day, and the training and guidance on the operation of the pump units are conducted for the scheme operators in the course of the software assistance.

iv) To avoid the power outage occurring frequently, the operation hour of the pumping units is set as short as possible and the measures to increase the capacities of elevated tanks are required to be taken.

2-2-1-4 Policy for Construction Conditions

i) As mentioned in Section 2-2-1-5, local contractors are utilized in the construction of 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) The vehicles and equipment requested are not procured under the Project since the Project budget is quite limited.

2-2-1-5 Policy for Utilization of Local Contractors

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 factories 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.

2-2-1-6 Policy for Operation and Maintenance

i) The operation and maintenance of piped water supply facilities are conducted under the responsibility of Water Supply and Sanitation Board (WSSB) to be established under the administration of the respective sub-county, and the water is sold at water kiosks with 20L jerrycans. The yard tap connections are also provided for the public facilities under the Project. The collection of water charge, operation and maintenance are conducted by the scheme operator (private) to be hired by WSSB under the supervision of WSSB. The various technical and management supports are considered indispensable for the proper operation and maintenance of the facilities, and then it is considered prerequisite for each RGC to belong to Umbrella organization.

ii) In order to assure the sustainability of the facilities under the Project, the activities necessary for establish the operation and maintenance organization are conducted for the targets of WSSB and populations therein in the course of soft component. Scheme operators to be hired by WSSB including kiosk attendants are also trained on technologies and know-how for operation and maintenance of the facilities.

2-2-1-7 Policy for Grade of Facilities, Etc.

i) The sizes of water supply facilities are determined based on the following consumption per capita of Water Supply Design Manual (2013).

Table 2.2-1 Per Capita Consumption of Uganda

Projected Population	Consumption per Capita (L/day)
Population <= 5,000	20
5,000 < Population <=20,000	35
20,000 < Population	50

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 not 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 WSSB level operation and maintenance of the piped water supply facilities is determined comparing the easiness and costs of construction, operation and maintenance among diesel generation, solar power generation and commercial electricity supply. The diesel engine generator is considered only for the emergency case, because it may not be substantially used due to high price of fuel.

iv) In case that the solar power generation system is applied, the security measures such as guard house, security light and 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 water distribution will be made by gravity flow from the elevated water tank.

vi) The elevated tanks are of steel panels with steel frames to reduce the installation period at site as well as the construction period.

vii) Each water kiosk will be furnished with three (3) taps, and will be located so as to keep the distance from each house not more than 250m. Where the areas of which population is rather dense, the number of water kiosks will be increased to reduce the conveyance distance of the villagers as well as loads of water fetching by children and women.

viii) The water supply capacity of the facility will be planned to meet the demand estimated for 2022, and will be ready for yard tap connections in future.

ix) The materials predominantly applied in Uganda are used for the construction of water supply facilities to make the operation and maintenance smooth.

x) Since the local 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 materials to be adopted for the construction of facilities are of the quality to meet JIS (Japan Industrial Standard) and/or the Ugandan standard and/or the other international standards such as BS, DIN, ISO, ASTM, etc.

xii) The water supply facilities have to be planned and designed based on the Ugandan and Japanese standards as much as possible.

2-2-1-8 Policy for Construction Procedures and Project Implementation

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 RGCs are scattered widely in Lake Kyoga basin, and it takes about five (5)

hours to move from Iganga of south to Serere of north via. Mbale. On the other hand, the Project has to be completed in the limited period of one (1) fiscal year. Therefore, considering the security conditions in the basin area, the Project is implemented setting the base camp in Iganga and Mbale where safe lodging facilities are available, and the construction works proceed simultaneously with these base camps in order to complete whole of the construction works and the necessary activities in such limited period safely.

2-2-2 Basic Plan

2-2-2-1 Facility Plan

2-2-2-1-1 Water Supply Plan

(1) Selection of Target RGCs

As a result of the field survey, 12 RGCs were selected as illustrated in the following flow chart.

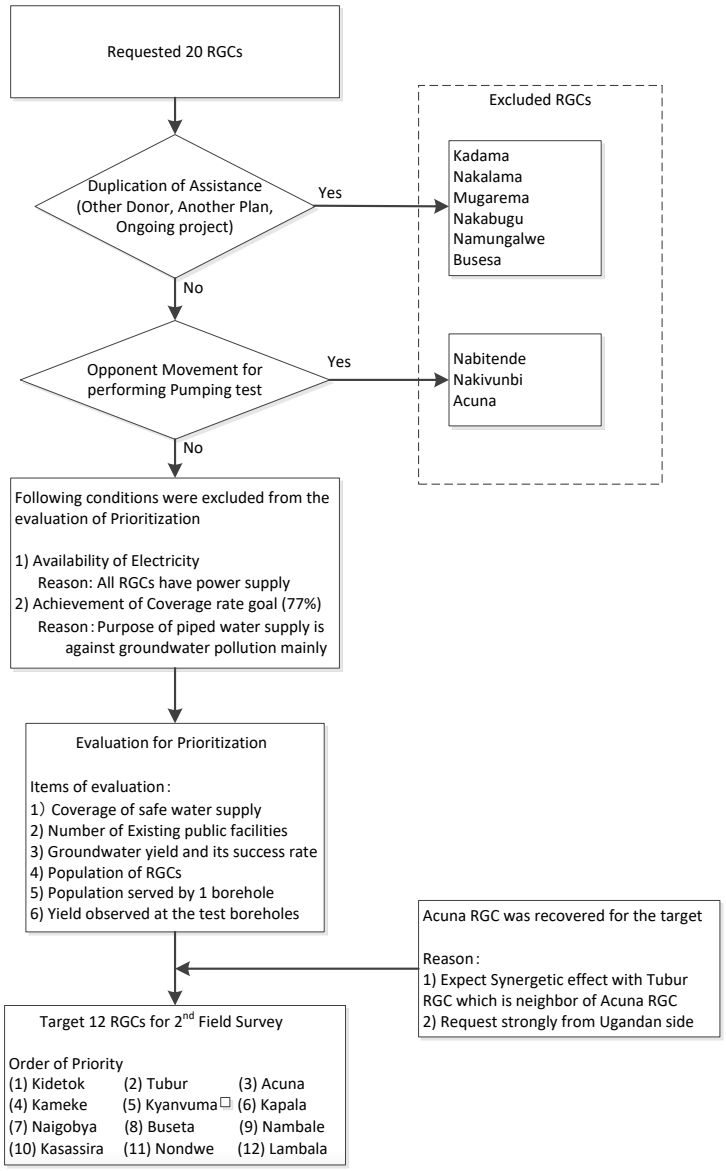


Figure 2.2-1 Selection Flow of 12 RGCs

As shown in the above figure, the following six (6) RGCs were excluded from those for the further survey because some overlapping of the Project implementation was found in some RGCs which have water supply facilities in their territories, or where construction works of water supply facilities were on-going.

i) Kadama RGC

According to NWSC, the transmission pipeline of Mbale - Kadama - Tyiriri is planned under the Water Management Development Program (WMDP) of the World Bank, and the tender documents were being prepared for the implementation. The territory of Kadama RGC is included in its service area.

ii) Nakalama, Busesa and Namungalwe RGCs

NWSC had determined to implement the extension of the existing Jinja- Iganga transmission to Nakalama RGC, and the procurement of pipe materials was on-going at the time of the 1st field survey. This transmission is planned to be extended to Idudi, and Busesa RGC located on the way to Idudi is also included in its service area. They also plan to extend the transmission to Namungalwe RGC from Iganga resulting the territory of Namungalwe in the NWSC service area.

iii) Mugarema RGC

The Ministry of Agriculture, Animal Industry and Fisheries provided the consolidation center of fishes in the RGC under the assistance of Iceland (ICEIDA, and the piped water supply system also provided in the same assistance.

iv) Nakabugu RGC

According to the water office of the Luuka district, the piped water supply facility is being constructed for Luuka, and the Nakabugu RGC area is also included in its service area. The construction of transmission pipeline had reached to Nakabugu at the time of 1st field survey.

Other than the above RGCs, Acuna, Nakivumbi and Nabitende B. RGCs were excluded from those for 2nd field survey, because it is considered difficult to conduct the 2nd field survey due to the opposition of villagers so strong that caused the stop and cancel of pump-up test in the 1st field survey.

However, Acuna RGC which was once excluded from those for the 2nd field survey was determined to be re-included because its water supply facility is required to be constructed together with that for Tubur RGC to maximize the effect of the construction, and the request by the Ugandan side is strong. As a result, it was agreed at the discussions of 2nd field survey that 12 RGCs including Acuna were selected, and the 2nd field survey was conducted for these 12 RGCs.

Out of the selected 12 RGCs, Acuna, Tubur and Nondwe RGCs were excluded from the following reasons as a result of discussions with Ugandan side held after the 2nd field survey.

- Acuna and Tubur RGCs: The construction cost per capita is high and the effectiveness of the Project implementation is considered low. Water fees presented in the tariff of NWSC who will be in charge of operation and maintenance is considered so high that the villagers may not pay. MOWE will provide the other water supply facilities appropriate scale to them.
- Nondwe RGC: It is necessary to operate the pumping units for 18hr to fulfill the demand estimated for this RGC with the maximum use of borehole capacities. If this operation is continued long time, the borehole may be exhausted, and there is no room to expand the facility to cope with the future increase of demand. The construction cost is also considered high.

As a result, nine (9) target RGCs are selected as shown below, and the beneficial population is estimated at 24,738, and the average coverage is increased from 55.8% to 100%.

Table 2.2-2 Present Coverage and Beneficial Population in Target Year

No.	Code	Name	District	Population		Safe Water Coverage (%)	
				2015	2022	2015	2022
1	I-3	Nambale	Iganga	1,520	1,863	32	100
2	I-6	Lambala	Luuka	1,496	1,742	86	100
3	I-7	Naigobya	Luuka	1,469	1,711	88	100
4	I-9	Kyanvuma	Luuka	2,772	3,228	56	100
5	P-2	Kasassira	Kibuku	4,369	5,676	21	100
6	P-3	Kameke	Pallisa	1,221	1,546	78	100
7	P-4	Kapala	Pallisa	2,160	2,735	44	100
8	P-5	Buseta	Kibuku	1,752	2,276	66	100
9	S-1	Kidetok	Serere	3,020	3,961	83	100
Total (Average)				19,779	24,738	55.8	100

(2) Target Year and Population

The target year for the population is set at 2022. The served area of each RGC was delineated with the RGC representatives so as to include the core part of RGC where the population density is considered high together. The number of household was counted in the socio-economic survey, and the average household size of the sub-county to which the respective RGC belongs was used for calculating the population of the delineated service area. The population of the target year (2022) was estimated applying the annual growth rate of census data tabulated below.

Table 2.2-3 Served Population of RGC after Implementing the Project

No.	Code	Name	District	Population (2015)	Population Growth Rate (%)	Population (2022)	Area (km^2)
1	I-3	Nambale	Iganga	1,520	2.95	1,863	0.57
2	I-6	Lambala	Luuka	1,496	2.20	1,742	0.33
3	I-7	Naigobya	Luuka	1,469	2.20	1,711	0.47
4	I-9	Kyanvuma	Luuka	2,772	2.20	3,228	0.59
5	P-2	Kasassira	Kibuku	4,369	3.81	5,676	0.48
6	P-3	Kameke	Pallisa	1,221	3.43	1,546	0.58
7	P-4	Kapala	Pallisa	2,160	3.43	2,735	0.70
8	P-5	Buseta	Kibuku	1,752	3.81	2,276	0.87
9	S-1	Kidetok	Serere	3,020	3.95	3,961	0.69
Total				19,779	-	24,738	5.28

Note: Population growth rate is referred the 2014 Uganda Population and Housing Census

(3) Consumption per Capita and Water Demand

The consumption per capita in the rural areas is set in the Water Supply Design Manual (2013), and the water demand of each RGC is calculated based on the population in the target year as shown below.

Table 2.2-4 Calculation of Water Demand

No.	Code	Name	District	Pop. (2022)	Average Day Demand (m^3/day)	Max. Day Demand (x1.3) (m^3/day)	Loss (UFW, 5%) (m^3/day)	Total Daily Demand (m^3/day)
1	I-3	Nambale	Iganga	1,863	37	48	2	50
2	I-6	Lambala	Luuka	1,742	35	45	2	47
3	I-7	Naigobya	Luuka	1,711	34	44	2	46
4	I-9	Kyanvuma	Luuka	3,228	65	84	4	88
5	P-2	Kasassira	Kibuku	5,676	199	258	13	271
6	P-3	Kameke	Pallisa	1,546	31	40	2	42

No.	Code	Name	District	Pop. (2022)	Average Day Demand (m^3/day)	Max. Day Demand (x1.3) (m^3/day)	Loss (UFW, 5%) (m^3/day)	Total Daily Demand (m^3/day)
7	P-4	Kapala	Pallisa	2,735	55	71	3	74
8	P-5	Buseta	Kibuku	2,276	46	59	2	61
9	S-1	Kidetok	Serere	3,961	79	103	5	108

Note: Per Capita Consumption: Population not more than 5,000 — 20L/day/capita
Population more than 5,000 and not more than 20,000 — 35L/day/capita
Population more than 20,000 — 50L/day/capita
Peak Day Factor: 1.3 (Water Supply Design Manual 2nd Edition, MOWE)
Unaccounted for Water (UFW): 5%

2-2-2-1-2 Water Supply Facility

(1) Components of Piped Water Supply Facility

The piped water supply facility is composed of water source borehole, transmission and distribution pipelines, elevated tanks, service pipes and water kiosks as illustrated in the following figure.

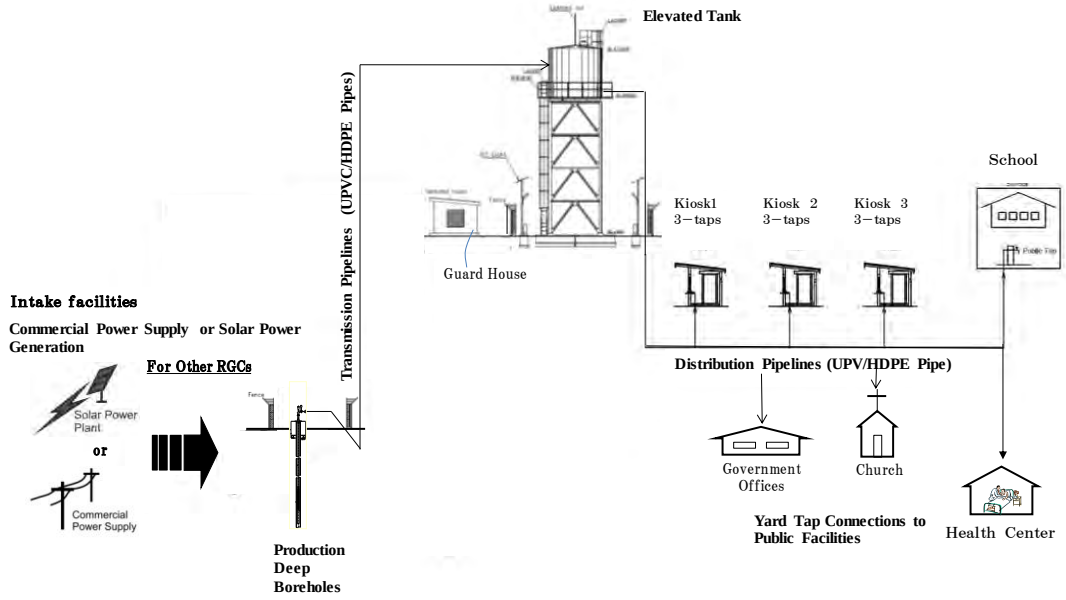


Figure 2.2-2 Typical Piped Water Supply Facility

(2) Water Source

1) Source Boreholes

There are four (4) test boreholes drilled under the previous development study in Naigobya, Kameke and Kidetok RGCs and these boreholes are planned to be used for water sources for the respective RGCs. There are seven (7) boreholes drilled under this Project in Nambale, Lambala, Kyanvuma, Kapala and Buseta RGCs and these boreholes are planned to be used for water sources of the respective RGCs. In Kasassira RGC, the existing borehole (DWD55991) drilled by the District Water Office of Kibuku and its safe yield was confirmed in the field survey, but the casing diameter of this borehole is smaller than those for the water source for piped water supply facility, Therefore, it is planned to rehabilitate this borehole increasing the diameter from 5in to 6in in the detailed field survey.

The following table shows the features of the boreholes to be used for the piped water supply facilities.

Table 2.2-5 Water Source Boreholes for Piped Water Supply Facilities

No.	Code	Name of RGC	Borehole Code	Safe Yield (m^3/hr)****	Available Water (m^3/hr)	Water Demand (m^3/day)	Remarks (Drilling)
1	I-03	Nambale	I-03-NBH-1	15.0	17.6	50	Preparatory Survey
			I-03-NBH-2*	2.6			Preparatory Survey
2	I-06	Lambala	I-06-NBH-1	28.0	28.0	47	Preparatory Survey
3	I-07	Naigobya	JTB-6***	3.7	3.7	46	Development Study
4	I-09	Kyanvuma	I-06-NBH-2	40.0	40.0	88	Preparatory Survey
5	P-02	Kasassira	DWD55991**	17.5	17.5	271	MOWE
6	P-03	Kameke	JTB-11***	7.2	7.2	42	Development Study
7	P-04	Kapala	P-04-NBH-1	8.0	10.7	74	Preparatory Survey
			P-04-NBH-2	2.7			Preparatory Survey
8	P-05	Buseta	P-05-NBH-1	22.7	22.7	61	Preparatory Survey
9	S-01	Kidetok	JTB-17***	7.2	20.4	108	Development Study
			JTB-18***	13.2			Development Study

Note: *: The borehole of I-03-NBH-2 is used as Stand-by of the borehole of I-03-NBH-1.
**: The existing borehole of DWD55991 is used for the water source after rehabilitation to increase the casing diameter from 5in. to 6in.
***: The casing diameter of the boreholes of JTB-6, 11, 17 and 18 are 5in, while those of the other boreholes are 6in.
****: Safe Yield is calculated as 80% of critical yield.

The cleaning, removal of dropped objects, aquifer tests of these boreholes have to be carried out in the detailed field survey.

2) Water Quality

The water quality analysis of the groundwater in the existing boreholes drilled in the previous development study, the test boreholes drilled under the Project, and the existing borehole in Kasassira RGC were conducted. The groundwater in all the boreholes were confirmed to be safe.

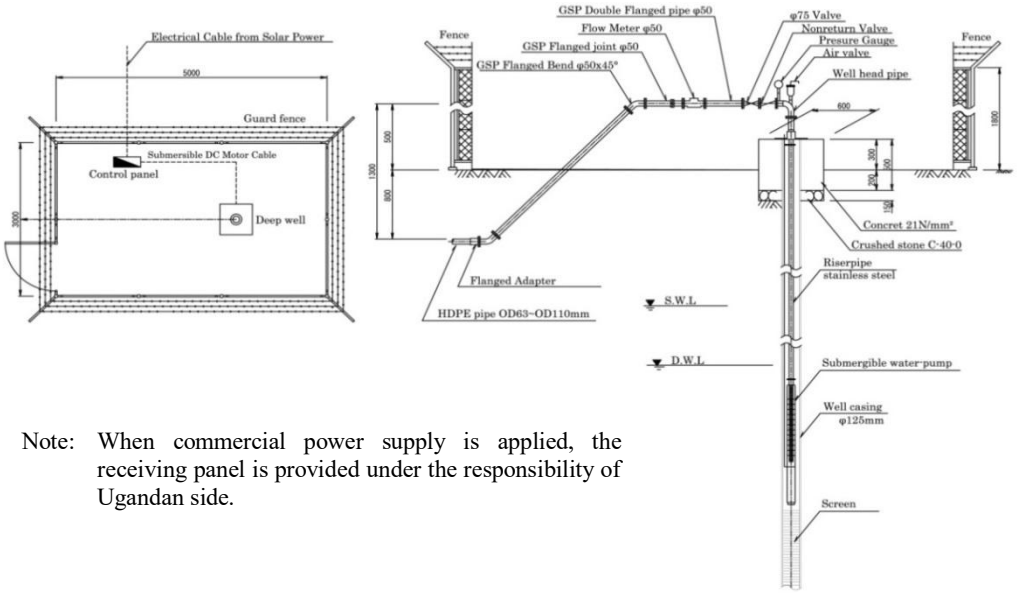
3) Warranty against Defects of Boreholes

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 to be installed by them.

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 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.

(3) Intake Facility

As presented in Figure 2.2-3, the deep borehole intake facility consists of the deep borehole and the submersible motor pump, and the yard of intake facility is surrounded by the security fence. The submersible motor pump for deep boreholes is to be applied for the Project.



Note: When commercial power supply is applied, the receiving panel is provided under the responsibility of Ugandan side.

Figure 2.2-3 Intake Borehole Facility

1) Selection of Power Source

Though the commercial power supply is requested by the government of Uganda, the comparative study is made for i) commercial power supply, ii) solar power generation, and iii) commercial power supply +diesel generation (stand-by).

<Solar Power Supply>
In case that the safe yield of borehole is considered high enough, the solar power generation is adopted for power source. Solar power generation is available only for about eight (8) hours in daytime, and out of eight (8) hours, about six (6) hours are considered effective for power generation getting enough radiation. If the pumping hours obtained by dividing the day demand by the safe yield is not more than six (6) hours, the solar power generation is adopted. However, if the total head for lifting water calculated as a sum of elevation difference between dynamic water level of borehole and high water level of elevated tank is estimated higher than that available in the specification of ordinary type of DC motor pump, it is not possible to adopt the solar power generation.

<Commercial Power Supply>
The commercial power supply is available in all target RGCs. When the commercial power supply is selected, the power line has to be extended to the intake site for UMEME grid under the responsibility of Ugandan side. The extension of power lines are confirmed in the Minutes of Discussion to be completed before the commencement of the work.

It is necessary to consider the measures against outage of power supply for the commercial supply. The following table shows the number and the duration of power outage of UMEME.

Table 2.2-6 Outage of Power Supply by UMEME in Each RGC

RGC	2013			2014			2015		
	Total Hour of Outage	Annual Occur-rence	Average Hour of Outage	Total Hour of Outage	Annual Occur-rence	Average Hour of Outage	Total Hour of Outage	Annual Occur-rence	Average Hour of Outage
Kapala, Kameke	1736.33	447	3.88	2920.19	747	3.91	1538.13	570	2.70
Kasassira, Buseta	1540.73	403	3.82	2475.86	680	3.64	1536.40	554	2.77
Nambale, Naigobya, Kyanvuma, Lambala	496.63	253	1.96	989.13	361	2.74	986.05	389	2.53
Kidetok	1137.18	166	6.85	2992.81	445	6.73	1192.16	370	3.22

According to the data of 2015, the average hours of outage are about three (3) hours in all the RGCs though the occurrence of outage increased slightly. On the other hand, the outage happens twice a week and lasts in half a day according to the interview of villagers. It is inferred that the outage happens almost every day, but that happens and lasts in some hours a few times a week. It is, therefore, necessary to provide any measures against such power outages.

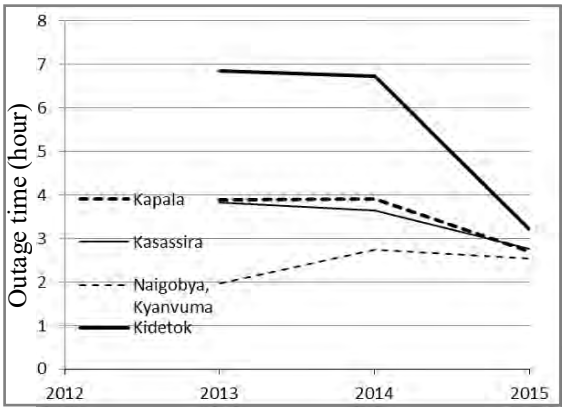


Figure2.2-4 Variation of Average Outage Hour

The stand-by generator will not be used well because fuel has to be stored always and fuel cost is considered high. In order to provide against the power outage of half a day, the capacity of elevated tank is planned to be increased for the volume equivalent to the demand of half a day, and stand-by generator is not provided. Instead, the volume of water demand for the outage hours will be stored in the elevated tank as mentioned in the sub-section (5) of this section. Since as mentioned above, the outage lasts in half a day according to the interview at RGC, and 12hr of the additional capacity for the emergency cases is allowed according to Water Supply Design Manual (2013), the water storage equivalent to the demand of half a day (12hr) is considered in the design storage capacity. In case of the power outage, this additional volume of water is used for distribution. Although the storage capacity is increased, the emergency water is always stored in the elevated tank and is ready for use. However, if the water volume equivalent to 1.5 times of day demand is not pumped up for 18hr-operation due to low safe yield of water source borehole, a diesel generator is provided as a stand-by.

<Results of Selection>
The sequence of the above-explained is illustrated in Figure 2.2-5, and the selected power sources are presented below.

Table 2.2-7 Selected Power Source

No.	Code	Name of RGC	Available Water (m^3/hr)	Water Demand (m^3/day)	Time for Pump up by Max. Yield (hr)	Opera-tion Hour	Total Head (m)	Power Source
1	I-03	Nambale	17.6	50	2.8	6.0	64.80	Solar
2	I-06	Lambala	28.0	47	1.7	6.0	67.05	Solar
3	I-07	Naigobya	3.7	46	12.4	13.0	76.50	UMEME
4	I-09	Kyanvuma	40.0	88	2.2	6.0	108.78	UMEME
5	P-02	Kasassira	17.5	271	15.5	16.0	75.79	UMEME+Generator
6	P-03	Kameke	7.2	42	5.8	6.0	80.05	Solar
7	P-04	Kapala	10.7	74	6.9	7.0	76.07	UMEME
8	P-05	Buseta	22.7	61	2.7	6.0	52.18	Solar
9	S-01	Kidetok	20.4	108	5.3	6.0	93.34	UMEME

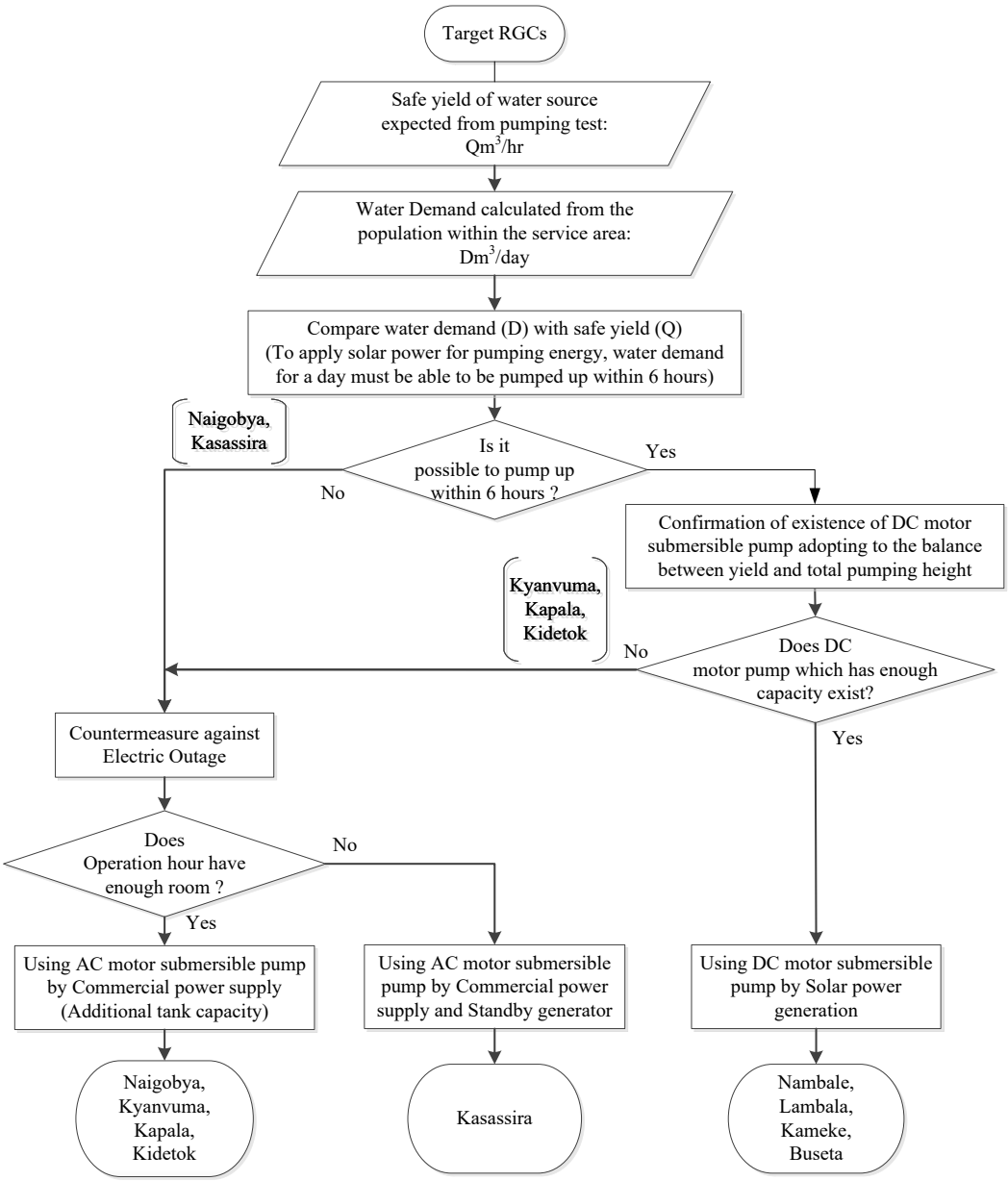


Figure 2.2-5 Selection of Power Sources

2) Solar Power Generation Facilities

a) Solar Power Generation Modules

The solar power generation is employed in the Nambale, the Lambala, the Kameke and the Buseta RGCs. As the generation facilities for these RGCs, the number of generation modules are set to meet the required powers of DC motor pumps based on the conditions of sunshine hours (annual average: 7.9hr/day) and solar radiation (4.8kWh/m^2/day).

- Solar power generation modules (200W/module)
- Supports of generation modules
- Lightning rods
- Power cables from generation facilities to submersible motor pump in source borehole

The number of generation modules required for output of DC motor are calculated from pump capacity and total lifting head as shown in the following table.

Table 2.2-8 Required Number of Generation Modules

No.	Code	RGC	Borehole Code	Power Source	Required Number of Solar Generation Panels
1	I-03	Nambale	I-03-NBH-1	Solar	42
			I-03-NBH-2	Solar	14 (Stand-by pump using modules of I-03-NBH-1)
2	I-06	Lambala	I-06-NBH-1	Solar	36
3	P-03	Kameke	JTB-11	Solar	36
4	P-05	Buseta	P-05-NBH-1	Solar	36

The electric power generated by the generation modules is conveyed to the submersible motor pump by transmission cable. The generation modules are installed in the yard of elevated tank, and the cables are placed together with the transmission pipelines. Where the generation modules are not set in the same yard as the elevated tank, cables are placed separately. The power cables are buried using the protection pipes of uPVC.

b) Measures against Theft of Modules

The following measures are taken to prevent the generation modules from theft, and the modules are set on the supports so high as about 3.0m that the theft can not reach easily.

<Security Fence>
Security fences with entrance gates will be provided for intake facilities, elevated tanks and solar power generation stations. The fences are to be as high as 2.4m and spikes will also be provided on top of the fence.

<Security Light>
Security lights will be provided for the solar power generation station. The lights are of 20W LED lump and solar power generation module with battery will also be installed.

<Guard House>
The guard house will be constructed beside the yard of power generation station, and the guard employed for security of power generation station will use the house. The flush toilet will be furnished.

3) Submersible Motor Pump for Intake Borehole

In case the commercial power supply is used for the power source of motor pump, AC motor pump is applied, and in case the solar power generation, DC motor pump is applied, because AC-DC inverter is expensive and the conversion loss of the inverter is high (Approximately 20%) and the durable period of the inverter is short. The control function of MA electrode (Protection of idle running) is also furnished. The operation hours, the pump capacity, and the motor output are presented in the following table.

Table 2.2-9 Principal Features of Intake Pumps

No.	Code	Name of RGC	Borehole Code	Safe Yield (m^3/hr)	Water Demand (m^3/day)	Operation Hour (hr)	Design Discharge (m^3/min)	Total Head (m)	Motor Type & Required Capacity (kW)	Power Source	Dist. of Trans. (m)
1	I-03	Nambale	I-03-NBH-1	15.0	50	6.0	0.140	64.80	DC, 8.40	Solar	1,257.3
			I-03-NBH-2	2.6			0.043	52.06	DC, 2.80	Solar	991.5
2	I-06	Lambala	I-06-NBH-1	28.0	47	6.0	0.131	67.05	DC, 7.20	Solar	502.4
3	I-07	Naigobya	JTB-6	3.7	46	13.0	0.059	76.50	AC, 1.50	UMEME	1,046.3
4	I-09	Kyanvuma	I-06-NBH-2	40.0	88	6.0	0.245	108.78	AC, 7.50	UMEME	4,887.1
5	P-02	Kasassira	DWD55991	17.5	271	16.0	0.283	75.79	AC, 5.50	UMEME	1,292.1
6	P-03	Kameke	JTB-11	7.2	42	6.0	0.117	80.05	DC, 7.20	Solar	1,938.7
7	P-04	Kapala	P-04-NBH-1	8.0	74	7.0	0.133	32.71	AC, 3.00	UMEME	182.1
			P-04-NBH-2	2.7			0.045	26.54	AC, 1.10	UMEME	82.0
			After Junction	-			0.178	43.36	-	-	2,751.7

No.	Code	Name of RGC	Borehole Code	Safe Yield (m^3/hr)	Water Demand (m^3/day)	Operation Hour (hr)	Design Discharge (m^3/min)	Total Head (m)	Motor Type & Required Capacity (kW)	Power Source	Dist. of Trans. (m)
8	P-05	Buseta	P-05-NBH-1	22.7	61	6.0	0.227	52.18	DC, 7.20	Solar	880.4
9	S-01	Kidetok	JTB-17	7.2	108	6.0	0.100	42.21	AC, 3.00	UMEME	559.8
			JTB-18	13.2			0.200	67.03	AC, 5.50	UMEME	800.0
			After Junction	-			0.344	26.31	-	-	1,464.3

The operation hours of motor pump has to be set as short as possible as the yield of source borehole allows.

According to the electricity tariff of UMEME, the water prices are different from hours in a day. The lowest water price is offered in the time from 0:00 to 6:00, and if it is possible to pump up the volume of water required for a day in this time period, the electricity charge for operating pumps will be the lowest.

- 0:00～06:00: Off-peak hour (UGX313.4/kWh)
- 06:00～18:00: Peak hour (UGX695.7/kWh)
- 18:00～24:00: Shoulder hour (UGX533.5/kWh)

The operation hour is set as short as possible to the minimum of six (6) of this electricity tariff.

4) Control Facilities

The operation of submersible motor pumps in the source boreholes is conducted by the scheme operators hired by WSSB. On and off of the motor pumps are made by the control panel in the elevated tank yard checking the water levels of the tank basically as illustrated below.

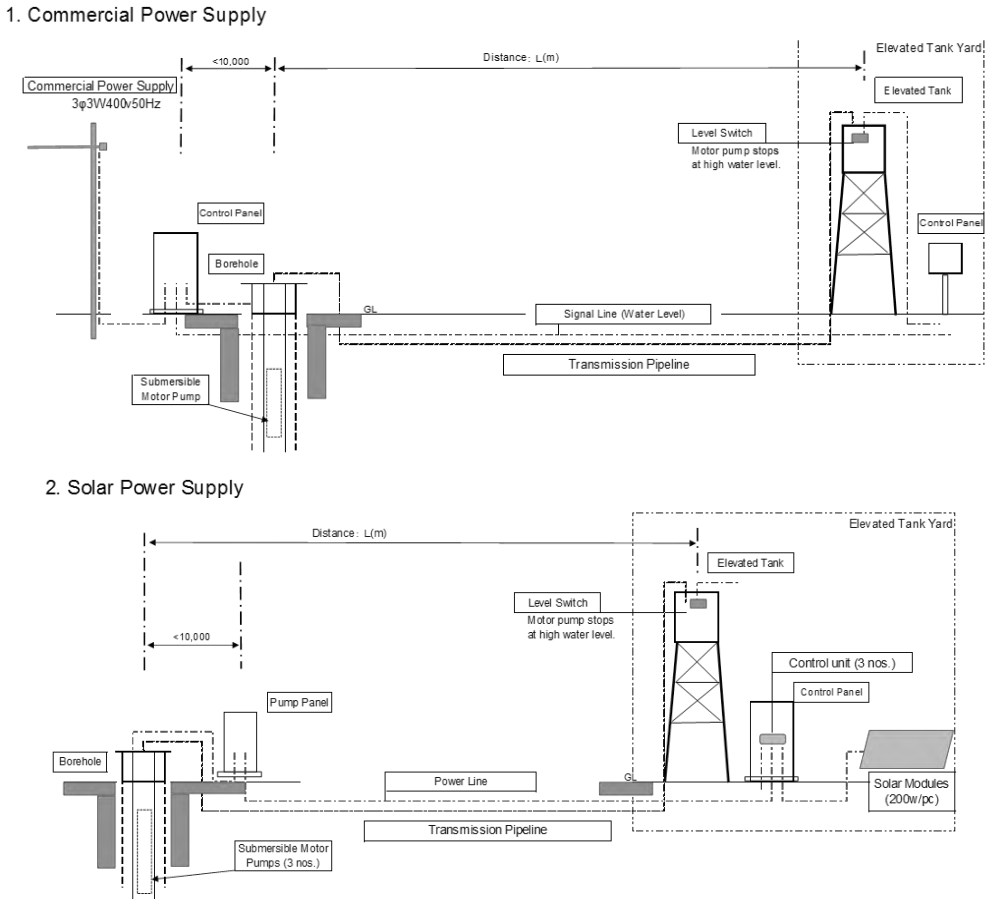


Figure 2.2-6 Concepts of Operation Control of Intake Pump and Elevated Tank

Start and stop of pump units are conducted manually, but to avoid the unnecessary pumping, a water level sensor is set at the maximum water level in the tank, and the motor pump is stopped automatically. In addition, another control panel is set at the borehole site also to facilitate the easiness in repairing motor pump, etc.

(4) Transmission Pipelines

1) Pipelines

The transmission pipelines convey the water lifted up at the intake borehole to the elevated tank. The pipelines are buried under the ground except for the parts of vertical pipelines at the elevated tank. The buried depth of pipelines is 0.9m from the top of the pipe to the ground surface in accordance with the Water Supply Design Manual (2013). The pipelines are designed to run in the utility space of the road reserve along the roads. The pipelines crossing the roads are placed in the protection pipes of concrete considering the live loads of vehicles passing above them.

2) Pipe Materials

The following table shows the characteristics of pipes available in Uganda.

Table 2.2-10 Comparison of Pipe Materials

Description \ Type		Evalu-ation	Galvanized Steel Pipe (GSP)	Evalu-ation	Ductile Iron Pipe (DIP)	Evalu-ation	uPVC Pipe	Evalu-ation	HDPE Pipe
Diameter Applied		Nominal Diameter30-150mm, Max Pressure PN10 & 16							
Easiness in Construction	Elasticity	×	Not Good Fittings are required.	×	Not Good Fittings are required.	Δ	Little Good Fittings are required, but few degrees may be adjusted at socket.	○	Good Flexible for bending
	Impact Resistivity	○	Good Strong against impact load.	○	Good Strong against impact load.	×	Not good Not strong against impact load.	Δ	Little Good Not strong against impact load.
	Weight	×	Heavy Conveyed by at least 2 persons.	×	Very Heavy Heavy equipment for lifting is required.	○	Light Conveyed by 1 person.	Δ	Light Several persons are required because one piece of pipe is very long.
Durability	Resistivity to Acid and Alkaline	×	Bad	×	Little Bad	○	Good	○	Good
	Tensile Strength	○	Strong	○	Very Strong	Δ	Little Weak Sand bed has to be formed.	Δ	Little Weak Sand bed has to be formed.
	Weather Resistivity when Exposed	○	Good	○	Good	Δ	Not Good Deteriorated by sunshine	Δ	Not Good Deteriorated by sunshine
Procurement	Delivery	○	Prompt Delivery	×	2 months	○	Prompt Delivery	○	Prompt Delivery
	Popularity and Availability		Widely used in Uganda		Imported and less to find in domestic market		Widely used in Uganda		Widely used in Uganda
	Available Diameter	○	15 - 300	○	50 - 300	○	50 - 200	Δ	20 - 200 There is no products of some diameters.
	Price (100 ㎜ diameter)	×	4.72	×	5.25	○	1	Δ	1.5
Operation and Maintenance		×	Difficult Special tools are required for cutting, etc.	×	Difficult Cutting in the field is difficult	○	Easy Easily cut	Δ	Rather easy Easily cut but fittings are required for connection.
Overall Judgement (○: 5 point, Δ: 3 point, ×: 0 point)		25	Because it is strong at exposed part, it will be used only at the parts of chamber of branches and joint.	20	Not available in local market, and less economical.	39	Price is lowest, and will be used for both transmission and distribution pipeline.	36	HDPE pipes with small diameter (39-50mm) are economical and difference of price is small.

The pipes of uPVC (PN10/16 class) available in the local markets are used for the transmission pipelines. The advantage in pricing is focused. The distance and diameter of the transmission pipelines are summarized in the following table.

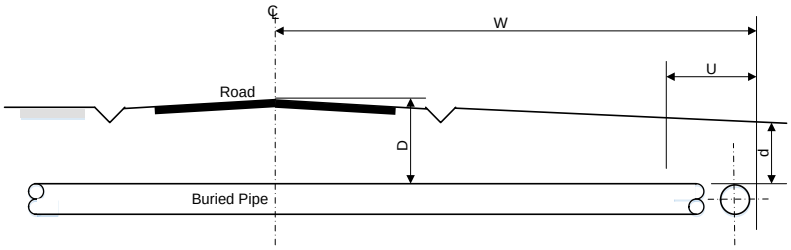
Table 2.2-11 Transmission Pipelines

No.	Code	Name of RGC	Static WL (m)	Impact Pressure (m)	Static Pressure + Impact Pressure (m)	Nominal Pressure	Transmission Pipelines		
							Diameter (mm)	Pipe Type	Distance (m)
1	I-03	Nambale	66.3	6.9	73.2	PN10	OD160	uPVC	1,276.7
			54.0	6.9	60.9	PN10	OD90	uPVC	25
2	I-06	Lambala	63.7	20.8	84.5	PN10	OD90	uPVC	483.0
3	I-07	Naigobya	67.0	21.8	88.8	PN16	OD63	uPVC	1,035.0
4	I-09	Kyanvuma	98.0	16.6	114.6	PN16	OD160	uPVC	4,872.0
5	P-02	Kasassira	62.1	33.6	95.7	PN16	OD110	uPVC	1,265.0
6	P-03	Kameke	73.6	14.3	87.9	PN16	OD110	uPVC	1,920.0
7	P-04	Kapala	63.6	15.7	79.3	PN10	OD63	uPVC	181.6
			59.6	17.5	77.1	PN10	OD110	uPVC	81.7
		After Junction	-	-	-	PN10	OD110	uPVC	2,740.2
8	P-05	Buseta	45.2	26.5	71.7	PN10	OD90	uPVC	862.0
9	S-01	Kidetok	84.1	12.2	96.3	PN16	OD90	uPVC	558.0
			82.3	23.6	105.9	PN16	OD110	uPVC	799.0
		After Junction	-	-	-	PN16	OD110	uPVC	1,445.2

Note: The water hammer pressure is estimated applying the equation provided in the Water Supply Design Manual, MOWE.

3) Utility Space in Road Reserve

According to UNRA (Uganda National Road Authority) and Road Departments of district administrations, the pipelines have to be placed in the utility spaces allocated along the roads. The depth of pipelines crossing roads is also specified as indicated in Figure 2.2-7. It is necessary to apply the approval of road authorities of UNRA and the road department of the respective districts before the commencement of the construction works.



	Road Reserve (W)	Utility Space (U)	Min. Depth at Center (D)	Min. Depth at Edge (d)
National Road in RGC	More than 15.0m	2.0m	1.2m	0.9m
District Road	15.0m	3.0m	1.0m	0.9m
Community Access Road	10.0m	3.0m	1.0m	0.9m

Figure 2.2-7 Utility Space and Road Reserve

(5) Reservoirs (Elevated Tanks)

1) Water Demand Pattern

The water demand patterns are discussed in the Water Supply Design Manual (2013) as stated below.

- In rural areas, it can be assured that the bulk of the water used in a day is drawn between 7:00AM and 7:00PM, but with hourly variations. Generally, two peak periods will be observed, one in the morning and the other in the evening. The same pattern can be assumed to apply for private connections and public standpipes.

- The peak hour factor for the population over 1,000 is 2.0.

Table 2.2-12 Peak Hour Factor of Water Demand in Rural Areas

Population (Pe)	Peak Hour Factor (Phf)
1,000 or more	2.0
500	2.5
200	3.0
100	3.5
50	4.5

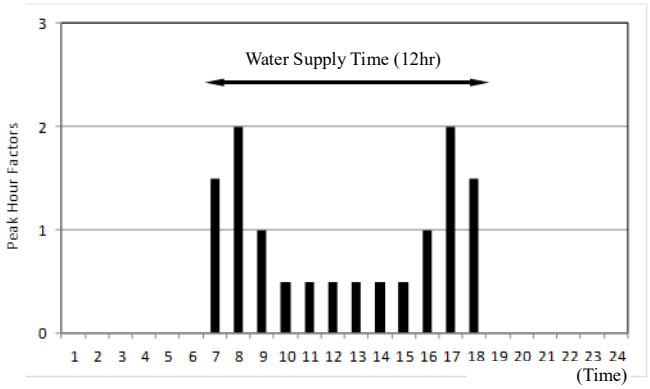
Source: Water Supply Design Manual, MOWE

Based on the above discussions, the water demand pattern is set as follows:

- Service Hour: The water is sold by water kiosks to the population in RGC. Open and close of water kiosks are managed by the kiosk attendant. The operation hour is set for 12hr from 7:00AM to 7:00PM.
- Peak Hour Demand: The Peak Hour Demand of 12hr operation is calculated considering the Peak Hour Factor and the average hourly demand for 12hr operation calculated from the Maximum Day Demand as follows:

  Average hourly demand (m^3/hr) = Max. day demand (m^3/day) / Operation hour (12hr)

  Peak hourly demand (m^3/hr) = Average hourly demand (m^3/hr) x Peak hour factor (2.0)
- The water demand pattern set as above-mentioned is presented below.



Conditions: Operation hour is 12hr from 7:00AM to 7:00PM.
The peak hour factor is set at 2.0 for the morning and evening, and the factor for other time is set at 0.5.

Figure 2.2-8 Water Demand Pattern

2) Capacity and Height of Elevated Tanks

a) RGCs Using solar Power Generation

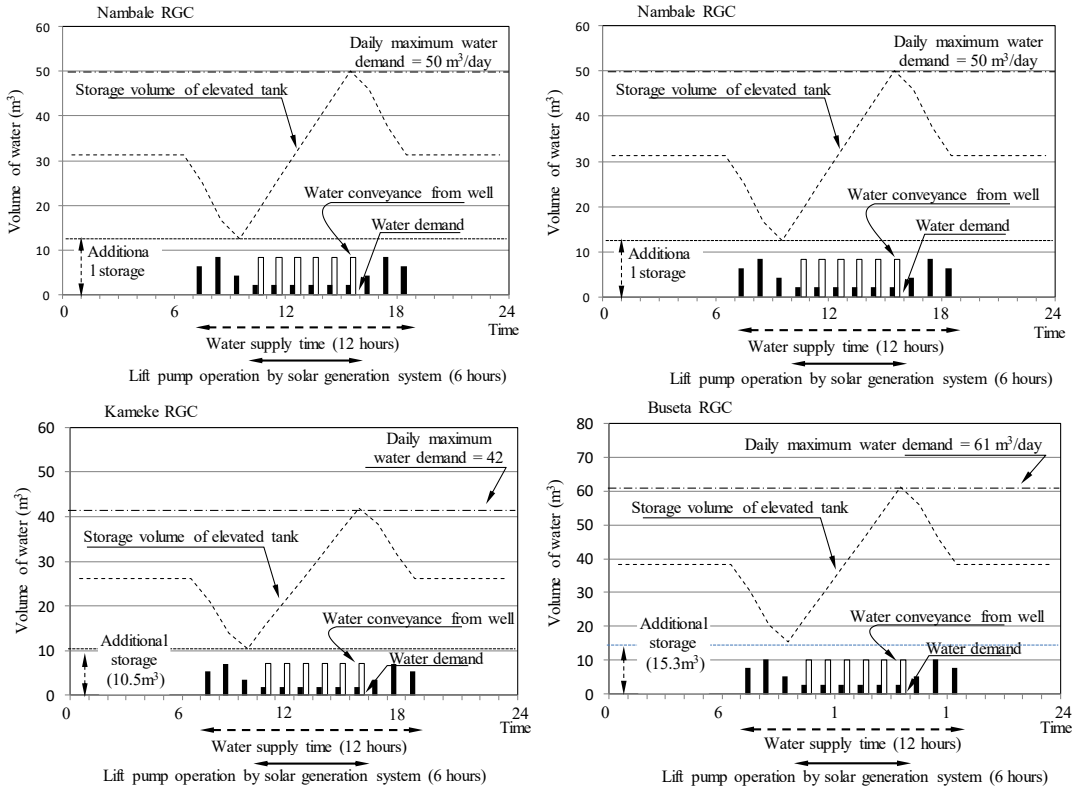
The capacities of elevated tanks for the RGCs using the solar power generation are determined taking into account the following items.

- Min. Required Volume: The operation hour of submersible motor pump is set for six (6) hour from 10:00 to 16:00. The volume of water to be supplied out of the pump operation hour has to be stored in the elevated tank as mentioned below, and this volume is considered as that required at minimum equivalent to 70% of the maximum day demand.

  Min. required volume = Demand after pump operation (16:00 - 19:00)
  + Demand before pump operation for next day
- Volume provided against decrease of pumped water due to weather conditions: The solar power generation tends to be affected by the weather conditions. Generally, the power

generation is decreased to 40 - 60% in cloudy weather and 12 - 20% in rainy weather. It is, therefore, considered to spare some volume of water in the elevated tank to provide against the decrease of water in the rainy season.

Considering the above items, the residual time of the elevated tanks for RGCs using solar power generation is set at 1.0 day, and the variations of stored water volume of RGCs using solar power generation are shown below.



Conditions: Generating hour of solar power: six (6) hours from 9:00 to 15:00.
Operation hours of water kiosks: 12hr from 7:00 to 19:00.
Peak hour factor in the morning and the evening: 2.0

Figure 2.2-9 Variation of Water Volume Stored in Elevated Tank

b) RGCs Using Commercial Power Supply

As described above, it is important to operate the lifting pump in the time of which water tariff is lowest in order to reduce the electricity cost. The lifting of water pump at the source borehole has to be completed before 6:00AM.

Further, it is necessary to store the water for the half a day demand additionally. According to Water Supply Design Manual (2013) stipulates that the reserve of storage capacity against the emergency case is important in the towns recommending 50% of the maximum day demand.

Table 2.2-13 Emergency Volume to be Reserved in Reservoir Tank*

Transmission	Residual Time to be Reserved for Emergency
Gravity Flow	6hr
Transmission by Pump	12hr

*source: Water Supply Design Manual (MOWE)

Therefore, the capacity of elevated tank in RGCs using commercial power supply is set considering the residual time of 1.5 days.

However, in the Kasassira RGC the safe yield of source borehole is rather low, and the operation hour of 16hr is required for lifting up the water for day demand. It is not possible to lift up the water for half a day demand as provision against power outage. The stand-by generator is provided instead of half a day demand of additional storage in this RGC. The residual time of the elevated tank in the Kasassira RGC is set at 1.0.

The variation of stored water volume in case that the lifting pump is operated in the time of which electricity tariff rate is the lowest is shown in Figure 2.2-10.

c) Dimensions of Elevated Water Tanks

The dimensions of the elevated tanks in the target RGCs are presented in the following table.

Table 2.2-14 Dimensions of Elevated Water Tank

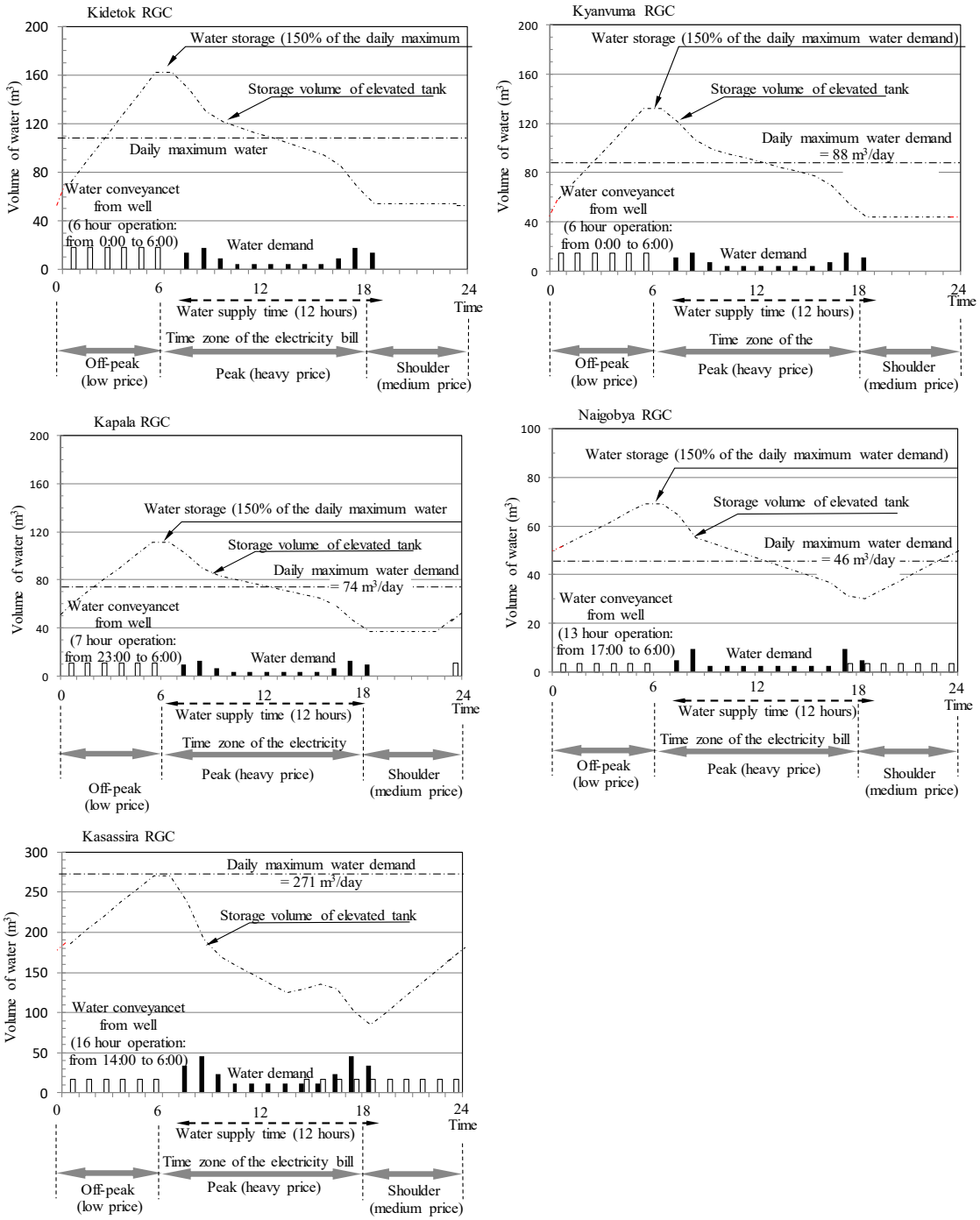
No.	Code	RGC	Max. Day Demand (m^3/day)	Power Source	Measures to be Taken for Power Outage	Residual Time (day)	Required Capacity (m^3)	Height of LWL above Ground (m)*
1	I-03	Nambale	50	Solar	-	1.0	50	20.0
2	I-06	Lambala	47	Solar	-	1.0	47	20.0
3	I-07	Naigobya	46	Commercial	Add. Storage	1.5	69	10.0
4	I-09	Kyanvuma	88	Commercial	Add. Storage	1.5	132	15.0
5	P-02	Kasassira	271	Commercial	Generator	1.0	271	17.5
6	P-03	Kameke	42	Solar	-	1.0	42	15.0
7	P-04	Kapala	74	Commercial	Add. Storage	1.5	111	15.0
8	P-05	Buseta	61	Solar	-	1.0	61	17.5
9	S-01	Kidetok	108	Commercial	Add. Storage	1.5	162	17.5

*: Determined by hydraulic calculation of pipeline networks (EPANET)

The Low Water Level (LWL) of the elevated tank is determined by the hydraulic calculation of pipeline networks covering all the service area, and the height of LWL above ground surface is calculated as a difference between the ground elevation and LWL.

3) Type, Structure and Material of Elevated Tank

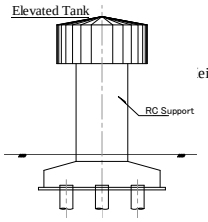
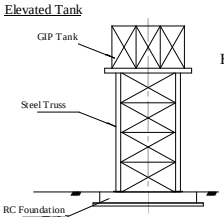
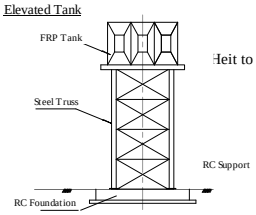
The elevated tank is of steel panels on the support of steel truss, which is widely adopted in Uganda. Steel truss structure is rather light comparing with the RC structure, and most of the work to be done at site includes assembling the truss materials resulting in shorter construction period. The inside surface of storage tank is coated with acid resistive material and is protected by painting.



Conditions: The lifting pump is operated during the time period of which electricity price is lowest as much as possible.
The service hour of water kiosks and peak factor of maximum hourly demand are same as those of RGCs using solar power generation.
Kidetok and Kyanvuma RGCs: 6hr of pump operation
Kapala RGC: 7hr of pump operation
Naigobya RGC: 13hkr of pump operation

Figure 2.2-10 Variation of Stored Water Volume of RGCs Using Commercial Power Supply

Table 2.2-15 Comparison of Types of Elevated Tank

Strucrure / Description		Reinforced Concrete Structure（RC）		Steel Panel Tank with Steel Truss Support（SS）		FRPM Panel with Steel Truss Support（FRP）
						
Comparison	Structure	×	- RC tanks are adopted for the tank as small as 2 - 5 ton, but quite rare for the ones over 100m^3 in Uganda.	○	- The most commonly adopted type of elevated tank even for the ones rather large over 500m^3 in Uganda.	△	- Never being used in Uganda.
		△	- All the components of tank such as foundation, support and water tank are of RC concrete and considered the heaviest resulting in applying pile foundation as required.	○	- The weight is lighter than RC tanks. It is because the structure consists water tank of prefabricated steel panels and steel truss support.(Approximately 50% weight of RC tank.).	○	- Except water panel material, this is the lightest structure, as SS, which consists water tank of prefabricated FRP panel and steel truss support.
		○	- The most bearable to the external forces.	○	- More tolerable than FRP against external force.	△	- Tolerable against external force but not as much as SS.
		○	- The most durable and resistive to acidic property.	○	- Expiration is shorter than RC due to continuous maintenance for corrosion prevention.	○	- Most tolerable against corrosion.
	Water Tightness of Water Tank	△	- High quality water tight concrete is required for water tank.	○	-Sophisticated management is required for steel panel.	○	- Quality of FRP panel is the best due to production is standardized.
		△	- Waterproof coating for internal surface is indispensable.	△	- Waterproof coating for internal surface is not necessary. However, regular maintenance for corrosion on steel panel is annually required.	○	- Regular maintenance is less required than SS because water tank does not deteriorate.
		△	-Structurally, corrosion is unavoidable in long term. Generally, water tightness is good in quality.	△	- Long term wise, generally, water tightness is not maitained due to imperfect maintenance at local.	△	- Long term wise, generally, water tightness is not maitained due to imperfect maintenance at local.
	Easiness of Construction	△	- Frame and water tank should be provisonally constructed at oversea. Besides, materials such as special circular frame, mine timbering, scaffolding are needed to import. On the other hand, main building materials, except water proof coating for internal surface, can be procured. However skilled craftsman and sophisticated management are required. Therefore, workability is worst among 3 structures.	○	Major materials are available in the local or the third coundtry markets and it is considered easy for the construction of the prefablicated materials.	○	- Main materials are procured from 3rd country or Japan, and construction procedure is prefabricated.
		△	- Long time and the largest land among 3 structures for provisional construction are required. Therefor, site selection is regulated.	○	- Sophisticated construction supervision is not required as RC, because provisional materials are prefabricated, and crane is used for prefabricated construction.	○	- Sophisticated construction supervision is not required as RC, because provisional materials are prefabricated, and crane is used for prefabricated construction.
		△	- Despite the fact that the water proof coating is necessary, water leakage and infiltration are not prevented perfectly. Once water leakage and infiltration happened, it is difficult to perfectly prevent it.	○	- In comparison to RC, it needs smaller land and shorter time for provisional construction. Therefore, site selection is less regulated.	○	- In comparison to RC, it needs smaller land and shorter time for provisional construction. Therefore, site selection is less regulated.
				△	- Water proof coating for water tank is not required but annual maintenance is required. If water leakage and infiltration arise, it is easily prevented by fixing joint.	○	- Water proof coating for water tank is not required, and maintenance is less required than SS. If water leakage and infiltration arise, it is easily prevented by fixing joint.
	Safety in Construction	△	- Including provisional construction, construction needs long term in high place. Besides, its procedure is complicated. Consequently, it has the most risk in 3 constructions methods.	○	- Construction procedure is simply prefabricated. Term of working in high place is short. Therefore it is safer than RC.	○	- Construction procedure is simply prefabricated. Term of working in high place is short. Therefore it is safer than RC.
	Durability	○	- Except a place of which highly acidic subgrade that causes corrosion, generally, durability is approximately 30 years. Besides maintenance is less needed than other construction.	○	- Steel maintenance is indispensable to achieve over 20 years duration. Elements can be easily procured because of many examples from the past.	△	- Almost same as SS, except duration is expected about over 30 years, and necessity of guiding supervisor in maintenance for upper facilities, and . Repairing materials are difficult to procure.
	Economic Performance	○	- It is heavy construction which needs many kinds of construction and materials. Besides, most of material is procured from abroad. Economic performance, therefore, is not efficient.	○	- In comparison to RC, it is easier because its structure is prefabricated, lighter and cheaper. SS had been used in Uganda.	△	- As same as SS, except it is more expensive than SS, it is simple prefabricated structure and is tolerant against corrosion.
	Construction Period	△	- Its construction is progressed in order of provisional, fundation, principal frame, and water tank construction. Due to preparation of material in each construction and quality assurance, it is the longest (5.5 months) construction among 3 methods.	○	- Construction procedure is prefabricated. Provisional construction is less work and shorter(3.0 months) than RC.	○	- Construction procedure is prefabricated. Provisional construction is less work and shorter(3.0 months) than RC.
Overall Evaluation		×	- It is large scale structure which is firm but has never been practiced in Uganda due to its cost. Therefore it is not suitable in Uganda.	○	- SS is the most suitable structure because Uganda has experiences in SS construction. SS has advantage in maintenance in comparison to FRP.	△	- FRP is complemental structure of SS but actual maintenance and economic performance is less than SS. It has never been adopted in Uganda. Therefore it is not best structure.
			○ - 5, 5 x 5 = 25 marks		○ - 12, 5 x 12 = 60 marks		○ - 11, 5 x 11 = 55 marks
			△ - 9, 3 x 9 = 27marks Total 52 marks		△ - 3, 3 x 3 = 9 marks Total 69 marks		△ - 4, 3 x 4 = 12 marks Total 67 marks

4) Appurtenant Facilities

The appurtenant facilities of the elevated tanks are stated below.

- 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.
- Overflow pipe: Surplus water is discharged by overflow pipe.
- 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.
- Lightning rod: As thunder usually happens in rainy season, the lightning rod is set for security protection of facility.
- Steel cradle (trussed structure, stair steps etc.): Regular disinfection of elevated tank and distribution facility will be carried out. To secure safety and easiness of this activity steel steps of 0.85m wide are set on the steel cradle.
- Flow meter: The outlet flow from the elevated tank to distribution pipeline is grasped by flow meter, and the information of operation and maintenance will be gotten in comparison with the measurement results of flow meters at water kiosks.
- Water level sensor for auto-stop: Water level sensor is set at HWL to avoid overflow by mistake in operation of intake pump.

5) Foundation

The Standard Penetration Tests (SPT) were carried out in the field survey at the sites of elevated tanks. The results of SPT are presented in Figure 1.2-9 in Chapter 1.

The surface soil is mainly of sandy or silty clay, and in most cases high N values are observed as shown in the figure above, and the bearing capacity of the elevated tank sites are considered high enough to bear the loads by elevated tank. However, in some sites the capacity may not be sufficient for bearing the expected loads (Nambale, Naigobya and Kasassira RGCs), and in such cases soil improvement such as soil cement, etc. will be considered to increase the bearing capacity of foundation soils.

(6) Disinfection Facilities

The disinfection facilities are not provided in the Project, but the chlorination is carried out manually. The training on methods and procedures of chlorination will be conducted in the course of soft component.
Simple chlorine injection facility may be installed by the own terms of Ugandan side. To facilitate installation of bypass pipes, T-shaped pipes will be installed (2 places) with the caps on the branched ends.

The chlorine inject facility shall be considered to be installed by the Ugandan side. Those facilities to be provided apart from scope of this Project, and any problems and damages caused and/or induced by the installed injection facility shall not be considered as defects, and responsibility of repair and recovery shall be charged neither for the consultant nor the contractor.

(7) Distribution Network

1) Pipelines

The distribution pipelines are placed from the elevated tank to water kiosks and yard tap connection for public facilities. To facilitate the private connection by the users after the completion of the water supply facilities, the distribution networks are placed to cover all the service area expanding the pipelines to the edge of the area. The diameters of pipelines are determined by the hydraulic calculations to secure the minimum and the maximum water pressures of 10m and 60m at the branch to service pipes considering Water Supply Design Manual (2013). As same as the transmission pipelines, they are buried in the utility spaces along the roads with the depth of 0.9m from top of the buried pipe to the ground surface considering the Water Supply Design Manual (2013). In case the pipelines cross the main roads, the water pipes are placed in the protection pipes (concrete) considering the vehicle loads. The distance and the diameters of distribution pipelines in each RGC are shown below.

Table 2.2-16 Distribution Pipelines

No.	Code	Name of RGC	Distribution Pipelines		
			Diameter (mm)	Type	Distance (m)
1	I-03	Nambale	OD63 - OD110	uPVC	4,265.0
2	I-06	Lambala	OD63 - OD110	uPVC	2,338.2
3	I-07	Naigobya	OD63 - OD110	uPVC	5,367.4
4	I-09	Kyanvuma	OD63 - OD160	uPVC	5,388.1
5	P-02	Kasassira	OD63 - OD160	uPVC	6,505.2
6	P-03	Kameke	OD63 - OD110	uPVC	3,644.2
7	P-04	Kapala	OD63 - OD110	uPVC	3,523.2
8	P-05	Buseta	OD63 - OD110	uPVC	5,583.3
9	S-01	Kidetok	OD63 - OD160	uPVC	6,294.6

2) Materials of Pipes

As same as the materials of transmission pipelines, the distribution pipelines are of uPVC (PN10 class) available in the Ugandan market. The minimum diameter is OD63mm.

3) Chambers

Various valves, water meters and fittings are planned to be set on the routes of the transmission and the distribution pipelines. These appurtenant facilities are set in the chamber of reinforced concrete. The minimum size of such chamber is 1.0m x 1.0m, and the pipes in chambers are of GSP (Galvanized Steel Pipe).

(8) Distribution Facilities

1) Water Kiosks

Water is sold by the water kiosks placed in the service area with the price determined by WSSB per jerrycan (20L). Three (3) stances of tap stands are provided in each water kiosk and room space of 2.0m x 2.0m is provided for the work of a kiosk attendant. The soak pit to drain the surplus water is also provided behind the taps. The water kiosks are provided scattering in the area considering the maximum conveyance distance of 250m in accordance with Water Supply Design Manual (2013).The service pipes of HDPE(OD32mm or OD 50mm) will be placed to connect water kiosks to distribute pipes. The total length of each service pipes are 978m and 121m for OD32mm and OD50mm, respectively. The numbers of water kiosks to be constructed in each RGC are shown in the following table.

Table 2.2-17 Number of Water Kiosks in RGCs

No.	Code	Name of RGC	Number of Kiosks to be Constructed
1	I-03	Nambale	6
2	I-06	Lambala	5
3	I-07	Naigobya	7
4	I-09	Kyanvuma	9
5	P-02	Kasassira	11
6	P-03	Kameke	7
7	P-04	Kapala	7
8	P-05	Buseta	9
9	S-01	Kidetok	9

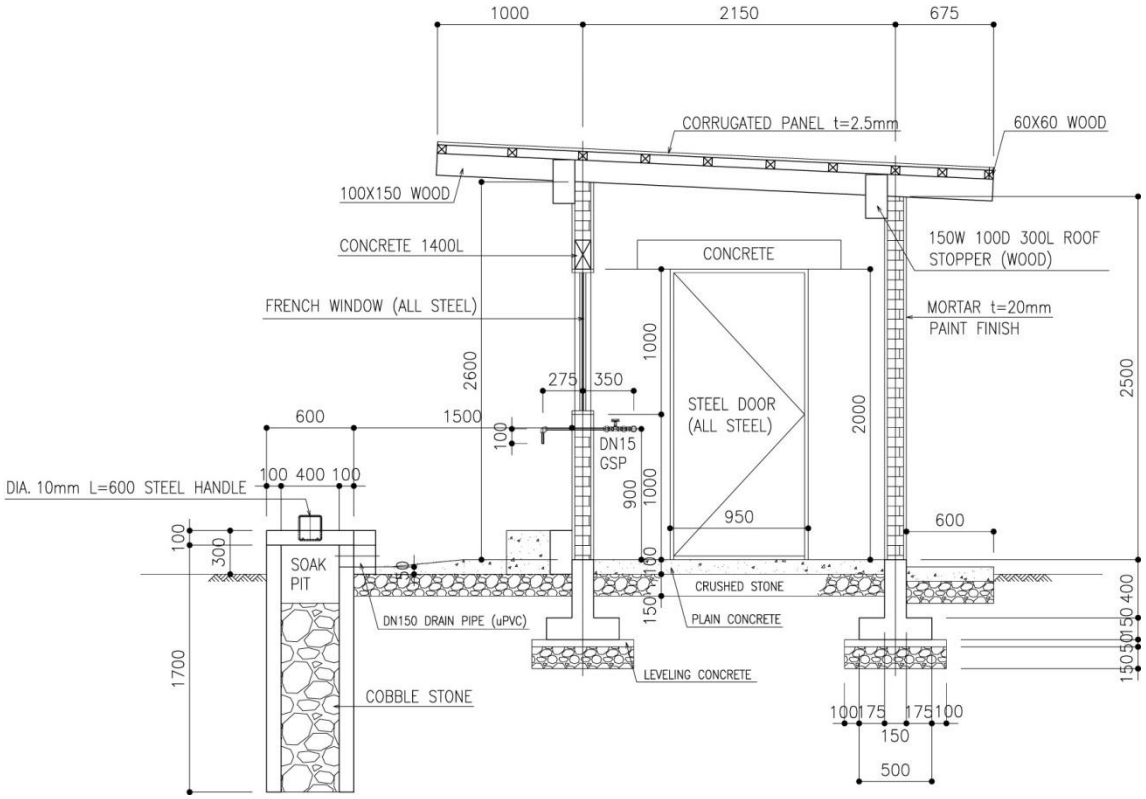


Figure 2.2-11 Water Kiosks to be Constructed under the Project

2) Service Pipes for Yard Tap Connection to Public Facilities

Yard tap connections to the public facilities are provided under the Project. The service pipes for this yard tap connection are installed as shown on Figure 2.2-12. The service pipes consist of a branch saddle, valves, service pipes, a water meter and a tap stand as illustrated in the figure.

The service pipes are of HDPE (OD32mm or OD50mm), and tap stand is of GSP (DN25mm). The total distances of OD32mm and OD50mm are planned to be 4,523m and 1,946m, respectively. The vertical pipe of yard tap is of GSP (DN25mm).

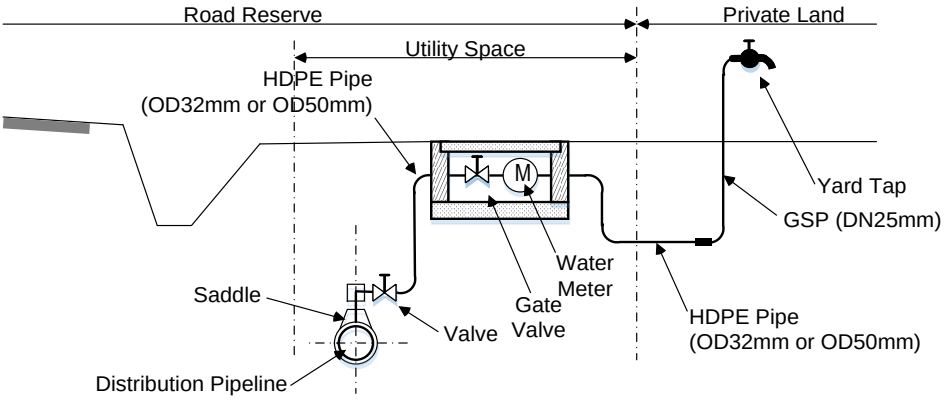


Figure 2.2-12 Service Pipes for Yard Tap Connection to Public Facility

The number of yard tap connections to public facilities are summarized below.

Table 2.2-18 Summary of Number of Yard tap Connections

No.	Code	Name of RGC	School	Hospitals	Church, Mosque, Etc.	Others	Total
1	I-03	Nambale	5	1	4	2	12
2	I-06	Lambala	4	0	4	0	8
3	I-07	Naigobya	4	1	3	1	9
4	I-09	Kyanvuma	7	0	5	0	12
5	P-02	Kasassira	4	1	5	1	11
6	P-03	Kameke	5	1	3	2	11
7	P-04	Kapala	7	1	2	2	12
8	P-05	Buseta	6	1	3	1	11
9	S-01	Kidetok	9	1	2	1	13

2-2-2-2 Procurement Plan

It was confirmed that the equipment and materials stated below are requested by the Government of Uganda.

Table 2.2-19 Requested Equipment and Materials

S/No.	Equipment	District/Ministry						
		Soroti	Serere	Pallisa	Kibuku	Iganga	Luuka	RWSSD/ DWD
1	4X4 Wagons							2
2	4X4 Double Cabin Pickups		1	1				1
3	Mobile Water Quality Kits	1	1	1	1	1	1	1
4	GPS Receivers	1	1	1	1	1	1	1
5	Computers and Accessories	1	1	1	1	1	1	1
6	Office furniture	1	1	1	1	1	1	1

RWSSD: Rural Water Supply and Sanitation Department

2-2-2-2-1 Vehicles

Station wagons of 4WD (2 nos.) and pick-up trucks of 4WD (1 no. for the district water offices of Serere and Pallisa) are requested, but these vehicles are not procured under the Project because of the following reasons.

In the Serere and the Pallisa district water offices, they have the 4WD vehicles for the water officer though they look rather old. The Station Wagon vehicles for RWSSD are necessary for participating in the activities under the Project according to them. The most officers above

principal officers have their vehicles attached already. The staff who does not have their vehicles and stay in the field moved with the consultants' vehicles. In this field survey, they moved with the consultant by the consultant's vehicles and hold the stake holder meetings.

However, this procurement is not included in the scope of the Project due to the limited budget for the Project.

2-2-2-2-2 Mobile Water Quality Kits

District water office has to be responsible for the monitoring of borehole water quality in the districts. Therefore, the procurement of mobile water quality kits is requested. The water quality monitoring is carried out by Umbrella-East and any water quality kit will not be procured in the Project.

2-2-2-2-3 GPSs, Computers and Office Furniture

The most of water officers have their own computers for their work, and GPSs are also available in the water offices. As for the office furniture, basic items of furniture are available in the water office. Therefore, no other computers and furniture will not be procured under the Project.

2-2-3 Outline Design Drawings

The outline design drawings for the piped water supply facilities to be constructed under the Project are as follows:

Table 2.2-20 List of Outline Design Drawings

No.	Titles of Drawings
1.	Location Map
2.	Nambale RGC, General Layout
3.	Lambala RGC, General Layout
4.	Naigobya RGC, General Layout
5.	Kyanvuma RGC, General Layout (1/4)
6.	Kyanvuma RGC, General Layout (2/4)
7.	Kyanvuma RGC, General Layout (3/4)
8.	Kyanvuma RGC, General Layout (4/4)
9.	Kasassira RGC, General Layout
10.	Kameke RGC, General Layout (1/2)
11.	Kameke RGC, General Layout (2/2)
12.	Kapala RGC, General Layout (1/2)
13.	Kapala RGC, General Layout (2/2)
14.	Buseta RGC, General Layout
15.	Kidetok RGC, General Layout (1/2)
16.	Kidetok RGC, General Layout (2/2)
17.	Typical Trench Excavation and Pipe Installation
18.	Typical Concrete Thrust Block
19.	Typical Air Valve Chamber
20.	Valve Chamber for Borehole Water Transmission Pipes DN100 (OD110) and DN50 (OD63) uPVC
21.	Typical Valve Chamber for Distribution Pipe DN50 (OD63) uPVC
22.	Typical Borehole and Intake Facilities
23.	Nambale RGC, Plan of Elevated Tank and Solar Power Generation Array
24.	Nambale and Lambala RGCs, Elevated Tank
25.	Lambala RGC, Plan of Elevated Tank and Solar Power Generation Array
26.	Naigobya RGC, Plan of Elevated Tank
27.	Kyanvuma RGC, Plan of Elevated Tank

No.	Titles of Drawings
28.	Kasassira RGC, Plan of Elevated Tank
29.	Kasassira RGC, Elevated Tank
30.	Kameke RGC, Plan of Elevated Tank and Solar Generation Array
31.	Kapala RGC, Plan of Elevated Tank
32.	Buseta RGC, Plan of Elevated Tank and Solar Power Generation Array
33.	Kidetok RGC, Plan of Elevated Tank
34.	Typical Fence and Gate
35.	Water Kiosk House
36.	Guard House
37.	Kasassira RGC, Generator House
38.	Nambale, Lambala, Kameke and Buseta RGCs, Solar Cell Panel Stand

2-2-4 Implementation Plan

2-2-4-1 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 sub-county local administration through district local government after handing over to the Ugandan side, and each local government will be responsible for the operation and maintenance of facilities. The Water Supply and Sanitation Board (WSSB) to be

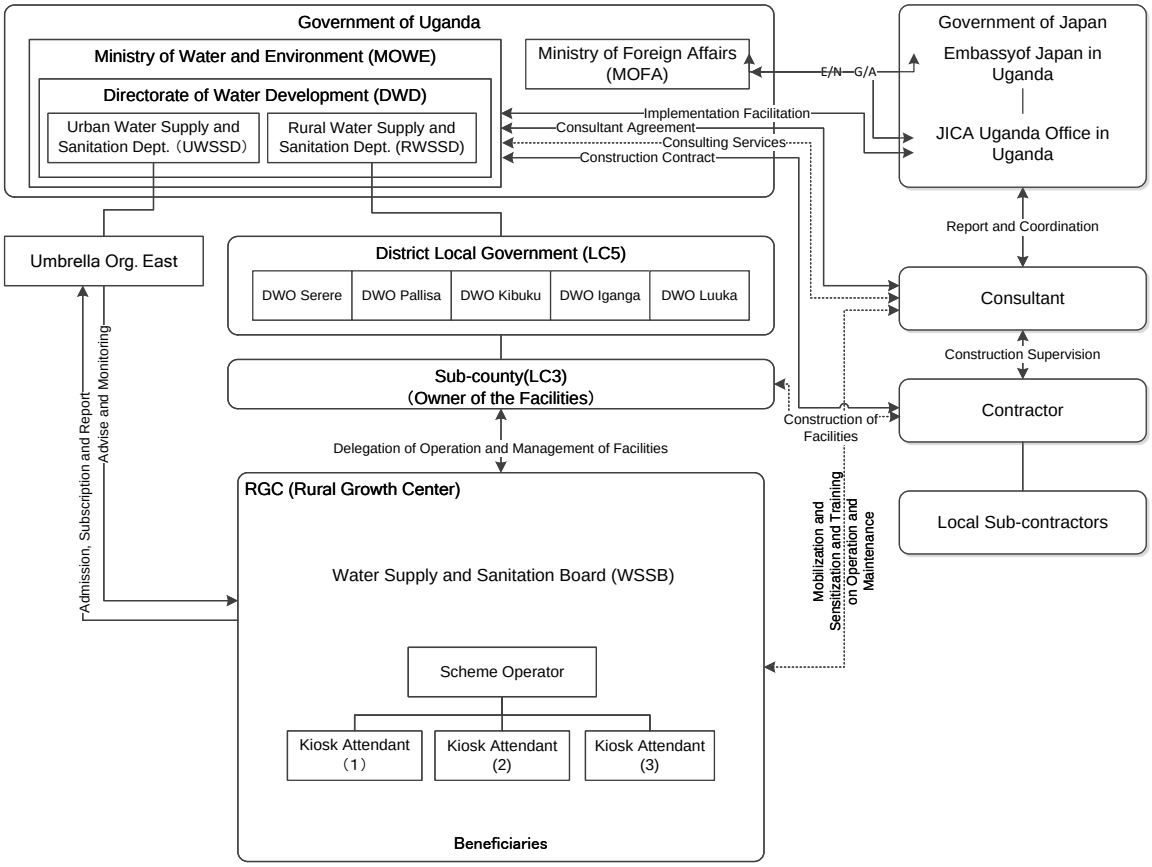


Figure 2.2-13 Project Implementation Organization

established in each sub-county will take the responsibility of operation and maintenance of the facilities. WSSB will assign a scheme operator to operate and maintain the facilities. WSSB has to join the Umbrella-Organization East which is established as an outpost of MOWE in order to get its assistance in operation and maintenance activities.

MOWE will make agreement with the consultant to get the services in detailed design, preparation of tender documents, assistance in tendering, construction supervision, and soft component. MOWE will hire the Japanese contractor to proceed with the construction of the facilities utilizing the local contractors. The organizations and agencies relating to the Project implementation are illustrated in Figure 2.2-13.

2-2-4-2 Implementation Conditions

2-2-4-2-1 Construction Works Considering Safety Measures

The elevated tanks will be provided for each water supply system of RGC, and two (2) water tanks out of total of nine (9) are planned to have the truss supports of which heights will reach about 20m high. Total heights of these tanks including the heights of panel tanks on the top reaches about 24m. It is necessary to provide the safety measures in the works in such high places.

The pipelines will be placed along the existing roads basically, and it is necessary to commence the backfilling as soon as the pipe placing is finished in order to avoid the fall into the trench of about 1.1m deep. In case the trench has to be left excavated, it is necessary to dispatch security personnel to avoid fall accidents.

2-2-4-2-2 Acceptance of Land Use for Facilities and Construction Permits

The elevated tanks and the water kiosks will be constructed at vacant yards located along the existing roads. These lands are considered as public land owned by sub-county or those considered as private lands owned by community members. Most of the lands are identified as public but some as private. The use of these lands for the water supply facilities are authorized by the documents agreeing such use of land for the Project. The socio-economic conditions of RGCs may change before the commencement of the construction work. It is, therefore, important to re-confirm the intension of land owners to avoid land problems at the commencement of construction works.

2-2-4-3 Scope of Works

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

Table 2.2-21 Scope of Works of Ugandan and Japanese Governments

Description	Japanese Side	Ugandan Side
(1) Land Acquisition for Facilities and Construction Works ,and Preparation of Access Roads to the Sites		○
(2) Drawing Works for Commercial Power (5RGCs)		○
(3) Provision of Wells (Existing and Exploratory Wells)		○
(4) Construction of Water Source Facility, Transmission and Distribution Facility and Service Facility (including protective Fence etc.)	○	

2-2-4-4 Consultant Supervision

The Project will be implemented under the Japan's Grant Aid system. The consultant will execute the detailed design study and construction supervision, including soft component, as known as Soft Component for securing the sustainable maintenance of facilities.

2-2-4-4-1 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 mobilization will also be conducted. Besides, the following additional work will be implemented for all the source boreholes; cleaning by air lifting, observation by borehole camera, pumping test, reaming works for existing well of Kasassira RGC, additional survey for elevated tank, and transmission and distribution pipe, lastly reconfirmation of land provision towards owners of land for kiosks and elevated tanks.

2-2-4-4-2 Tender

The consultant will assist MOWE in tendering procedures of the Project. After the authentication by JICA, the contract will become effective as the contract for grant aid.

2-2-4-4-3 Construction Supervision

Consultant will assist MOWE 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 soft component during and after the construction, and make an effort to secure the sustainability of the operation and maintenance by villagers.

2-2-4-5 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.

Sequentially after completion of construction, the completed facility will be temporarily used by the villagers. The training for WSSB on operation and maintenance practice will be conducted as one of the soft component activities. Since the official handover will be made after the completion of all the facilities and the defect liability period is also count from the date of official handover, it is necessary to stipulate clearly in the tender documents on the temporary use, the date of official handover and the count of the defect liability period.

The above specifications related to quality control should comply with the international

specifications, such as JIS and ISO etc.

Furthermore, for the purpose of confirmation of implementation safety and quality, quality and safety management conference will be conducted for following members; account executive of consultant, personnel from construction operator, personnel from implementing agency. This conference will be conducted 3 times during working execution term.

2-2-4-6 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 member countries, South Africa and Kenya are considered as the third county for the procurement in Japan and in Uganda, respectively. The scheduled procurement countries for main equipment is listed below.

Table 2.2-22 Country of Procurement for Major Equipment and Materials

No.	Items	Japan	Third Country	Uganda
1.	Submerged Motor Pump	○	○	○
2.	Solar Power Generation Module	○	○	○
3.	Generator for Emergency	○	○	○
4.	Cement, Reinforcing Bar		○	○
5.	Gravel, Coarse Aggregate			○
6.	PVC Pipe		○	○
7.	HDPE Pipe		○	○
8.	Galvanized Steel Pipe		○	○
9.	Steel Panel Tank		○	○
10.	Steel Material for Elevated Tank		○	○

In case of the 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. In case of procurement from Japan, there are two (2) 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.

2-2-4-7 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 2.2-23 Outline of Initial Instruction and Operation Training

Item	Facility/Equipment	Training Contents
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 Water Supply Kiosk	- 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

2-2-4-8 Technical Assistance Plan (Soft Component Plan)

As a result of the field survey, it is found that the scheme operator and the kiosk operators hired by WSSB are considered the most suitable for the operation and maintenance of the facilities to be provided under the Project. However, there are various technical and operational issues to be solved in order to secure the sustainability of the facilities. It is necessary to provide assistance through the soft component to solve these issues.

2-2-4-8-1 Objectives

To secure the sustainability of the use of piped water supply facilities, the objectives of the soft component are set as follows:

Objective 1: Basic activities such as water charge collection are done smoothly and the facilities are operated on financially stable conditions.

(Water fee will be instructed to be set under consideration for poor classes. Also, mobilization and sensitization activities related to this will begin in the early stage of soft component activities.)

Objective 2: The piped water supply facilities constructed under the Project are used cleanly and continuously under proper operation and maintenance (inspection and repair).

The soft component contains such activities that derived from lessons learnt from existing similar project as thefts of public taps, broken down of gate valves due to water theft, and thorough implementation of learned issues on O&M

2-2-4-8-2 Outputs

The expected outputs of the soft component are stated below.

Output 1: Villagers understand the importance of safe water and the relations among safe water, and health and sanitation.

Output 2: Administrative officers and villagers understand the importance and roles of WSSB, scheme operators, kiosk attendants and Umbrella organization.

Output 3: Members of WSSB including scheme operators and kiosk attendants understand objectives of WSSB, roles of each member, and method of organizational operation.

Output 4: Members of WSSB including scheme operators and kiosk attendants learn about the technical knowledge and skills for the operation and maintenance of the piped water supply facilities such as structures, inspection and repair of the facilities.

Output 5: Members of WSSB including scheme operators and kiosk attendants understand water charge collection at kiosk, reading flow meter, and importance of cleaning kiosk and soak pit.

2-2-4-8-3 Input Plan

In order to reach the above-mentioned outputs, sensitization and mobilization of villagers and administrative staff, and training of WSSB including scheme operators and kiosk attendants are proposed to be conducted.

These activities are conducted with the following three (3) stages.

Stage 1: Sensitization and mobilization of villagers and administrative staff (Pre-construction) (Activities for Output 1 and Output 2)

Stage 2: Training of WSSB including scheme operators and kiosk attendants (Class room study during construction) (Activities for Output 3)

Stage 3: Training of WSSB including scheme operators and kiosk attendants (OJT activities conducted in the actual operation and maintenance in post-construction)
As for the RGCs of which construction works of water supply facilities are completed at the last moment of the whole implementation period, their trainings will be conducted in the other supply facilities having been completed. (Activities for Output 4 and Output 5)

2-2-4-8-4 Implementation of Activities

The activities of the soft component will be carried out in four (4) months of the detailed design and 16 months of the construction period.

(1) Sensitization and Mobilization of Villagers and Administrative Staff (Pre-construction)

Sensitization and mobilization before construction of the facilities are conducted in the course of the detailed design survey. As soon as the consultant's agreement is settled, the local consultant to be assigned for these activities will be selected, and the Japanese Consultant will study on the contents and schedule of the activities and prepare the handouts and manuals for the activities with the selected Community Development Expert/Facilitator. Based on the manuals prepared, the Japanese Consultant and the Expert will conduct the preparatory works. 1.5 months period will be allocated for these works. Following the preparatory works, 2.0 month period will be allocated for the sensitization and mobilization in the field, and workshops necessary for the activities will be held in nine (9) RGCs. It will take 0.5 months to wrap-up the activities having been done, and confirmation of achievement of the understandings after the series of activities. Four (4) month period is allocated as a whole of this stage of activities.

Among these activities, the staff of MOWE dispatched for the coordination of the consultant's field works shall attend the workshops to be held at the initial stage and those relating to the trainings of candidate S/Os and the confirmation of amount of contribution in order to indicate that the Project is implemented by the Ugandan government as well as to facilitate the assistance in operation and maintenance after the handover by the participation of the government staff in the decisions of the important issues.

(2) Training of WSSB including scheme operators and kiosk attendants (Class room study during construction)

Since it is necessary for WSSB to understand the basic knowledges on the operation and maintenance of the facilities before the completion of construction works, the activities during the construction works have to be conducted considering the progress of construction works. The preparatory works have to be conducted in the first 1.0 month period. The Japanese Consultant and the Community Development Expert will mobilize at the time of commencement of the construction, and conduct the selection of local consultant, and preparation of manuals. The training activities will be conducted by the selected local consultants (Operation and Maintenance Experts). These activities have to be done in the period until the construction completion in each RGC, and all the activities have to be completed in 15 month period.

About 15 months period is allocated for this activity. More practical trainings for the works of S/As, K/As and accountants will be carried out and the staff of MOWE shall attend the important workshops especially on setting water tariff and handing over the facilities to the communities.

(3) Training of WSSB including scheme operators and kiosk attendants (OJT activities conducted in the actual operation and maintenance in post-construction)

The training after the completion of construction consists of monitoring of the WSSBs' O&M and OJT to improve their O&Ms. The activities will be conducted in the last nine (9) month period of the construction. The degree of understanding by a WSSB will be monitored during this period.

This monitoring activity is considered quite important because the issues found in such monitoring activities will affect the contents of assistance to be provided after the completion of the Project. It is, therefore, essential for the government staff to experience and feel the extent of mastering the skills and practices for the required operation and maintenance by participating in such monitoring activities by themselves.

2-2-4-9 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 Figure 2.2-14.

The target RGCs are scattered widely in Lake Kyoga basin. 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 at Iganga and Mbale. 3 sections for construction will be established as shown in Figure 2.2-15 in order to forward a plan of implementation.

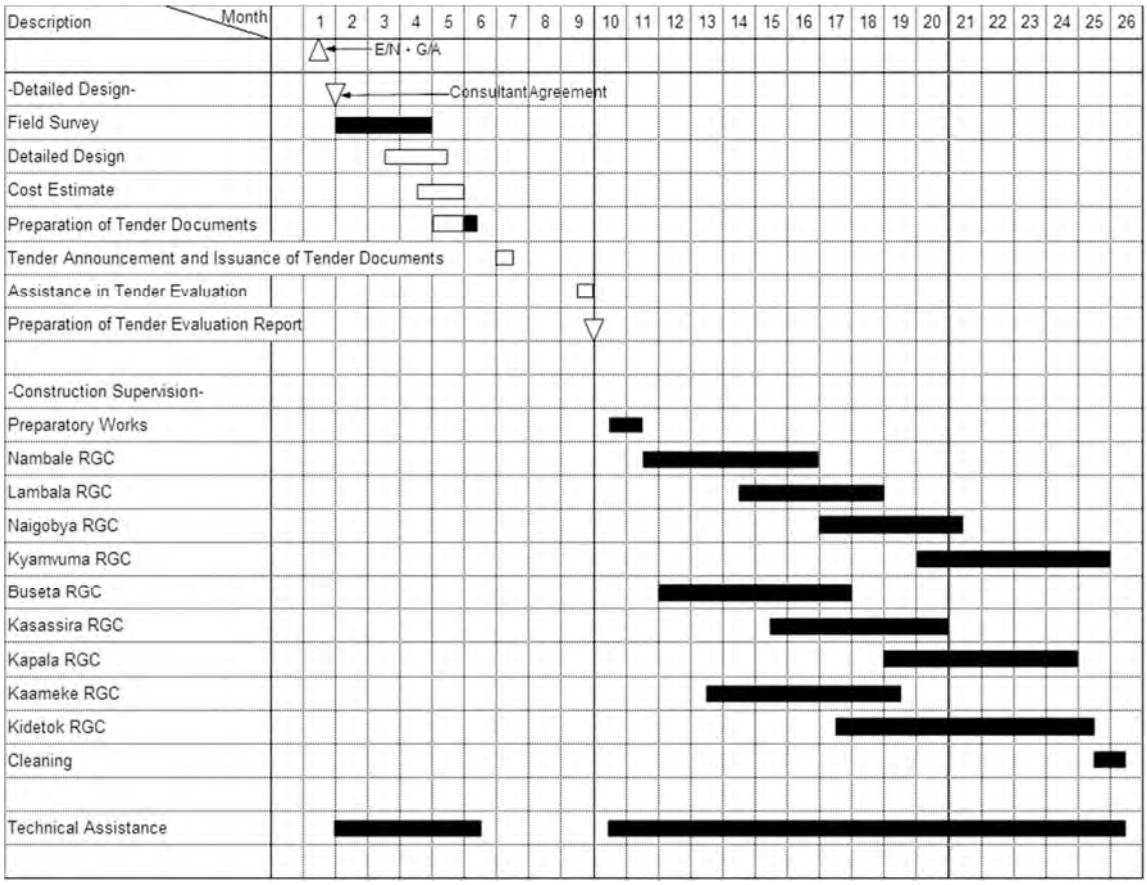


Figure 2.2-14 Project Implementation Schedule

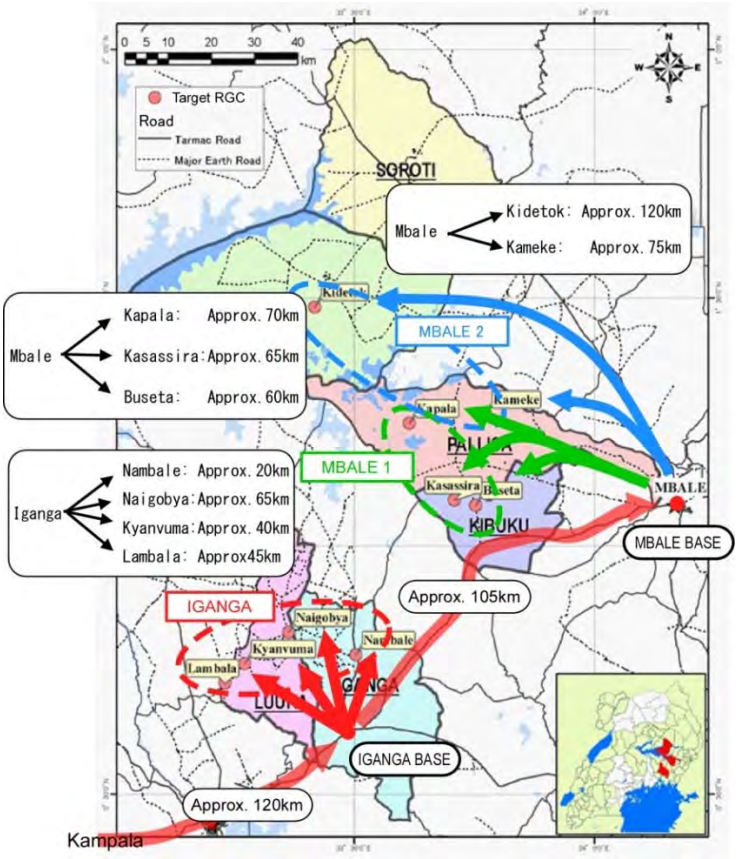


Figure 2.2-15 Construction Sections for Implementation

2-3 Obligations of Recipient Country

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

i) Payment of fees for Banking Arrangement (B/A) and Authorization to Pay (A/P)
It is necessary to pay the fees for opening a bank account and issuing A/P for the payment to the consultant after the conclusion of G/A, and after the tender for construction work for issuing A/P for the payment to the contractor and the consultant.

ii) Payment of taxes and duties such as VAT
The payments for taxes and duties are being discussed between the Japanese and the Ugandan Governments. The Ugandan side shall settle the procedures for the taxes and duties to be exempted as a result of the discussion in time, and shall get the project code and prepare the budget of the necessary amount for paying such items of taxes and duties to be reimbursed by the Ugandan side in time.

iii) Secure necessary number of required staff for project implementation
Before the tender of construction, the staff of MOWE should be dispatched to work with Japanese consultant to manage soft component. During the construction, the staff of MOWE should be dispatched to facilitate project works, to coordinate among the related organizations and to participate in the activities of soft component. The staff has to stay for three (3) months in detailed design and 16 months in construction supervision. Since the project sites are widely distributed over Lake Kyoga basin, two (2) resident staff are required for operation. It is considered impossible by one (1) resident staff.

iv) Connection of commercial electricity power supply to water supply facilities
Ugandan side shall provide the required electricity connection from the available existing power lines to the source well site for enabling the operation of intake motor pump in 5 RGCs such as Naigobya, Kyanvuma, Kasassira, Kapala and Kidetok RGCs. The Ugandan side shall complete the necessary connections ready to use before the Commencement of the construction in Kasassira RGC.

v) Provision of necessary data and materials for the Project

vi) Security at the project sites

vii) Formal approval for project implementation from the authority of environmental and social consideration

viii) Preservation and protection of the source boreholes drilled in the previous development study as well as those drilled in this survey.

ix) Secure of facility yard, tentative construction yard and surplus soil dumping yard for construction

x) Assistance in obtaining the permission of UNRA concerning construction of pipelines and water supply facilities planned to be provided in and across the road area.

xi) Assistance in temporary registration of the staff of the contractor and the consultant to Engineering Registration Board.

xii) Protection of source boreholes until site delivery to the Japanese constructor

xiii) Quick unloading and customs clearance procedures for the equipment and materials to be procured and imported into Uganda

xiv) Submission of Project Monitoring Report during the construction

xv) Submission of project completion report

xvi) Submission of environmental monitoring result

xvii) Appropriate use and maintenance of the constructed facilities under the Project

2-4 Operation and Maintenance Plan of the Project

2-4-1 Operation and Maintenance Plan for the Piped Water Supply Facility

2-4-1-1 Operation and maintenance management system of current public piped water supply facilities in Uganda

(1) Operation and maintenance management system of current public piped water supply facilities

After surveying the existing public piped water supply facilities, the operations and maintenance (O&M) systems actually used in the rural areas in Uganda could be sorted out as shown in the table below.

Table 2.4-1 Current O&M Systems for Piped Water Supply Facilities in Rural Area in Uganda

O&M Body	Relation to WSSB	Responsible Body of O&M	Role of Operator	Scale of water supplied population (Roughly)	Key point in case of applying to this project
a. National Water and Sewerage Corporation (NWSC)	None	NWSC is responsible for all O&M.		more than 30,000	・ The scales of facilities of this project are too small for NWSC ・ In case that a town served by NWSC exists near the site, NWSC may have interest.in O&M of the relevant facilities.
b. WSSB & Private Operator (P/O)	Contract on O&M P/O pays fixed amount or fixed rate of collected water fee to WSSB. P/O is a kind of private company	P/O WSSB on major repairs	Pump operation and the record, collection of water fee, payment on power supply cost, inspection of the scheme and minor repair.	5,000 to 30,000	・ Sustainability of facilities is strongly depending on the capacity and sense of responsibility of each P/O ・ Contract must be done through official bidding; it must be followed by several procedures predetermined by MOWE. Since P/O is a company, it needs overhead cost for running. To cover the cost properly, the facility system must be large. ・ Cluster management system, which gather some schemes nearby and one P/O operates the schemes, is recommended for adaptation of P/O management in the scale of this project
c. WSSB only (WSSB employ Scheme Operator (S/O))	Selection and employment of S/O A part of collected water user fee will be paid to S/O as his/her salary.	WSSB WSSB on major repairs.	Many variations exist according to their responsibilities. The idea of MOWE is "S/O is responsible to pump operation and its recording, collection of water fee, inspection of the scheme, and minor repairs."	Less than 5,000	・ Contract is mainly personal agreement between WSSB and an operator, bidding is not necessary ・ Job contents of S/O are almost same as that of P/O substantially. ・ No applied cases of this O&M system exist yet in Eastern Uganda

Points listed below should be kept in mind when selecting appropriate O&M system for the target RGCs from the above O&M bodies.

・ The facilities and served populations are too small for direct O&M by NWSC.

- If P/O are used for O&M, as they are companies, overhead costs are necessary. For the small scale piped water supply facilities, however, the portion of expenditure accounts for large percentage in collected water fees, and as can be seen from past experience, maintenance via P/O is very likely to face financial trouble.
- In MOWE, there are registered 17 P/Os, but very few have earned good reputations.
- At the time of this survey started, MOWE recommended the P/O system, it recommends the S/O system at present for such small scale water supply facilities to be constructed in the Project.

Therefore, from the knowledge gained above and from the served population scale of the target RGCs, "the WSSB + S/O system" is best suited to the facilities to be constructed by this project.

Table 2.4-2 Population of the Target RGCs

District	Target RGC	Population (2022)*
Iganga	Nambale	1,863
Luuka	Lambala	1,742
	Naigobya	1,711
	Kyanvuma	3,228
Kibuku	Kasassira	5,676
	Buseta	2,276
Pallisa	Kameke	1,546
	Kapala	2,735
Serere	Kidetok	3,961

* Investigated in the socio-economic survey in this project (2015)

(2) The Supervision and support bodies on O&M in the field of piped water supply

DWO and U/O will serve as governmental organizations that support the O&M. For DWOs, however, as they are so highly affected by decentralization strategy of the central government so that it results in a shortage of manpower in local governments. They can handle the O&M of hand pump wells; but, they don't have enough stuff to look after O&M for piped water supply schemes. On the other hand, U/O is an body under MOWE, which is specialized in O&M support of piped water supply schemes with a mission to provide maintenance training, technical advice, management support, preventative maintenance control, water user fee collection, support plans for facility reconstruction and expansion, etc., as well as monitoring water quality. Except for areas under NWSC control, all the other areas are under U/Os. Presently, there are six U/Os in whole Uganda. Umbrella-East, whose office is in Mbale, is in charge of the project areas. Previously, it was a semipublic organization, and in 2016, it became a completely governmental one. The Ugandan government has been investing its subsidy to the U/Os for aiming smooth implementation of extensive repairs, extension and rehabilitation of facilities, and more. Therefore, it is necessary to join an U/O and receive its support as one of the measures for ensuring sustainability of the piped water supply facilities built by this project.

However, each U/O has not enough officers for the purpose at present. For example, the responsible U/O of the project area is "Umbrella-East", whose personnel composition is listed in the table below.

Table 2.4-3 Personnel Composition of Umbrella-East

Role	Nos.
Manager	1
Admin/Accounts Assistant	1
Electrical & Mechanical Technician	0
Water Quality Analyst	1

Role	Nos.
Social Mobiliser	1
Assist Social Mobiliser	1
Engineering Assistant	1
Secretary	1
Driver	1
Office Attendant	1

Thus WSSB executives and the S/O must cooperate and take responsibility for the daily O&M of the facilities. U/O should be recognized just a support organization at present.

(3) Support system concerning safe water supply and sanitation

In order to secure self-sufficient sustainability of piped water supply facilities, villagers must understand the necessity of using safe water and creating and maintaining a healthy and sanitary environment, and thereby willingly paying their water fees.

WSSBs and villagers (community members) play the major role in ensuring sustainability of piped water supply facilities to be constructed in the Project. While Local Governments, especially DWOs, play supporting roles through promotion of mobilization and sensitization activities and those monitoring for keeping everyone informed and well-known on importance of safe water supply by the piped water supply facilities.

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

Table 2.4-4 Local Administrative Officers related to Mobilization/Sensitization Activities for Safe Water, Health, Sanitation and Hygiene

Local Government	Affiliated to MOWE	Affiliated to the Ministry of Gender, Labor and Social Development	Affiliated to the Ministry of Health
District	District Water Officer (DWOr) Assistant DWOr (Mobilization) Assistant DWOr (Sanitation) Assistant DWOr (Water supply)	Community Development Officer (CDO)	Health Officer (HO)
Sub-county		Community Development Assistant (CDA)	Health Assistant (HA)

In MOWE series, DWO officers are in charge of this issue. However, the DWOs have limited number of personnel and their manpower is not sufficient. Therefore, it is difficult for DWOs to support the mobilization and sensitization activities in the Project. Real activities to facilitate and support villagers and WSSBs are usually to be carried out by CDAs and HAs. However, in their implementation of these activities, they are likely to face the following issues:

- CDAs and HAs are supposed to carry out various kinds of extension activities: the mobilization and sensitization for community-based management on water supply facilities is only a part of the activities. Therefore, it cannot be expected their full cooperation for the Project.
- CDAs and HAs belong to other series of ministries, and they are outside of the control by MOWE.

Therefore, it is essential for securing sustainability of water supply facilities to implement and/or support these necessary extension activities in the Project

2-4-1-2 Issues concerning O&M of Piped Water Supply Facilities built by the Project

O&M of the small-scale piped water supply facilities built in rural areas by this project is mainly up to WSSB, S/Os, and K/As. In implementing O&M, they will surly face the serious issues listed below. In order to secure sustainable use of the facilities, these issues should be remedied in advance.

Issue 1: Villagers do not know the importance of safe water, and the relation among safe water, health and sanitation.

In order to secure self-sufficient sustainability of piped water supply facilities, villagers must understand the necessity of using safe water and creating and maintaining a healthy and sanitary environment, and thereby willingly paying their water fees.

However, according to the social survey, average water fetching time per household is some 8.9 hours per day during the dry season, but drops to 2.4 hours per day in the rainy season, probably because villagers use surface water or rainwater in that season.

Table 2.4-5 Current Situation of Fetching Water Work in Target RGCs

District	Code	Target RGC	Approximate time required for fetching water Dry season (Hour/day)	Approximate time required for fetching water Rainy season (Hour/day)
Iganga	I-3	Nambale	11.9	2.1
Luuka	I-6	Lambala	4.0	1.9
	I-7	Naigobya	8.0	1.5
	I-9	Kyanvuma	8.8	3.1
Kibuku	P-2	Kasassira	10.5	2.9
	P-5	Buseta	7.8	1.4
Pallisa	P-3	Kameke	11.4	2.6
	P-4	Kapala	11.3	3.7
Serere	S-1	Kidetok	6.8	2.4
		Average	8.9	2.4

Further, field survey results (water quality test of existing boreholes) show that in high population areas such as Buseta, Kapala, etc., E-coli were found in a number of boreholes. As MOWE concerned, it can be said that water pollution tends to spread in some RGCs with large populations.

The table below shows the interview survey results at health centres in each sub-county. The morbidity of water born diseases changes from 0.1 to 13.4 % in the target sub-counties.

Table 2.4-6 Morbidity (Disease Rate) of Water Born Diseases

District	Sub-county	Target RGC	Patients（year 2015）					Population of Sub-county	Disease Rate (%)
			Diarrhea	Worm	Intestinal infection	Typhoid	Dysentery		
Iganga	Nambale	Nambale	648	2,088	0	18	N/A	47,115	5.8
Luuka	Irongo	Lambala	239	433	N/A	6	N/A	28,691	2.4
		Kyanvuma							
	Bukooma	Naigobya	36	12	N/A	5	N/A	39,049	0.1
Kibuku	Kasassira	Kasassira	879	131	0	0		21,840	4.6
	Buseta	Buseta	1,392	756	0	0	89	16,709	13.4
Pallisa	Kameke	Kameke	250	180	0	0	N/A	17,273	2.5
	Gogonyo	Kapala	639	538	0	0	N/A	29,568	4.0
Serere	Pingire	Kidetok	121	1	N/A	N/A	N/A	34,581	0.4

Looking at payment and collection status of water user fees, which are basic to O&M, many villagers use hand pump wells without paying the relevant fees, and the community allows that to happen. Further, there are no preparations/savings for repairing and maintaining the hand pump wells, and when repair or maintenance must be done, donations are collected.

Issue 2: Neither the local administrative officers nor the villagers understand the purpose, roles and importance of the WSSB, S/O, K/As, and U/O.

Because the target RGCs have no piped water supply facilities, most of the villagers have no understanding of what is required to conduct O&M properly and sustainably. Naturally, therefore, they know nothing of the specific roles of WSSB executives, S/O, K/As, or U/O.

On the other hand, even if DWOs are very aware of the O&M of point water sources, they cannot be said to be well versed in the O&M of piped water supply facilities. Therefore, both DWO and villagers in the project sites must be fully informed about the roles and purposes of WSSB and U/O.

Issue 3: Members of WSSBs do not know objectives of WSSB, roles of each member, and method of organizational operation.

The RGCs and the sub-counties involved have no piped water supply facilities, so the sub-county councilors and the sub-county chiefs, who are the main members on WSSBs, do not know the purposes and roles of the WSSB, or the O&M issues. And of course the members to be chosen from the RGC community (routinely three people) do not know as well. Further, in some communities, even the water user committees for hand pump management do not function properly.

Thus, education and training for WSSB members chosen when construction of facilities begins should take place, and such training should include concrete information on O&M including objectives and roles of WSSBs, and necessity of transparency.

Issue 4: A S/O for this project, chosen by the WSSB, has not learned the technical knowledge and skills for the operation and maintenance of the piped water supply facilities such as structures, inspection and repair of the facilities constructed by this project

S/Os are chosen by WSSB executives, and together with those WSSB executives, they operate and maintain facilities. Specifically, hand pump mechanics are thought to be one of candidates, and of course these people cannot be expected to have necessary knowledge and skills for O&M of piped water supply facilities. S/Os must work with WSSBs on day-to-day O&M, and to do this, workshops that give the basic knowledge necessary must be held. Even though the available time period is limited, as much training as possible should be inputted; when monitoring of their O&M indicate the necessity of additional training, such training can be accomplished through continuous input with OJT method.

Issue 5: K/As do not understand the importance of collecting water user fees, maintaining flow meters, and cleaning the soak pit

K/As are at the position of the front line of water supply service by piped water supply facilities. Further, they have the important duty of collecting water user fees, which enable sustainable O&M of facilities. In order to do that effectively, the Attendants must have the knowledge necessary to maintain the Kiosk, manage the collection of water user fees, treat flow meters and record its value, etc. Also, in reality, hand pumps often have no fences, their soak pits are clogged, and repairs are left undone.

2-4-1-3 Supposed Method of O&M for the Piped Water Supply Facilities built in the Project

As described in "(1) Operation and maintenance management system of current public piped water supply facilities in Uganda", the cooperated O&M system by the combination between WSSB and S/O is assessed to be most applicable to the Project.

The specific structure of the O&M system can be expected to work as shown in the figure below. Concerning the division of roles and responsibility between WSSB executives and the S/O, there are several possible patterns, and from which each RGC can choose by its own decision.

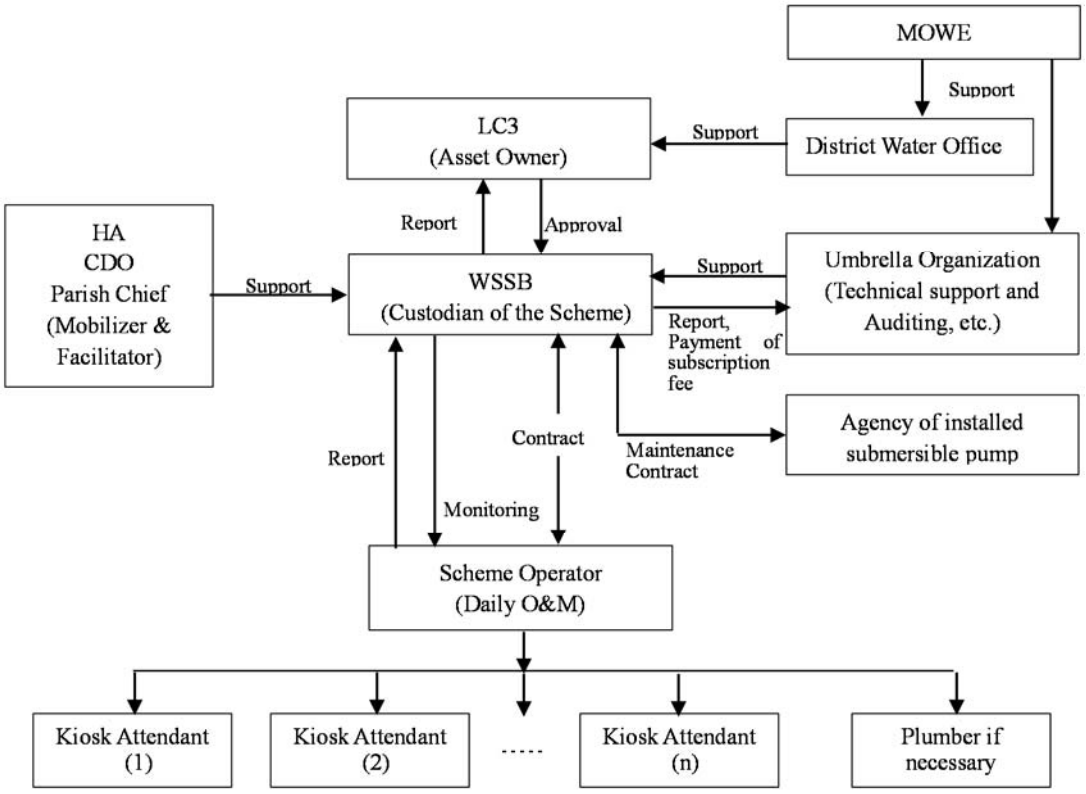


Figure 2.4-1 Supposed Organization Constitution of O&M in the Project

That is to say, the WSSB (including a S/O and K/As), which is given authority to operate and maintain the water supply system from the Sub-County Council (LC3), will operate and maintain the facilities. In addition, a maintenance contract should be made with the supplier of the submersible pump as it requires highly professional skills; and major repairs, etc., can be done by joining in the U/O to obtain their support. K/A is responsible for collection of water fees at Kiosk, its cleaning, etc. S/O may hires K/A directly for each Kiosk.

Table 2.4-7 Role of Institution or Person in Operation and Maintenance (Provisional)

Organization	Role of the Organization	Staffing
Sub-county (LC3)	・ Owner of the piped water supply system on the law ・ Coordination between DWO and community	LC3 council
WSSB (Member)	・Setting water fee through drafting and legislating by-laws ・Opening bank account ・Management of bank account ・Account audit for S/O ・Payment to U/O membership fee	Sub county chief, LC3 councilor, 3 persons from the Community member

Organization	Role of the Organization	Staffing
	・Report to MOWE、DWO and U/O ・Report to the community about operation and maintenance status of the water supply system ・Mobilization of the community to the activity of water and sanitation	
WSSB（S/O）	・Operation and Maintenance of the water supply facilities ・Collection of water fee from K/As and public facilities which served water by yard tap (Twice a month) ・Daily checking on the status of water source, pipelines, elevated tank and flow meters. ・Recording water flow from source borehole transmitted and distributed volume at elevated tank. ・Cleaning of elevated tank ・Cleaning of solar panels ・Checking leakage and repair ・Keeping the record about technical maintenance ・Payment of operation fee (electricity, fuel etc.) ・Keeping financial record ・Preparation and submission of monthly report on financial and technical matters to WSSB.	S/O If necessary, WSSB will employ Plumber for repair
WSSB（K/A）	・Collection and keeping water fee at each Kiosk ・Reading and recording flow meter（daily） ・Submission of water sales record to S/O ・Submission of collected water fee to S/O ・Cleaning of Kiosk and soak pit	K/A

2-4-1-4 Training Plan for Ensuring Practical and Sustainable O&M System of the Facilities built in the Project

Assistance program called soft component is to be implemented to solve the issues above described and ensure sustainable use of the facilities built in the project. The main issues of the soft component are establishment of WSSB in each target RGC and take over the knowledge of O&M of the facilities to the WSSB. (Details of the plan is described in “attachment 13: Soft component plan”)

The interrelationship between issues and inputs (activities) is shown in below table.

Table 2.4-8 Activity and its Target person for Solving Issues

Issue	Activity for solution	Main target personnel
Issue 1: Villagers do not know the importance of safe water, and the relation among safe water, health and sanitation.	Mobilization activity (Workshop)	Residents of RGC
Issue 2: Neither the local administrative officers nor the villagers understand the purpose, roles and importance of the WSSB, S/O, K/As, and U/O	Mobilization activity (Workshop)	Sub-county, Residents of RGC
Issue 3: Members of WSSBs do not know objectives of WSSB, roles of each member, and method of organizational operation.	During / Post Construction Training (Workshop and OJT)	WSSB (Executives, S/O, K/A)
Issue 4: A S/O for this project, chosen by the WSSB, has not learned the technical knowledge and skills for the operation and maintenance of the piped water supply facilities such as structures, inspection and repair of the facilities constructed by this project.	During / Post Construction Training (Workshop and OJT)	S/O, Including WSSB executives
Issue 5: K/As do not understand the importance of collecting water user fees, maintaining flow meters, and cleaning the soak pit.	During / Post Construction Training (Workshop and OJT)	K/A Including S/O

Key items described in the following table shall be conducted in accordance with their proper timings in the schedule to smoothly implement the soft component plan and establish practical and sustainable O&M system in target RGCs,

Table 2.4-9 Key Items and its Implementation Timing for Establishment of O&M Systems

No.	Timing	Key Items
1.	During detailed design	・ Mobilization and Sensitization activity ・ The activity should finish end of detailed design
2.	Just after commencement of construction	・ Establishment of WSSB ・ Selection of Candidates of S/Os and K/As
3.	Just before handover of the facility	・ Formulation of by-laws of WSSB ・ Setting up water fee ・ Opening bank account of WSSB ・ Selection of S/O and K/As

2-4-2 Operation and Maintenance Plan for Requested Equipment and Materials

No procurement is planned in the Project.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) Costs Covered by Ugandan Side

The costs to be covered by the Ugandan side is estimated to be 5,915,116UGX (199.3 million JPY) as broken down in Table 2.5.1.

Table 2.5.1 Costs Covered by Ugandan Side

(Unit: 1,000 UGX)

Items	Costs	Remarks
(1) Charge accompanied with B/A and A/P	*****	*.*% of the total project cost is supposed to be charged. The amount is estimated at about ***** JPY.
(2) Payment for tax and dunes	*****	**% of the sum of the total direct construction and equipment costs (**** JPY) are supposed to be the amount of local subcontractor. The amount of VAT is calculated taking 18% of the sum of this amount and the amount of subcontract by the consultant (**** UGX).
(3) Drawing of commercial power for facility operation	*****	There are 5 RGCs using commercial power out of 9 RGCs. To ensure amount of electricity to be supplied for water pumps, MOWE is responsible for this connection as confirmed in M/D and T/N, of which amount is estimated in Appendix 8. Besides, negotiation for the lands necessary for power pole is required to be made by the applicant of such power connections.
(4) Ensure personnel for implementation of the Project	*****	At detailed the design survey (3 months) and the construction supervision (16 months), government staffs are necessary to be dispatched to facilitate operation and coordination of such survey and supervision. The staff are required to be conversant with project contents, Japanese grant aid and also personnel has to be able to work with the consultant and the contractor as a resident staff. Target RGCs are widely located, so that two (2) resident staff are required. Cost of remuneration for these staff is not necessary to be newly ensured because the staffs are government staff. However, daily allowance, accommodation expenses (about 110,000UGX/day) during the detailed design survey and construction supervision for 2 staffs (5 days * 9 sites = 90 man/day) is necessary to be prepared.
Total	5,915,116	

(2) Conditions of Cost Estimate

i) Time of Estimate: May 2016
ii) Exchange Rate: 1USD = 113.65 JPY
1UGX = 0.0337 JPY
Average from February 2016 to April 2016
iii) Construction Period: Implementation design、term of work implementation is just as implementation schedule.
iv) Other: Quality survey is prepared in accord with grant aid system of Japanese government.

2-5-2 Operation and Maintenance Cost

The items to be considered as the operation and maintenance costs for piped water supply facilities of RGCs are summarized in Table 2.5.2 and the details are shown in Appendix 9.

Operation cost is accounted for the following costs; operation and maintenance cost, and other cost. Operation cost consists of cost of operator and electricity. Maintenance cost consists of maintenance and spare parts costs for solar panel and motor pump. Other costs consist of the

annual subscription fee for UOE (Umbrella Organization East) and allowance for WSSB committee members.

5% of the procurement cost for solar power generation facility and submerged pump are accounted as accumulated fund along with Water Supply Design Manual (2013). Amount of the accounted is not required every year. However, once the repair cost is required, it will be a large. So that, it is necessary to accumulate same amount of money as repair cost.

Figure 2.5.1 shows the relation between the O&M costs per Jerrycan (20L) and the population served. According to this figure, the smaller the served population is the larger the O&M costs per Jerrycan is. Especially, the RGCs of which population is less than 2,000 is counted almost double of those of the RGCs having the population over 4,000.

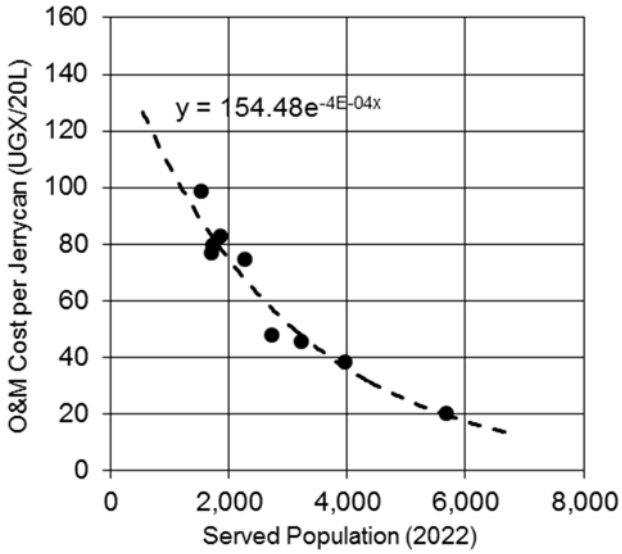


Figure 2.5.1 O&M Costs per Jerrycan (20L) and Served Population

Maintenance cost per a Jerrycan (20L) varies from 20 to 98UGX/20L. In almost all RGCs, it is lower than the amount of willingness-to-pay. Kameke is confirmed as the highest Jerrycan cost of which 98UGX/20L. However, the amount of willingness-to-pay is 94UGX/20L and it is approximately same amount as maintenance cost of Jerrycan, therefore, considered as acceptable.

Payable amounts (5% of annual income) is also presented in Table 2.5.2, and the amounts estimated for each RGC is considered lower than those calculated for the willingness to Pay. In RGCs, the annual income differs from RGC to RGC, and it may not be possible for some villagers to pay the necessary amounts. In these RGCs, the tariff has to be set at the initial stage of soft component considering the gaps of income among the villagers. The tariff shall be so set that even the villagers having low income are able to access the safe water. Since the villagers with rather high income may have to pay more than those with lower income, it is necessary to determine the water tariff with overall consensus among the villagers. For this purpose it is required to commence the activities of soft component in earlier stage of the implementation.

Table 2.5.2 Operation and Maintenance Costs of Piped Water Supply Facilities

Description		Nambale		Lambala		Naigobya		Kyamvuma		Kasassira	
1. Operation Costs											
Scheme Ooperator		25,200,000	33%	25,200,000	37%	25,200,000	39%	25,200,000	35%	25,200,000	25%
Security Guard		6,000,000	8%	6,000,000	9%	0	0%	0	0%	0	0%
Kiosk Attendant		21,600,000	29%	18,000,000	26%	25,200,000	39%	32,400,000	44%	39,600,000	40%
Electoricity		0	0%	0	0%	6,220,327	10%	5,647,003	8%	12,231,076	12%
Fuel (Diesel)		0	0%	0	0%		0%	0	0%	13,092,768	13%
Chemical		174,273	0%	174,273	0%	217,842	0%	457,468	1%	882,259	1%
2. Maintenance Costs											
Mech. & Elect.		1,935,936	3%	1,935,936	3%	1,935,936	3%	1,935,936	3%	1,935,936	2%
Labour		1,296,600	2%	1,296,600	2%	1,296,600	2%	1,296,600	2%	1,296,600	1%
Spare Parts		17,226,948	23%	13,718,467	20%	2,145,378	3%	3,985,527	5%	3,279,660	3%
3. Others		1,980,000	3%	1,980,000	3%	1,980,000	3%	1,980,000	3%	1,980,000	2%
Total of O&M Costs		75,413,757	100%	68,305,276	100%	64,196,083	100%	72,902,534	100%	99,498,299	100%
Population Projected for 2022		1,863		1,742		1,711		3,228		5,676	
Annual Water Supply (m^3/year)		18,250		17,155		16,790		32,120		98,915	
Annual Nos. of Jerrycan (20L) (nos./yrear)		912,500		857,750		839,500		1,606,000		4,945,750	
O&M Costs per Jerrycan(UGX/20L)		83	100%	80	100%	77	100%	45	100%	20	100%
Result of Socio-economic Cond. Survey	Willingness to Pay (UGX/20L)	120	146%	84	105%	80	105%	89	195%	102	505%
	Payable Amount (UGX/20L)	95	114%	84	105%	111	145%	108	237%	112	557%

Description		Kameke		Kapala		Buseta		Kidetok	
1. Operation Costs									
Scheme Ooperator		25,200,000	33%	25,200,000	39%	25,200,000	30%	25,200,000	33%
Security Guard		6,000,000	8%	0	0%	6,000,000	7%	0	0%
Kiosk Attendant		25,200,000	33%	25,200,000	39%	32,400,000	39%	32,400,000	43%
Electoricity		0	0%	4,292,045	7%	0	0%	6,484,939	9%
Fuel (Diesel)		0	0%	0	0%	0	0%	0	0%
Chemical		130,705	0%	392,115	1%	217,842	0%	533,712	1%
2. Maintenance Costs									
Mech. & Elect.		1,935,936	3%	1,935,936	3%	1,935,936	2%	1,935,936	3%
Labour		1,296,600	2%	1,296,600	2%	1,296,600	2%	1,296,600	2%
Spare Parts		13,709,913	18%	4,435,494	7%	13,718,467	17%	5,569,770	7%
3. Others		1,980,000	3%	1,980,000	3%	1,980,000	2%	1,980,000	3%
Total of O&M Costs		75,453,154	100%	64,732,190	100%	82,748,845	100%	75,400,957	100%
Population Projected for 2022		1,546		2,735		2,276		3,961	
Annual Water Supply (m^3/year)		15,330		27,010		22,265		39,420	
Annual Nos. of Jerrycan (20L) (nos./yrear)		766,500		1,350,500		1,113,250		1,971,000	
O&M Costs per Jerrycan(UGX/20L)		98	100%	48	100%	74	100%	38	100%
Result of Socio-economic Cond. Survey	Willingness to Pay (UGX/20L)	94	96%	120	251%	95	128%	103	270%
	Payable Amount (UGX/20L)	101	102%	146	305%	170	229%	157	409%

Scheme Operator and Kiosk Attendants are accounted as large as 50 - 60% of the operation and maintenance cost. If this is fixed cost, the running cost will be compressed especially in cutover. Therefore, cost i.e. wages for Scheme Operator and Kiosk Attendant is proposed to be reconsidered as a commission system depending on the water sold.

Chapter 3 Project Evaluation

Chapter 3 Project Evaluation

3-1 Preconditions for the Project Implementation

(1) Provision of Lands for Construction of Facilities

Land provision for the construction of the piped water supply facilities such as boreholes, elevated tanks and installation yards for solar generating modules has been discussed with concerned persons and organizations during the site survey. As a results, the necessary lands are to be voluntarily provided from the relevant communities and/or local government. However, RWSSD and the relevant Local governments are required to secure such lands by the starting of the Project

(2) Permission of the Construction

Permission of the relevant road authorities shall be obtained before starting the construction work in order to install transmission/distribution pipes in road areas.

(3) Completion of Environmental and Social Consideration Procedure

MOWE is required to complete environmental and social consideration procedure for the Project, and receive the formal approval on the implementation of the Project from NEMA.

(4) Agreement for the Project on Custom Clearance, Taxes and Duties between Japanese and Ugandan Governments

Both governments are on the way of discussion for the Project on Custom Clearance, Taxes and Duties, etc. These issues should be solved and agreed before starting the Project. The Government of Uganda is required to take necessary action promptly for the tax exemption after the agreement.

(5) Secure Necessary Budget to Fulfill the Obligations of the Government of Uganda

The Government of Uganda needs to obtain Project Code for the Project from MOPED, and take appropriate budgetary measures to secure the amount necessary for fulfilling the obligations to be borne by the Ugandan side.

3-2 Necessary Inputs by Recipient Country

(1) Continuous Support to WSSBs and S/Os

WSSBs will be established and S/Os will be hired during the Project, which are considered to be cores of operating and maintaining water supply facilities, and the Project enhances the WSSB members' and S/Os' abilities through technical assistance activities.

Because Umbrella East and MOWE will play the role of maintaining and monitoring of their O&M abilities after completion of the technical assistance, Umbrella East is especially required to conduct monitoring and assisting activities at sites. However, Umbrella East has a vacant position in the organization at present so that it is required to replenish necessary staff with the specialty immediately.

3-3 Important Assumptions

Important assumptions in relation to the effectiveness and sustainability of the Project are considered as follows:

(1) Policy about improvement of rural water supply in NDP II is not changed.
(2) Policy about provision of technical support on O&M to WSSBs by MOWE and U/O is not changed.

3-4 Project Evaluation

3-4-1 Relevance

The Project implementation by Grant Aid is evaluated to be reasonable based on the result of this survey for the following reasons.

(1) The Government of Uganda aims at "improving living conditions in rural areas" through safe water supply in the NDP II. The project can contribute this target.
(2) The Government of Uganda id promoting construction of piped water supply systems to secure safe water supply at densely inhabited RGCs. The implementation of the project meets the policy.
(3) Implementation of the project contributes to decrease inhabitants' load of water fetching.
(4) Positive impacts of the project are larger than that of zero-option as a result of environmental impact consideration

3-4-2 Effectiveness

(1) Quantitative Impacts

Quantitative impact to be expected by implementation of this Project is shown in Table 4-2. WSSB (S/O and K/A) will record the selling water volume on the management ledger by measuring the flow meters installed at the Kiosks, therefore, the amount of average water supply volume can be confirmed by looking at the management ledger.

Table 3.4-1 Quantitative Effective Index of the Project

Effective Index	Base Value （2015）	Target Value (2022) Three (3) Years after Completion
Water Supply Volume by the constructed piped water supply facilities[1]	0 m^3/day	581 m^3/day
Water Quality (Turbidity)[2]	N/A	Less or equal 25 NTU

(2) Qualitative Impacts

Qualitative impact to be expected by implementation of the Project is mentioned below.

- Mitigation of burden for fetching water (time)
- Mitigation of water-borne diseases by safe water supply
- Qualitative improvement on Operation and Maintenance of the piped water supply facilities through the inputs of soft component

[1] Effective Index "Water Supply Volume by the constructed piped water supply facilities" refers to the average daily water usage by the relevant RGC residents; the quantity does not include any losses such as water leakage. The RGC-wise breakdown (average day demand) is shown in Table 2.2-4.
[2] As the water source used by the relevant villagers are not specified, the basic value is set as N/A, and the target value is set in comply with Ugandan water quality standard. .

Appendix-1

Member List of the Study Team

Member List of the Study Team

<First Field Survey>

Name	Title	Position / Organization	Period
Shigeyuki Matsumoto	Team Leader	Senior Advisor(Water Supply and Sanitation), JICA	17th - 23rd May 2015
Hirofumi Yoshitake	Project Coordinator	Assistant Director, Water Resources Management Team 2, Water Resources Management Group, Global Environment Department, JICA	17th - 23rd May 2015
Ichiro Tanaka	Chief Consultant / Water Supply Plan	OYO International Corporation	17th May - 31st Jul. 2015
Katsuhito Yoshida	Hydrogeology 1 / Groundwater Development	OYO International Corporation (Yoshida Hydrogeological Consultant Ltd.)	12th Jun. - 31st Jul. 2015
Soichiro Yumoto	Environmental and Social Consideration 1 / Social Survey / Operation and Maintenance Plan	TEC International Co., Ltd.	17th May - 30th Jun. 2015, 10th – 31th Jul. 2015
Shiro Matsunami	Coordinator / Environmental and Social Consideration 2 / Test Drilling Supervision 2	OYO International Corporation	17th May - 31st Jul. 2015

<Second Field Survey>

Name	Title	Position / Organization	Period
Shigeyuki Matsumoto	Team Leader	Senior Advisor(Water Supply and Sanitation), JICA	10th - 15th Oct. 2015
Hirofumi Yoshitake	Project Coordinator	Assistant Director, Water Resources Management Team 2, Water Resources Management Group, Global Environment Department, JICA	8th - 15th Oct. 2015
Ichiro Tanaka	Chief Consultant / Water Supply Plan	OYO International Corporation	10th - 24th Oct. 2015, 16th Apr. - 28th May 2016
Shinichi Iseki	Deputy Chief Consultant / Hydrogeology 2 / Geophysical Survey / Test Drilling Supervision 1	OYO International Corporation	6th Oct. - 21st Dec. 2015, 9th Jan. - 10th Apr. 2016, 21st Apr. - 28th May 2016
Katsuhito Yoshida	Hydrogeology 1 / Groundwater Development	OYO International Corporation (Yoshida Hydrogeological Consultant Ltd.)	30th Oct. – 28th Nov. 2015
Masahiro Kawachi	Water Supply Facility Design	TEC International Co., Ltd.	25th Nov.- 14th Dec. 2015, 6th Apr. - 25th May 2016
Soichiro Yumoto	Environmental and Social Consideration 1 / Social Survey / Operation and Maintenance Plan	TEC International Co., Ltd.	6th Oct. - 14th Dec. 2015, 19th Mar. - 28th May 2016
Matasaburo Tsukuda	Construction Planning / Procurement Planning / Cost Estimation	TEC International Co., Ltd.	6th April - 28th 2016
Shiro Matsunami	Coordinator / Environmental and Social Consideration 2 / Test Drilling Supervision 2	OYO International Corporation	6th Oct. – 21st Dec. 2015 9th Jan. - 28th May 2016

<Design Review>

Name	Title	Position / Organization	Period
Ichiro Tanaka	Chief Consultant / Water Supply Plan	OYO International Corporation	3rd - 12th Sep. 2016
Shinichi Iseki	Deputy Chief Consultant / Hydrogeology 2 / Geophysical Survey / Test Drilling Supervision 1	OYO International Corporation	3rd - 12th Sep. 2016
Soichiro Yumoto	Environmental and Social Consideration 1 / Social Survey / Operation and Maintenance Plan	TEC International Co., Ltd.	3rd - 12th Sep. 2016

<Explanation of Draft Report>

Name	Title	Position / Organization	Period
Shigeyuki Matsumoto	Team Leader	Senior Advisor(Water Supply and Sanitation), JICA	20th - 25th Nov. 2016
Tadashi Kageyama	Project Management	Acting Director, Water Resources Management Team 2, Water Resources Management Group, Global Environment Department, JICA	20th - 30th Nov. 2016
Ichiro Tanaka	Chief Consultant / Water Supply Plan	OYO International Corporation	15th – 30th Nov. 2016
Shinichi Iseki	Deputy Chief Consultant / Hydrogeology 2 / Geophysical Survey / Test Drilling Supervision 1	OYO International Corporation	15th – 30th Nov. 2016

Appendix-2

Study Schedule

Study Schedule

<First Field Survey> (May - July 2015)

Date		Shigeyuki Matsumoto (Team Leader) Hirofumi Yoshitake (Project Coordinator)	Ichiro Tanaka (Chief Consultant / Water Supply Plan)	Soichiro Yumoto (Environmental and Social Consideration 1 / Social Survey / Operation and Maintenance Plan)	Shiro Matsunami (Coordinator / Environmental and Social Consideration 2 / Test Drilling Supervision 2)	Katsuhito Yoshida (Hydrogeology 1 / Groundwater Development)
5/ 17	Sun	NRT - DXB	NRT - BKK			
5/ 18	Mon	DXB - EBB, Courtesy call to JICA	BKK - NBO - EBB, Courtesy call to JICA			
5/ 19	Tue	Explanation and Discussion of Inception Report (MOWE), Discussion with NWSC, Discussion with Ministry of Finance, Planning and Economic Development				
5/ 20	Wed	Site reconnaissance (Pallisa and Iganga Districts)				
5/ 21	Thu	Discussion and Signing with MOWE on M/D, Report to JICA Office	Discussion and Signing with MOWE on M/D			
5/ 22	Fri	Report to Embassy, EBB - DXB	Preparation of tender (Social Survey), Data Collection			
5/ 23	Sat	DXB - NRT	Tender for local consultant (Social Survey)			
5/ 24	Sun		Contract with local consultant (Social Survey)			
5/ 25	Mon		Discussion with MOWE and NWSC, Data collection			
5/ 26	Tue		Site reconnaissance (Soroti and Serere Districts), Social Survey, Survey on existing piped water supply facilities			
5/ 27	Wed					
5/ 28	Thu					
5/ 29	Fri		Discussion with MOWE			
5/ 30	Sat		Preparation of tender (Pumping Tests), Data collection			
5/ 31	Sun					
6/ 1	Mon		Discussion with MOWE, Survey on assistance by other donors			
6/ 2	Tue		Site Reconnaissance (Kibuku, Pallisa, Iganga and Luuka District), Survey on assistance by other donors, Social survey, Survey on existing piped water facilities			
6/ 3	Wed					
6/ 4	Thu					
6/ 5	Fri					
6/ 6	Sat					
6/ 7	Sun					
6/ 8	Mon					
6/ 9	Tue					
6/ 10	Wed		Discussion with MOWE	Social Survey, Survey on existing water supply facilities	Discussion with MOWE	
6/ 11	Thu		Preparation of tender (Pumping tests)		Preparation of tender (Pumping tests)	
6/ 12	Fri		Tender for local consultant (Pumping tests)		Tender for local consultant (Pumping tests)	NRT - BKK
6/ 13	Sat		Contract with local consultant (Pumping tests)		Contract with local consultant (Pumping tests)	BKK – NBO - EBB
6/ 14	Sun		Data Arrangement		Data Arrangement	Data Arrangement
6/ 15	Mon		Survey on hydrogeology, Survey on existing water supply facilities		Data Collection	
6/ 16	Tue					
6/ 17	Wed				Preparation of sensitization activity	Survey on hydrogeology (Luuka and Iganga Districts)
6/ 18	Thu					
6/ 19	Fri					
6/ 20	Sat					
6/ 21	Sun					
6/ 22	Mon				Assistance of sensitization activity (Luuka District)	Field survey (Supervision of pumping test and water quality analyses of existing boreholes)
6/ 23	Tue					
6/ 24	Wed					
6/ 25	Thu					
6/ 26	Fri					
6/ 27	Sat					
6/ 28	Sun			EBB - NBO	Data Arrangement	Data Arrangement

Date		Shigeyuki Matsumoto (Team Leader) Hirofumi Yoshitake (Project Coordinator)	Ichiro Tanaka (Chief Consultant / Water Supply Plan)	Soichiro Yumoto (Environmental and Social Consideration 1 / Social Survey / Operation and Maintenance Plan)	Shiro Matsunami (Coordinator / Environmental and Social Consideration 2 / Test Drilling Supervision 2)	Katsuhito Yoshida (Hydrogeology 1 / Groundwater Development)
6/ 29	Mon		Survey on basic plan on water supply facilities	NBO - BKK	Assistance of sensitization activity (Luuka and Iganga District)	Field survey (Supervision of pumping test and water quality analyses of existing boreholes)
6/ 30	Tue			BKK - NRT		
7/ 1	Wed					
7/ 2	Thu				Assistance of sensitization activity (Iganga District)	
7/ 3	Fri					
7/ 4	Sat					Survey on hydrogeology (Kibuku, Pallisa and Soroti Districts)
7/ 5	Sun					
7/ 6	Mon					Field survey (Supervision of pumping test and water quality analyses of existing boreholes)
7/ 7	Tue					
7/ 8	Wed					
7/ 9	Thu					
7/ 10	Fri			NRT - BKK		
7/ 11	Sat			BKK - NBO - EBB		
7/ 12	Sun			Assistance of sensitization activity (Kibuku and Pallisa District)	Assistance of sensitization activity (Kibuku, Pallisa and Soroti District)	
7/ 13	Mon					
7/ 14	Tue					
7/ 15	Wed					
7/ 16	Thu					
7/ 17	Fri					
7/ 18	Sat		Preparation of Technical Note (T/N)			
7/ 19	Sun					
7/ 20	Mon					
7/ 21	Tue		Discussion with MOWE on T/N			
7/ 22	Wed					
7/ 23	Thu				Assistance of sensitization activity (Iganga District)	
7/ 24	Fri					
7/ 25	Sat		Data arrangement		Data arrangement	Data analysis
7/ 26	Sun		Preparation of tender (Test drilling survey)			
7/ 27	Mon		Discussion with MOWE on T/N		Data collection	
7/ 28	Tue					
7/ 29	Wed		EBB - NBO			
7/ 30	Thu		NBO - BKK			
7/ 31	Fri		BKK - NRT			

<Second Field Survey> (October 2015 – May 2016)

Date		Shigeyuki Matsumoto (Team Leader) Hirofumi Yoshitake (Project Coordinator)	Ichiro Tanaka (Chief Consultant / Water Supply Plan)	Shinichi Iseki (Deputy Chief Consultant / Hydrogeology 2 / Geophysical Survey / Test Drilling Supervision 1)	Katsuhito Yoshida (Hydrogeology 1 / Groundwater Development)	Masahiro Kawachi (Water Supply Facility Design)	Soichiro Yumoto (Environmental and Social Consideration 1 / Social Survey / Operation and Maintenance Plan)	Matasaburo Tsukuda (Construction Planning / Procurement Planning / Cost Estimation)	Shiro Matsunami (Coordinator / Environmental and Social Consideration 2 / Test Drilling Supervision 2)
10/ 3	Sat	NRT - DXB							
10/ 4	Sun	DXB - EBB							
10/ 5	Mon	For other project							
10/ 6	Tue			NRT - BKK			NRT - BKK		NRT - BKK
10/ 7	Wed			BKK - NBO - EBB			BKK - NBO - EBB		BKK - NBO - EBB
10/ 8	Thu	Site reconnaissance		Site reconnaissance			Site reconnaissance		Site reconnaissance
10/ 9	Fri	For other project		Preparation of tender			Preparation of pre-sensitization		Preparation of pre-sensitization
10/ 10	Sat		NRT - BKK						
10/ 11	Sun	Meeting with JICA office	BKK - NBO - EBB Meeting with JICA	Meeting with JICA office			Meeting with JICA office		Meeting with JICA office
10/ 12	Mon	Discussion with MOWE					Discussion with MOWE		Discussion with MOWE
10/ 13	Tue								
10/ 14	Wed	Signing on M/D					Signing on M/D		Signing on M/D
10/ 15	Thu	Report to Embassy and JICA office, EBB-DXB	Report to Embassy and JICA office				Report to Embassy and JICA office		Report to JICA office

Date		Shigeyuki Matsumoto (Team Leader) Hirofumi Yoshitake (Project Coordinator)	Ichiro Tanaka (Chief Consultant / Water Supply Plan)	Shinichi Iseki (Deputy Chief Consultant / Hydrogeology 2 / Geophysical Survey / Test Drilling Supervision 1)	Katsuhito Yoshida (Hydrogeology 1 / Groundwater Development)	Masahiro Kawachi (Water Supply Facility Design)	Soichiro Yumoto (Environmental and Social Consideration 1 / Social Survey / Operation and Maintenance Plan)	Matasaburo Tsukuda (Construction Planning / Procurement Planning / Cost Estimation)	Shiro Matsunami (Coordinator / Environmental and Social Consideration 2 / Test Drilling Supervision 2)
10/ 16	Fri		Discussion with MOWE				Preparation of pre-sensitization		Preparation of pre-sensitization
10/ 17	Sat		Preparation of tender (Geophysical survey)						
10/ 18	Sun								
10/ 19	Mon		Discussion with MOWE						
10/ 20	Tue		Data collection	Discussion(MOWE)					
10/ 21	Wed			Preparation of tender (Geophysical survey)					
10/ 22	Thu		EBB- NBO						
10/ 23	Fri		NBO - BKK						
10/ 24	Sat		BKK - NRT						
10/ 25	Sun			Tender for local consultant (Geophysical survey)					
10/ 26	Mon			Discussion(MOWE)					
10/ 27	Tue			Contract with local consultant (Geophysical survey) Discussion and Signing on T/N			Discussion on T/ N		
10/ 28	Wed			Preparation of field survey (Geophysical survey)			Preparation of pre-sensitization		
10/ 29	Thu						Kampala - Iganga		Kampala - Iganga
10/ 30	Fri				NRT - BKK		Pre-sensitization activity		Pre-sensitization activity
10/ 31	Sat				BKK - NBO - EBB				
11/ 1	Sun				Data arrangement				
11/ 2	Mon			Kampala – Iganga					
11/ 3	Tue			Field survey (Geophysical survey)	Field survey (Analysis of hydrogeology)				
11/ 4	Wed								
11/ 5	Thu								
11/ 6	Fri								
11/ 7	Sat								
11/ 8	Sun								
11/ 9	Mon								
11/ 10	Tue								
11/ 11	Wed								
11/ 12	Thu								
11/ 13	Fri								
11/ 14	Sat								
11/ 15	Sun								
11/ 16	Mon								
11/ 17	Tue								
11/ 18	Wed								
11/ 19	Thu								
11/ 20	Fri								
11/ 21	Sat								
11/ 22	Sun								
11/ 23	Mon								
11/ 24	Tue								
11/ 25	Wed					NRT - BKK			
11/ 26	Thu			Iganga - Kampala	EBB-NBO	BKK - NBO - EBB	Field survey (Environmental and social consideration)		Data arrangement
11/ 27	Fri			Discussion(MOWE)	NBO - BKK	Field survey (Water supply facility design)			
11/ 28	Sat			Kampala - Iganga	BKK -NRT				
11/ 29	Sun			Obtaining agreement on land use of test drilling site					
11/ 30	Mon								
12/ 1	Tue								
12/ 2	Wed								
12/ 3	Thu			Iganga - Kampala					
12/ 4	Fri			Tender for local consultant (test drilling)					Tender for local consultant (test drilling)
12/ 5	Sat			Negotiation with local consultant (test drilling)					Negotiation with local consultant (test drilling)
12/ 6	Sun								Kampala - Iganga
12/ 7	Mon								Obtaining agreement on land use of test drilling site
12/ 8	Tue			Contract with local consultant (test drilling)			Iganga - Kampala		
12/ 9	Wed			Discussion on T/N		Iganga - Kampala	Discussion on T/N		Field survey (Test drilling supervision)
12/ 10	Thu					Discussion(MoWE)			

Date		Shigeyuki Matsumoto (Team Leader) Hirofumi Yoshitake (Project Coordinator)	Ichiro Tanaka (Chief Consultant / Water Supply Plan)	Shinichi Iseki (Deputy Chief Consultant / Hydrogeology 2 / Geophysical Survey / Test Drilling Supervision 1)	Katsuhito Yoshida (Hydrogeology 1 / Groundwater Development)	Masahiro Kawachi (Water Supply Facility Design)	Soichiro Yumoto (Environmental and Social Consideration 1 / Social Survey / Operation and Maintenance Plan)	Matasaburo Tsukuda (Construction Planning / Procurement Planning / Cost Estimation)	Shiro Matsunami (Coordinator / Environmental and Social Consideration 2 / Test Drilling Supervision 2)
12/ 11	Fri			Signing on T/N		Discussion(MoWE)	Signing on T/N		Field survey (Test drilling supervision)
12/ 12	Sat			Kampala - Iganga		EBB - NBO			
12/ 13	Sun			Field survey (Test drilling supervision)		NBO - BKK			
12/ 14	Mon					BKK - NRT			
12/ 15	Tue								
12/ 16	Wed			Iganga - Kampala					Iganga - Kampala
12/ 17	Thu			Discussion with local consultant (Test drilling)					Discussion with local consultant (Test drilling)
12/ 18	Fri			Report to JICA office					Report to JICAoffice
12/ 19	Sat			EBB - NBO					EBB - NBO
12/ 20	Sun			NBO - BKK					NBO - BKK
12/ 21	Mon			BKK - NRT					BKK - NRT
1/9	Sat			NRT - BKK					NRT - BKK
1/10	Sun			BKK - NBO - EBB					BKK - NBO - EBB
1/11	Mon			Preparation of test drilling supervision					Preparation of test drilling supervision
1/12	Tue			Field survey (Test drilling supervision)					Field survey (supervision on Test drilling and social survey)
1/13	Wed								
1/14	Thu								
1/15	Fri								
1/16	Sat								
1/17	Sun								
1/18	Mon								
1/19	Tue								
1/20	Wed								
1/21	Thu								
1/22	Fri								
1/23	Sat								
1/24	Sun								
1/25	Mon								
1/26	Tue								
1/27	Wed								
1/28	Thu								
1/29	Fri								
1/30	Sat								
1/31	Sun								
2/1	Mon								
2/2	Tue								
2/3	Wed								
2/4	Thu								
2/5	Fri								
2/6	Sat								
2/7	Sun								
2/8	Mon								
2/9	Tue								
2/10	Wed								
2/11	Thu								
2/12	Fri								
2/13	Sat								
2/14	Sun								
2/15	Mon								
2/16	Tue								
2/17	Wed								
2/18	Thu								
2/19	Fri								
2/20	Sat								
2/21	Sun								
2/22	Mon								
2/23	Tue								
2/24	Wed								

Date		Shigeyuki Matsumoto (Team Leader) Hirofumi Yoshitake (Project Coordinator)	Ichiro Tanaka (Chief Consultant / Water Supply Plan)	Shinichi Iseki (Deputy Chief Consultant / Hydrogeology 2 / Geophysical Survey / Test Drilling Supervision 1)	Katsuhito Yoshida (Hydrogeology 1 / Groundwater Development)	Masahiro Kawachi (Water Supply Facility Design)	Soichiro Yumoto (Environmental and Social Consideration 1 / Social Survey / Operation and Maintenance Plan)	Matasaburo Tsukuda (Construction Planning / Procurement Planning / Cost Estimation)	Shiro Matsunami (Coordinator / Environmental and Social Consideration 2 / Test Drilling Supervision 2)
2/25	Thu			Iganga - Kampala					Field survey (supervision on Test drilling and social survey)
2/26	Fri			Discussion (MOWE)					
2/27	Sat			Kampala - Iganga					
2/28	Sun			Field survey (Geophysical survey, Test drilling supervision)					
2/29	Mon								
3/1	Tue								
3/2	Wed								
3/3	Thu								
3/4	Fri								
3/5	Sat								
3/6	Sun								
3/7	Mon								
3/8	Tue								
3/9	Wed								
3/10	Thu								
3/11	Fri								
3/12	Sat								
3/13	Sun								
3/14	Mon								
3/15	Tue								
3/16	Wed								
3/17	Thu								
3/18	Fri								
3/19	Sat						NRT - BKK		
3/20	Sun						BKK - NBO - EBB		
3/21	Mon						Field survey (Social survey)		
3/22	Tue								
3/23	Wed						Kampala - Iganga		
3/24	Thu						Field survey (Environmental and social consideration)		
3/25	Fri								
3/26	Sat								
3/27	Sun								
3/28	Mon								
3/29	Tue								
3/30	Wed								
3/31	Thu								
4/1	Fri			Iganga - Kampala			Iganga - Kampala		Field survey (Test drilling supervision)
4/2	Sat			Tender for local consultant (Geotechnical / Topographical survey)			Tender for local consultant (Geotechnical / Topographical survey)		
4/3	Sun			Data arrangement			Data arrangement		
4/4	Mon			TV meeting			TV meeting		
4/5	Tue			Contract with local consultant (Geotechnical / Topographical survey)			Contract with local consultant (Geotechnical / Topographical survey)		
4/6	Wed			Test drilling supervision		NRT - BKK	Kampala - Iganga	NRT - BKK	
4/7	Thu					BKK - NBO - EBB	Field survey (Operation and maintenance)	BKK - NBO - EBB	
4/8	Fri			Discussion with MOWE, EBB - NBO		Kampala - Iganga		Kampala - Iganga	
4/9	Sat			NBO - BKK		Field survey (Water supply facility design)		Survey for construction plan	
4/10	Sun			BKK - NRT					
4/11	Mon								
4/12	Tue								
4/13	Wed								
4/14	Thu								
4/15	Fri								
4/16	Sat		NRT - BKK						
4/17	Sun		BKK - NBO - EBB						
4/18	Mon		Discussion(MOWE)						
4/19	Tue		Survey on water supply plan						
4/20	Wed		Kampala - Iganga						
4/21	Thu		Survey on water supply plan	NRT - BKK					

Date		Shigeyuki Matsumoto (Team Leader) Hirofumi Yoshitake (Project Coordinator)	Ichiro Tanaka (Chief Consultant / Water Supply Plan)	Shinichi Iseki (Deputy Chief Consultant / Hydrogeology 2 / Geophysical Survey / Test Drilling Supervision 1)	Katsuhito Yoshida (Hydrogeology 1 / Groundwater Development)	Masahiro Kawachi (Water Supply Facility Design)	Soichiro Yumoto (Environmental and Social Consideration 1 / Social Survey / Operation and Maintenance Plan)	Matasaburo Tsukuda (Construction Planning / Procurement Planning / Cost Estimation)	Shiro Matsunami (Coordinator / Environmental and Social Consideration 2 / Test Drilling Supervision 2)
4/22	Fri		Survey on water supply plan	BKK - NBO - EBB		Field survey (Water supply facility design)	Stakeholder meeting	Survey for construction plan	Stakeholder meeting
4/23	Sat			Test drilling supervision					
4/24	Sun								
4/25	Mon		Stakeholder meeting						
4/26	Tue								
4/27	Wed								
4/28	Thu								
4/29	Fri								
4/30	Sat								
5/1	Sun								
5/2	Mon							Data collection (Cost estimation and Procurement plan)	
5/3	Tue								
5/4	Wed								
5/5	Thu								
5/6	Fri								
5/7	Sat								
5/8	Sun								
5/9	Mon								
5/10	Tue		Iganga - Kampala	Data arrangement			Survey for construction plan		Iganga - Kampala
5/11	Wed		Discussion(MOWE)						Discussion(MOWE)
5/12	Thu		Data collection						Field survey (Environmental and social consideration)
5/13	Fri		Discussion with JICA office						
5/14	Sat		Preparation of T/N						
5/15	Sun			Iganga - Kampala		Iganga - Kampala			
5/16	Mon		Preparation of T/N			Field survey (Water supply facility design)	Survey for construction plan	Data collection (Cost estimation and Procurement plan)	
5/17	Tue								
5/18	Wed		Discussion on T/N				Discussion on T/N		
5/19	Thu								
5/20	Fri								
5/21	Sat								
5/22	Sun	- EBB							
5/23	Mon	Discussion on T/N				EBB - NBO			
5/24	Tue	Discussion and Signing on T/N				NBO - BKK	Discussion and Signing on T/N		
5/25	Wed	Report to JICA office				BKK - NRT	Report to JICA office		
5/26	Thu	EBB - DOH	EBB - NBO				EBB - NBO		
5/27	Fri	DOH - NRT	NBO - BKK				NBO - BKK		
5/28	Sat		BKK - NRT				BKK - NRT		

<Design Review> (September 2016)

Date		Ichiro Tanaka (Chief Consultant/ Water Supply Plan)	Shinichi Iseki (Deputy Chief Consultant / Hydrogeology 2 / Geophysical Survey / Test Drilling Supervision 1)	Soichiro Yumoto (Environmental and Social Consideration 1 / Social Survey / Operation and Maintenance Plan)
9/ 3	Sat	HND - DOH		
9/ 4	Sun	DOH - EBB		
9/ 5	Mon	Meeting with MOWE, Courtesy call to JICA office		
9/ 6	Tue	Design review		
9/ 7	Wed	Meeting with MOWE, Data collection, Preparation of T/N		
9/ 8	Thu	Meeting with MOWE, Preparation of T/N		
9/ 9	Fri	Signing on T/N		
9/ 10	Sat	Data arrangement	Data collection	
9/ 11	Sun	EBB - DOH		
9/ 12	Mon	DOH - NRT		

<Explanation of Draft Report> (November 2016)

Date		Shigeyuki Matsumoto (Team Leader)	Tadashi Kageyama (Project Management)	Ichiro Tanaka (Chief Consultant / Water Supply Plan)	Shinichi Iseki (Deputy Chief Consultant / Hydrogeology 2 / Geophysical Survey / Test Drilling Supervision 1)
11/ 15	Tue			HND - DOH	
11/ 16	Wed			DOH - EBB	
11/ 17	Thu			Explanation of outline design to MOWE	
11/ 18	Fri			Explanation of outline design, Courtesy call to JICA office	
11/ 19	Sat			Data arrangement	
11/ 20	Sun	HND - DXB - EBB, Meeting in study team		Meeting in study team	
11/ 21	Mon	Discussion on M/D			
11/ 22	Tue	Discussion on M/D, Visit Ministry of Finance, Planning and Economic Development			
11/ 23	Wed	Discussion and signing on M/D			
11/ 24	Thu	Report to JICA office and Embassy EBB - DXB	Report to JICA office and Embassy, Meeting with MOWE		
11/ 25	Fri	DXB - NRT	For other project	Meeting with MOWE	
11/ 26	Sat			Site reconnaissance	
11/ 27	Sun			Site reconnaissance	
11/ 28	Mon		Report to JICA office	Meeting with MOWE, Report to JICA office	
11/ 29	Tue		EBB - DXB	Meeting with MOWE, EBB - DOH	
11/ 30	Wed		DXB - NRT	DOH - NRT	

Appendix-3

List of Parties Concerned in the Recipient Country

List of Parties Concerned in Recipient Country

Name	Organization
1. Ministry of Water and Environment	
Prof. Ephraim Kamuntu	Minister
Obong O. O. David	Permanent Secretary
Eng. Aaron M. Kabirizi	Director, DWD
Eng. Joseph Oriono Eyatu	Commissioner, DWD
Eng. Christopher Tumusiime	Assistant Commissioner, Rural Water Supply, DWD
Eng. Tumwine Murangira Francis	Assistant Commissioner, TS, DWD
Eng. Ahmed Sentumbwe	Principal Engineer, DWD
Dr. Ogiramoi Nyeko	Principal Engineer, DWD
Mutiibwa Robert	Principal Water Officer, DWD
Erisa Kyeyune	Senior Water Officer, DWD
Samuel Senfume	Hydrogeologist, DWD
Okoth Wilbrod	Hydrogeologist, DWD
Eria Aloet	Hydrogeologist, DWD
Bisoborwa Paul	Social Scientist, DWD
Babirye Cribia	Social Scientist, DWD
Isaiah Eitu	Social Scientist, DWD
Mugeiga Kato	Social Scientist, DWD
Busingye Genevieve	Social Scientist, DWD
Inan Biita	Economist, DWD
Ivan Biiza Peter	Economist, DWD
Eng. Stanley Watenga	Senior Engineer, DWD
Julius Buzibwa	Project Engineer, DWD
James Ssegsya	Project Engineer, DWD
Martha Naigaga	Environment Health Officer, DWD
Marcia Tusiime Mugisa	Environment Health Officer, DWD
Tubenawe Lawrence	Environment Health Officer, DWD
Stella Rose Ademun	Environmental Officer, DWD
Ronald Nyakana	Monitoring Officer, Urban Water Supply and Sanitation Services, DWD
Amanya Collins M.	Principal Economist, Department of Policy and Planning
Martin R. Wamalwa	Manager, DWD, Eastern Umbrella of Water and Sanitation
Kato Paul	Branch Manager, Water & Sanitation Development Facility (WSDF) - East
Odong	Water and Sanitation Specialist, Technical Support Unit (TSU) 3
Edimu Francy	Public Health Specialist, TSU 3
Rita Negasa Opira	Team Leader / Water and Sanitation Specialist, TSU 4
Okerenyang Joseph	Community Development Specialist, TSU 4
Ruth Amongin	Social Specialist, TSU 4
Mulala Fabian	Water and Sanitation Specialist, TSU 4
2. JICA Expert to Ministry of Water and Environment	
Daisuke Sakamoto	Expert on Piped Water Supply/Collaboration
3. Ministry of Finance, Planning and Economic Development	
Maris Wanyera	Commissioner, Development Assistance & Regional Cooperation, Directorate of Debt & Cash Management
Denis Mugagga	Economist, Development Assistance & Regional Cooperation, Directorate of Debt & Cash Management

Name	Organization
Matyama Fredrick	Commissioner, Financial Services Department
Tomohito Kanaizuka	Senior Advisor, ODA Loan and Private Sector Development, Development Assistance and Regional Cooperation Department

4. National Water & Sewerage Corporation (NWSC)

Eng. Alex Gisagara	Director Engineering Services
Dr. Adolf Spitzer	Senior Infrastructure Planner
Gilbert Muhwezi	Principal Engineer
Mangeni Stephen	Engineer
Carolyne Myangweso	Area Manager, Soroti Area
Tumwesigye James	Engineer, Soroti Area
Paul Isagara	Area Manager, Iganga Area
Nicholas. M. Mwebaze	General Manager, Jinja Area

5. National Environment Management Authority (NEMA)

Dr. Tom Okurut	Executive Director
Waiswa Ayazika Arnold	Director, Environment Monitoring & Compliance

6. Rural Electrification Agency, Ministry of Energy and Mineral Development

Turyagyenda John Abouf	Manager Project Development and Management
Eng. Onzia Joseph	Project Engineer

7. Soroti District Local Government

Egunyu George Micheal	Chair Person LC V
Lulaba Issac	Resident District Commissioner
John Nyakahuma	Chief Administrative Officer
Jane Akiror	Principal Assistant Secretary
Ocung Denis	District Water Officer
Esatn Moses	Community Development Officer

8. Serere District Local Government

Joseph Opiti Okojo	Chair Person LC V
Akonapesa Onya	Resident District Commissioner
Rwanguha Beron	Chief Administrative Officer
Moses Agum	Deputy Chief Administrative Officer
Okolimong Daniel	District Water Officer
Ogarima Richard	Assistant District Water Officer

9. Iganga District Local Government

Shaban Sadiq Nkuutu	Chair Person LC V
Walugembe Alamandhan	Resident District Commissioner
Wafula Ogumbo	Deputy Resident District Commissioner
Maira Mukasa Joseph	Chief Administrative Officer
Musingye Edward	Deputy Chief Administrative Officer
Waiswa Paul	District Engineer
Wilberforce Mbatya	District Water Officer
Nkoobe Ndikodemu	Assistant Engineering Officer

10. Pallisa District Local Government

Issah Batarigu Alibula	Chair Person LC V
Watenyeri John	Resident District Commissioner
Bategana Bakale Sadiq	Deputy Resident District Commissioner
Mbonge Issah	Chief Administrative Officer

Name	Organization
Hellen Adongo	Assistant Chief Administrative Officer
Patrick Buyinza	District Water Officer
Gadala Lawcey	Assistant District Water Officer
Ogwang Nicholas	Principal Town Clerk , Pallisa Town Council

11. Luuka District Local Government

Kakyaga Samueal	Chair Person LC V
Bangu Fred Agrey	Resident District Commissioner
Mawegye Andrew	Chief Administrative Officer
Namayega Edith	Deputy Chief Administrative Officer
Awuye Abdallah	Acting Chief Administrative Officer
Makinabu Yahaya	District Water Officer

12. Kibuku District Local Government

Nakeba Muhamed	Chair Person LC V
Wazikonya Margaret	Resident District Commissioner
Ngobi Fredie Aggrey	Chief Administrative Officer
Puche Devid	District Engineer
Sikyajula Elizabeth	District Water Officer
Mwiraguzu Moses	Community Development Officer
Joseph Wandira	District Fisheries Officer/Former councilor representing Kasssira
Nawoya Bruno	Town Clerk, Kibuku Town Council

13. The Other Donors

Samuel Dawuna Mutono	Senior Water & Sanitation Specialist, World Bank
Dieter Anders	Head of Programme, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Reform of Urban Water & Sanitation Sector (RUWASS)
Juliet Abaliwano Onyango	Programme Officer, Agence Française de Développement(AFD)

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

Kyosuke Kawazumi	Chief Representative
Yasumichi Araki	Senior Representative
Yukata Fukase	Senior Representative
Emi Sunohara	Representative
Shunichi Murakami	Representative

Appendix-4

Minutes of Discussions (M/D)

(1) Minutes of Discussions (22nd May 2015)
(2) Minutes of Discussions (14th October 2015)
(3) Minutes of Discussions (23rd November 2016)

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY
ON THE PROJECT
FOR RURAL WATER SUPPLY PHASE Ⅲ IN LAKE KYOGA BASIN,
EASTERN UGANDA,
IN THE REPUBLIC OF UGANDA

In response to the request from the Government of the Republic of Uganda (hereinafter referred to as "Uganda"), the Government of Japan decided to conduct a Preparatory Survey on the Project for Rural Water Supply Phase Ⅲ in Lake Kyoga Basin, Eastern Uganda (hereinafter referred to as "the Project") and entrusted the survey to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Uganda the Preparatory Survey Team (hereinafter referred to as "the Team"), which is headed by Mr. Shigeyuki Matsumoto, Senior Advisor, JICA, and is scheduled to stay in the country from 18 May 2015 to the end of July 2015.

The Team held a series of discussions with the officials concerned of the Government of Uganda and conducted a field survey in the Project area.

In the course of discussions and field survey, both parties confirmed the main items described in the attached sheets. The Team will proceed to further work.

Kampala, 22 May 2015

Mr. Shigeyuki Matsumoto
Team Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Mr. David. O. O. Obong
Permanent Secretary
Ministry of Water and Environment
The Republic of Uganda

Witness

Ms. Maris Wanyera
For: Permanent Secretary/Secretary to the Treasury
Ministry of Finance, Planning and Economic Development
The Republic of Uganda

A4-1

Attachment

1. Objective of the Project
The objective of the Project is to improve the access to safe water in the Lake Kyoga region through the construction of water supply facilities.

2. Project area
The project areas are located in 6 districts in the Lake Kyoga basin as shown in Annex-1.

3. Responsible and implementing organization
The responsible organization is Ministry of Water and Environment (hereinafter referred to as "MoWE). The implementing organization is Directorate of Water Development (hereinafter referred to as "DWD"). The organization chart of DWD and MoWE is shown in Annex-2.

4. Items requested by the Government of Uganda
The items written below were finally requested by the Government of Uganda;
(1) Construction of piped water supply schemes in 20 RGCs (shown in Annex-1)
(2) Equipment for monitoring of piped water supply schemes
(3) Support for establishing operation and maintenance system for each piped water supply scheme and support for sanitation and hygiene promotion
JICA will assess the appropriateness of the request through further survey and will recommend to the Government of Japan for approval. The final project sites and components will be determined in the course of the survey.

5. Japan's Grant Aid Scheme
5-1. The Ugandan side understood the Japan's Grant Aid Scheme explained by the Team as described in Annex-3.
5-2. The Ugandan side will take necessary measures as described in Annex-4 for smooth implementation of the Project, as a condition for the Japan's Grant Aid to be implemented.
5-3. JICA will report to the Ugandan side if there are any other undertakings based on the result of this survey.
5-4. The Team explained that implementation of the preparatory survey is not a commitment of the approval of the Project.

1

2

Appendix-4 (1)

6. Schedule of the survey

6-1. The consultant members in the Team will advance the first field survey in Uganda until the end of July 2015.

6-2. The consultant members in the Team will implement the second field survey in Uganda from the end of September 2015 to the end of March 2016.

6-3. JICA will prepare the draft report of the survey in English and dispatch a mission to Uganda in order to explain its contents in August 2016.

6-4. In case the contents of the draft report are accepted in principle by the Government of Uganda, JICA will complete the final report and send it to the Government of Uganda around November 2016.

7. Other relevant issues

7-1. Target RGCs of the survey

Both sides confirmed that the target RGCs of the survey are total 20 RGCs, which had been selected by the Ugandan side in the Application Form for Grant Aid from Japan in July 2011.

However, the Team explained that priority RGCs will be selected as the target of the second field survey, based on the results of site surveys, socio-economic survey as well as review of existing water facilities during the first field survey and the selection criteria mentioned below.

Both sides agreed that the results of the 1st field survey and the 1st analysis in Japan will be shared in the beginning of the 2nd field survey, and that target RGCs in the 2nd field survey would be discussed and determined.

7-2. Criteria for the site selection

Both sides confirmed that the selection of the Project sites will be conducted through the following two stages of the survey.

(1) In the first field survey from 18 May to the end of July, the Team will survey maximum 20 RGCs and prioritize them based on the following seven criteria, same as the methodology applied in the Development Study on Water Resources Development and Management for Lake Kyoga Basin in 2011:
   (a) The coverage of safe water supply,
   (b) The numbers of the existing public and administrative facilities and the business facilities in RGCs,
   (c) The expected yield at the RGC site and its success rate
   (d) The population of RGCs
   (e) The population served by one (1) borehole
   (f) The availability of electricity supply in RGCs, and
   (g) The yields observed at the test boreholes

   The RGCs which apply to the following criteria will be excluded from the list of target RGCs for the second field survey:
   (a) The RGCs which have already construction plans of water supply facilities funded by other development partners or the Ugandan side,
   (b) The RGCs which have low potential of groundwater and also low possibility to utilize existing other water sources such as pipelines by NWSC,
   (c) The RGCs which have already cleared the target of water supply coverage in National Development Plan,
   (d) The RGCs which have only low yield boreholes that cannot meet enough water quantity for piped water supply scheme, and
   (e) The RGCs which have only the possibility to use diesel generator for the facility's operation.

(2) In the second field survey and subsequent analysis in Japan from October 2015 to March 2016, the Team will conduct test borehole drilling at 20 sites of the selected RGCs and estimate project costs. Target RGCs for the Project will be finally selected considering the results of survey and budgetary limitation of the Japanese side.

7-3. Utilization of existing water sources

The Team explained the necessity to explore possibility to utilize existing boreholes as water sources for the Project. The Team will conduct the pumping tests of the candidate existing boreholes.

In relation to mentioned above, both sides confirmed that the Ugandan side takes responsibility to identify owners of those boreholes and local stakeholders, explain about the Project and pumping tests, and obtain consensus from them, with the technical support from the Team.

In case the boreholes are in good conditions for sustainable use and have enough yields as water sources for piped water supply schemes without any objection from

local stakeholders, the Team will consider using them as production wells for the Project.

In case the Project uses the existing boreholes, both sides agreed that the contractors of the Japan Grant Aid scheme will not have any warrant defects as may be found in boreholes, and that the Ugandan side has the responsibility to confirm the appropriateness of using those existing boreholes, in terms of conditions and yields.

The Team also explained the necessity to utilize pipelines of NWSC as water sources for the RGCs of Acuna and Tubur, as stated in the Application Form from the Ugandan side. Both sides confirmed that the Ugandan side takes responsibility to coordinate with NWSC with the technical support from the Team.

7-4. Test borehole drilling

The Team explained that the purpose of test borehole drilling is to confirm groundwater availability for the development of piped water schemes in the target RGCs. Those boreholes which are confirmed to have sufficient yield and drinkable water quality will be converted to the production wells of the Project. Successful boreholes will be transferred to MoWE and need to be properly protected by the Ugandan side until the commencement of the construction stage of the Project. Both sides confirmed that;

- Necessary number of test boreholes may differ from site to site according to water demand and groundwater potential. Maximum number of the total test boreholes is fixed to 20 due to the limitation of the survey duration as well as the amount of budget.
- If any test borehole is dry or produces insufficient water quantity for a piped water supply scheme, the Team will protect the borehole and hand it over to MoWE. In such case, the Project does not construct any facilities related to such borehole. MoWE will take responsibility for any defects after its handover.
- If any test borehole has defects in the implementation stage, the Ugandan side should warrant such defects.
- The selection of the target RGCs for the Project will be finally determined at the end of the survey. Additional test borehole drilling will not be conducted in the Japan's Grant Aid Project.

7-5. Water supply area of each RGC

Related to water supply area of each RGC, both sides agreed to the followings:

(1) MoWE takes responsibility to identify decision-makers and local stakeholders to discuss and decide the target water supply area of the Project for each RGC.
(2) The target water supply area and service population need to be decided with due considerations to available amount of water sources for the Project in each RGC.

7-6. Operation and Maintenance

Both sides confirmed that ensuring feasibility of operation and maintenance of the facilities is seriously important. The Application Form from MoWE states that it is proposed to apply the management organization comprised of the water board and technical staff, instead of hiring private operators. The Team will investigate current situation of operation and maintenance for existing piped water supply schemes in RGCs in Uganda and their performance during the first field survey.

The Team confirmed that the Government of Uganda has a policy to promote utilization of private operators for operation and maintenance. On the other hand, the Team also confirmed that MoWE agreed that the Team may propose several kinds of schemes for operation and maintenance other than private operators depending on each RGC's situation.

7-7. Undertakings of the Ugandan side for the Project

The Team explained the necessity of undertakings by the Ugandan side as follows, and the Ugandan side agreed to that:

(1) Although details will be investigated in the survey, generally the followings need to be ensured by the Ugandan side:
   (a) ensuring lands for facility construction in the Project, such as production wells, overhead storage tanks and kiosks,
   (b) obtaining permission for facility construction, pipeline construction under roads, and groundwater development,
   (c) constructing access roads to the construction sites,
   (d) connecting electricity lines to the borehole construction sites from nearby existing grid, and
   (e) constructing yard taps to private customers.
(2) If involuntary resettlement is necessary, MoWE is requested to take responsibility to follow an appropriate process for consensus building, coordination with competent authorities and compensation,
(3) MoWE needs to ensure land use permission for the Project by obtaining written consensus from land owners or administrators, and other stakeholders if necessary,

and

(4) The Ugandan side needs to cover applicable Ugandan tax imposed to the Japanese nationals working for the Project. The budget corresponding to the amount of taxes to be imposed to the Japanese nationals needs to be secured by MoWE in line with prevailing Government policies.

7-8. Items requested by the Team to MoWE to facilitate the survey

MoWE is requested and agreed to provide the Preparatory Survey Team with the arrangement required for the smooth implementation of the Survey as follows:

(1) To provide the Team with available relevant data, information and materials necessary for the execution of the Survey.

(2) To prepare the answers of the Questionnaire presented by the Team.

(3) To assign full-time counterpart to the Team during their stay in Republic of Uganda, to play the following roles as the coordinator to the Team:

- To make the appointments and to set up the meetings with authorities, departments and all other facilities and firms whatever the Team intends to visit.
- To attend the site survey and any other visiting place with the Team and to make any convenience on accommodation, working office, adequate transportation, getting the permissions if required, etc., and
- To assist and advise the Team for the collection of data and information as much as possible.

The Counterpart Team (hereinafter referred to as "the C/P Team") shall be formed including the members of MoWE. The C/P Team shall be composed of the members as follows:

- Team Leader of the C/P Team
- Water Supply Planner /Water Supply Facility Designer
- Hydrogeologist/Well Drilling Specialist/Geophysical Survey Specialist
- Specialist on Environmental Consideration
- Specialist on Social Consideration
- Environmental Health Officer

(4) To secure the permission to photograph and to enter into private properties and restricted areas for the Team for proper execution of the Survey, if necessary.

(5) To take any measures deemed necessary to secure the safety of the members of the Team.

- The Ugandan side is requested to provide ID Cards and Work permission to members of the Team in the early timing of the Survey period.

(6) To make arrangements to allow the Team to bring back to Japan any necessary data, maps and materials related to the Survey, subject to approval by the Government of the Republic

of Uganda in order to analyze the Project and prepare the reports.

(7) To support smooth custom clearance of the equipment and materials for the survey.

The Ugandan side understood the request and takes appropriate measures.

7-9. Environmental and social considerations

The Team explained that the environmental and social considerations process will follow the "JICA Guidelines for Environmental and Social Considerations" (April 2010). Both sides confirmed that MoWE is responsible for taking any measures to complete the clearance process, in case that the laws and regulations in Uganda require any environmental and social considerations for implementing the Project.

The Team also explained that it will pay attention especially to gender equity.

7-10. Project components and design criteria

Both sides agreed that the Water Supply Design Manual Second Edition of MoWE should be applied to the estimation of water demand.

Both sides agreed that the Japan's Grant Aid will cover the main facilities such as production wells, overhead storage tanks, transmission and distribution pipelines, connections to public facilities and kiosks, but not cover yard taps for private customers.

The Team explained that the necessity and justification of the requested equipment will be carefully examined in the survey.

Both sides agreed to set the target year as 2022, because the Japan's Grant Aid sets the target year as three years after the completion of the Project in principle.

Both sides agreed that water supply to local people around the production boreholes should be considered.

7-11. Demarcation with other development partners

The Ugandan side confirmed that there is no duplication among development partners on the sites of the Project, and agreed to be responsible for coordination to avoid duplication.

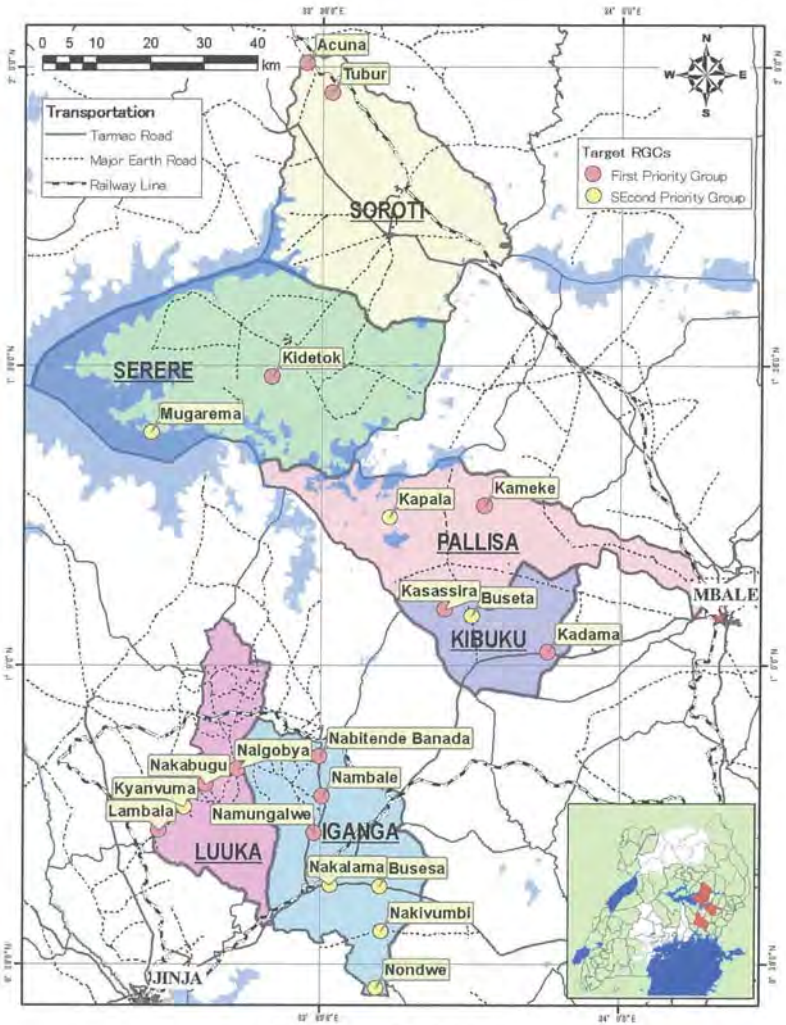
7-12. Technical note

Both sides agreed to confirm the progress of the field survey by signing a technical note whenever it is necessary. However, both sides confirmed that final components of the Project will be examined during analysis in Japan after the field survey.

Annex

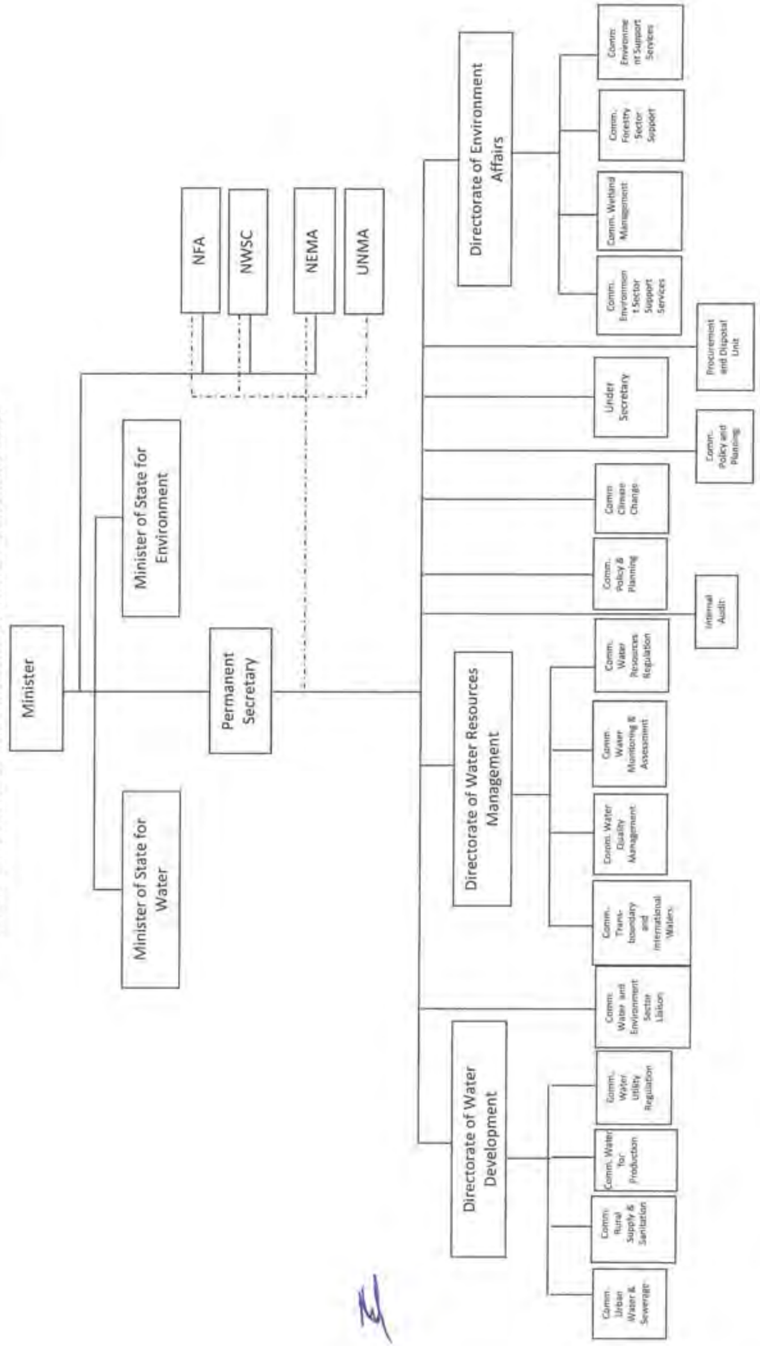
1. Project Area Map
2. Organization Chart
3. Japan's Grant Aid
4. Major Undertakings to be taken by Each Government

Annex-1



Site Location Map

MACRO STRUCTURE OF THE MINISTRY OF WATER & ENVIRONMENT



JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures :

- ·Preparatory Survey
  - The Survey conducted by JICA
- ·Appraisal &Approval
  - -Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- ·Authority for Determining Implementation
  - -The Notes exchanged between the GOJ and a recipient country
- ·Grant Agreement (hereinafter referred to as "the G/A")
  - -Agreement concluded between JICA and a recipient country
- ·Implementation
  - -Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid

Scheme from a technical, financial, social and economic point of view.

- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of a outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese

yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

Major Undertakings to be taken by Each Government

Table 1 Major Undertakings to be taken by Each Government (Construction)

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure lots of land necessary for the implementation of the Project and to clear the sites;		•
2	To ensure prompt customs clearance of the products and to assist internal transportation of the products in the recipient country		
	1)Marine (Air) transportation of the Products from Japan to the recipient country	•	
	2)Tax exemption and custom clearance of the Products at the port of disembarkation		•
	3)Internal transportation from the port of disembarkation to the project site	(•)	(•)
3	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services [be exempted] or [be borne by the Authority without using the Grant]		•
4	To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		•
5	To ensure that the Facilities be maintained and used properly and effectively for the implementation of the Project		•
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		•
7	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1)Advising commission of A/P		•
	2)Payment commission		•
8	To give due environmental and social consideration in the implementation of the Project.		•

(B/A : Banking Arrangement, A/P : Authorization to pay)

ANNEX-4

Table 2 Major Undertakings to be taken by Each Government (Equipment)

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To ensure prompt customs clearance of the products and to assist internal transportation of the products in the recipient country		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	•	
	2) Tax exemption and custom clearance of the Products at the port of disembarkation		•
	3) Internal transportation from the port of disembarkation to the project site	(•)	(•)
2	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be [exempted] or [be borne by the Authority without using the Grant]		•
3	To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		•
4	To ensure that the Facilities and the products be maintained and used properly and effectively for the implementation of the Project		•
5	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		•
6	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	Advising commission of A/P		•
	Payment commission		•
7	To give due environmental and social consideration in the implementation of the Project.		•

B/A : Banking Arrangement, A/P : Authorization to Pay

MINUTES OF DISCUSSIONS
ON THE PREPARATORY SURVEY
ON THE PROJECT
FOR RURAL WATER SUPPLY PHASE Ⅲ IN THE LAKE KYOGA BASIN, EASTERN UGANDA,
IN THE REPUBLIC OF UGANDA
(THE SECOND FIELD SURVEY)

In response to the request from the Government of the Republic of Uganda (hereinafter referred to as "Uganda"), the Government of Japan decided to conduct the Preparatory Survey on the Project for Rural Water Supply Phase Ⅲ in the Lake Kyoga Basin, Eastern Uganda (hereinafter referred to as "the Project") and entrusted the survey to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Uganda the Preparatory Survey Team (hereinafter referred to as "the Team"), which is headed by Mr. Shigeyuki Matsumoto, Senior Advisor, JICA, and the Ugandan side and the Team signed the minutes of Discussions on 22 May 2015. In addition to this, JICA sent to Uganda the Team again which is scheduled to stay in the country from 7 Oct 2015 to the end of April 2016 for the second field survey.

The Team held a series of discussions with the officials concerned of the Government of Uganda.

In the course of discussions and field survey, both parties confirmed the main items described in the attached sheets. The Team will proceed to further work.

Kampala, 14 Oct 2015

Mr. Shigeyuki Matsumoto
Team Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Eng. Aaron Kabirizi
For: Permanent Secretary
Ministry of Water and Environment
The Republic of Uganda

Attachment

1. Explanation of the results of the first field survey and the first analysis in Japan

The Team submitted the report on the results of the first field survey and the first analysis in Japan to the Ugandan side, and explained its contents.

2. Target RGCs for the second field survey

According to the criteria set in the minutes of discussions signed on 22 May 2015 (hereinafter "the minutes") and the subsequent discussions written in the technical notes signed on 28 July 2015, the both sides agreed that following RGCs, Nambale, Naigobya, Kyanvuma, Kasassira, Kameke, Kapala, Buseta, Kidetok, Tubur, Lambala, Nondwe and Acuna as the target RGCs for the second field survey.

The RGCs below are excluded from the target RGCs for the second field survey.

Nakalama, Kadama, Mugarema and Nakabugu were excluded from the target of the first field survey due to duplication with other projects of piped water supply system as agreed by the technical notes signed on 28 July 2015.

Namungalwe and Busesa were excluded because NWSC had already conducted surveys for piped water supply facilities in Namungalwe and has construction plans which are to use NWSC piped water network including Busesa. Considering their large cost, the construction plans by NWSC are better to supply enough amount of water and should be promoted.

Nabitende Banada and Nakivumbi were excluded due to strong opposition by the local people against the pumping tests of existing boreholes in the first field survey, which had forced the Team to abandon the tests. The Team recognized the safety concern about the team members and the foreseeable difficulties of consensus building among local people when it comes to conduct the second field survey in these RGCs.

3. Test borehole drilling

Maximum number of the total test boreholes is fixed to 20 due to the limitation of the survey duration as well as the amount of budget, as agreed by the minutes.

Based on the analysis of the results of the first field survey, the number of test borehole drilling will be allocated to each target RGC as follows;

Kyanvuma: 2
Kapala: 2
Buseta: 2
Nambale: 2
Kasassira: 2
Lambala: 2
Nondwe: 2

Allocation of the remaining 6 test borehole drillings will be decided through discussions between MoWE and the Team, according to the water demand and the results of hydrogeological survey.

The test borehole drillings may be reallocated to the target RGCs in case the followings happen:

(a) If one or more RGC(s) which are selected as the target of the second field survey and planned to implement test borehole drilling fail to reach consensus on the implementation of the Project during the mobilization and pre-sensitization process, and therefore the test borehole drillings in those RGCs become unnecessary.
(b) If the success rate of test boreholes is more than expected.

The reallocation will be decided through discussions between MoWE and the Team.

In the remaining RGCs, Naigobya, Kameke and Kidetok will be planned to use existing test boreholes which were drilled in the course of the Development Study on Water Resources Development and Management for Lake Kyoga Basin by JICA.

The Team requested MoWE to ensure land use permission for the test borehole sites by obtaining written consensus from land owners or administrators, and other stakeholders if necessary.

4. Mobilization and pre-sensitization

Both sides agreed to conduct mobilization and pre-sensitization activities in the RGCs which were selected as the target RGCs for the second field survey, and to cooperate for implementing these activities.

Both sides agreed that the RGCs from which MoWE and the Team cannot get acceptance and agreement through such activities would be excluded from the target RGCs. The process and way of decision making in the activities are to be agreed between MoWE and the Team.

The Team explained that a local social specialist would be hired by JICA's budget for accelerating mobilization and pre-sensitization in response to the request from MoWE written in the technical notes. Nevertheless, both sides also agreed that MoWE would have the primary responsibility for the negotiation with stakeholders and the Team would have the responsibility for indirect support.

Both sides agreed that the agreement from RGCs for being included in the target RGCs means that RGCs accept to bear the responsibilities in the second field survey and in the O&M phase especially as follows;

(a) If the project constructs piped water supply facilities, RGCs will bear the O&M cost and properly operate and maintain the facilities in the long run.
(b) The RGCs will provide lands which are necessary for the construction of production wells, overhead storage tanks and kiosks. In the case of Tubur and Acuna, the lands for a pumping station and pipelines also have to be secured instead of lands for production wells.
(c) The RGCs in which the wells constructed in the development study would be used for the production wells have to agree with the utilization of them.
(d) The RGCs in which the production wells would be constructed near the existing wells have to agree to change the water sources from the existing one to the new piped water supply systems.
(e) The RGCs in which test borehole drilling would be conducted have to agree with the implementation of geophysical survey and test drilling survey.
(f) The RGCs have to agree with the implementation of other various surveys including topographical survey and social survey.

5. Survey about sanitation and hygiene

The soft component plan will design sanitation and hygiene promotion activities in addition to support activities for establishment of O&M system in the second analysis in Japan. Therefore, necessary data and information for the designing will be obtained by the socio-economic survey during the second field survey. The socio-economic survey will be contracted out in a manner that expertise of sanitation and hygiene can be utilized.

6. Agreement with NWSC

Tubur and Acuna are included in the target RGCs for the second field survey on condition that the water source is the pipeline operated by NWSC. The Team will further investigate the feasibility to connect Tubur and Acuna to the existing NWSC's trunk main. The Team requested MoWE to facilitate discussions with NWSC and to make an agreement on water allocation, responsibility, O&M, and so on, if the feasibility is confirmed.

7. Electricity supply

According to the minutes, Clause 7-2, the RGCs which have only the possibility to use diesel generator for the facility's operation would be excluded. However, the Team had confirmed that every RGC had access or would have access to commercial electricity supply, so that no RGC was excluded by the reason of electricity supply.

Nonetheless, the Team found that the commercial electricity supply is unstable in some RGCs. Therefore, the both sides agreed that the choice of electricity supply would be discussed between both sides through the second field survey, considering the following options; solar panel, commercial electricity, and combination of commercial electricity and standby generator. The following criteria will be taken into consideration:

(a) Frequency and duration of power failure,
(b) Capacity of production boreholes and water demand (Operating time of solar panel is limited within daytime, so that the served population will be limited accordingly if the capacity of production boreholes is not enough.),
(c) O&M cost, and willingness to pay of the local people, and
(d) Operability and durability of electric system (Complicated system is prone to failure).

8. Undertakings of the Ugandan side for the Project

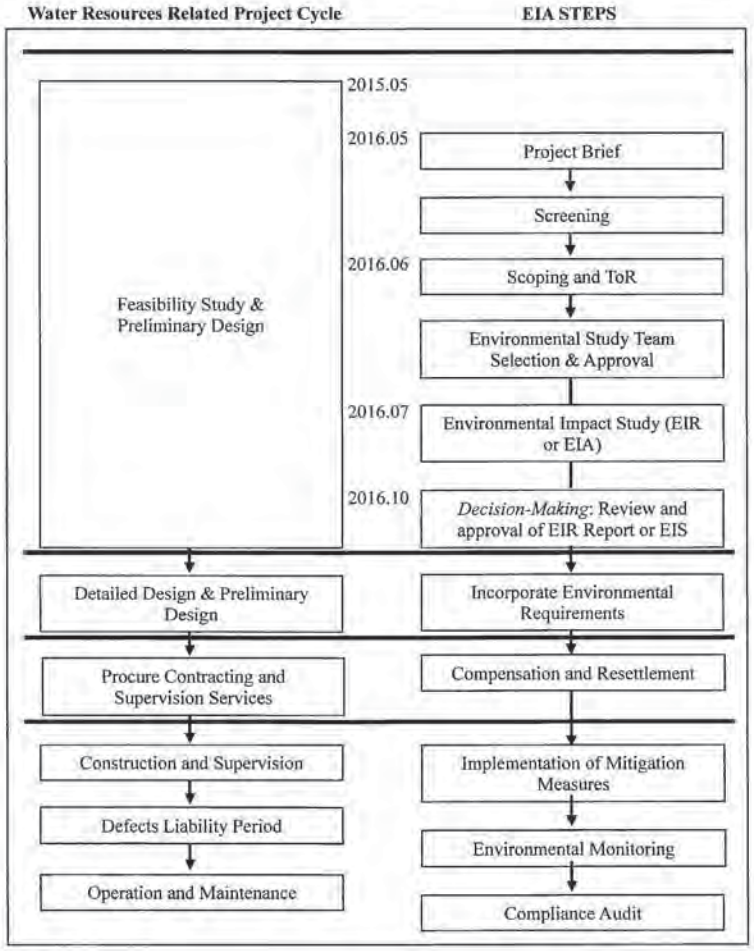
In addition to the description in the minutes, Clause 7-7, the team requested the necessity of undertakings by the Ugandan side as follows, and the Ugandan side agreed to that:

(1) MoWE ensures enough budgets for covering applicable Ugandan tax imposed to the Japanese nationals working for the Project based on the estimated amount of the project cost. Such budget for the fiscal year 2016/2017 should be included in the immediate budget request.
(2) MoWE would share the information about tasks which are necessary for the process of environment and social considerations and complete these tasks by the time of formal approval of the Project by the Japanese government. The process is described in Annex 1.
(3) Related to the clause 7-7(2) in the minutes, if involuntary resettlement is necessary, MoWE would prepare a Resettlement Action Plan (RAP)/ Abbreviated Resettlement Action Plan (ARAP) and make it available to the public.
(4) MoWE would complete the procedure to obtain project ID from the Ministry of Finance, Planning and Economic Development in Uganda.
(5) MoWE ensures the security of the Team during the second field survey especially in the RGCs.

9. Schedule

Both sides confirmed the schedules of each task. The duration of the second field survey would be about 7 months, until the end of April, 2016. After the second field survey, the Team will analyze the results of the field survey in Japan, make outline design, and estimate project cost for about four months. The Team will send the draft outline design to MoWE for the design review by the beginning of August, 2016, and finalize it reflecting the comments from MoWE. MoWE is requested to feedback its comments of the design review by the middle of September, 2016 in order to avoid the delay of the Project. The Team will prepare the draft report of the survey and explain its contents to the Ugandan side around November 2016.

Annex 1 Flow chart of the EIA process



Remarks

: Submission of relevant document to NEMA

Minutes of Discussions
on the Preparatory Survey for the Project for
The Project for Rural Water Supply Phase Ⅲ
in Lake Kyoga Basin, Eastern Uganda,
in The Republic of Uganda
(Explanation on Draft Preparatory Survey Report)

With reference to the minutes of discussions signed between Ministry of Water and Environment (hereinafter referred to as "MoWE") and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on 22 May, 2015 and 14 Oct, 2015 and in response to the request from the Government of the Republic of Uganda (hereinafter referred to as "Uganda") dated July 2011, JICA dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") for the explanation of Draft Preparatory Survey Report (hereinafter referred to as "the Draft Report") for the Project for Rural Water Supply Phase Ⅲ in Lake Kyoga Basin, Eastern Uganda in The Republic of Uganda (hereinafter referred to as "the Project"), headed by Mr. Shigeyuki Matsumoto, JICA Senior Advisor, from 20 to 24 November, 2016.

As a result of the discussions, both sides agreed on the main items described in the attached sheets.

Kampala, 23 November, 2016

Mr. Shigeyuki Matsumoto
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Eng. Aaron M. Kabirizi
Director
Directorate of Water Development
Ministry of Water and Environment
The Republic of Uganda

Witness

Mr. Fredrick Matyama
For: Permanent Secretary/Secretary to the Treasury
Ministry of Finance, Planning and Economic Development
The Republic of Uganda

ATTACHMENT

1. Objective of the Project
   The objective of the Project is to improve water coverage by/through construction of piped water supply facilities, thereby contributing to improve living environment.

2. Title of the Project
   Both sides confirmed that though the title of the Preparatory Survey is "the Preparatory Survey for the Project for Rural Water Supply Phase Ⅲ in Lake Kyoga Basin, Eastern Uganda in the Republic of Uganda", the title of the Project shall be changed to "The Project for Rural Water Supply in Lake Kyoga Basin, Eastern Uganda in the Republic of Uganda".

3. Project site
   Both sides confirmed that the sites of the Project are 9 RGCs (Nambale, Lambala, Naigobya, Kyanvuma, Kasassira, Kameke, Kapala, Buseta and Kidetok) in 5 Districts, which is shown in Annex 1.

4. Responsible authority for the Project
   Both sides confirmed that the Ministry of Water and Environment will be the executing agency for the Project (hereinafter referred to as "the Executing Agency"). The Executing Agency shall approve all the design documents and tender documents, and coordinate with all the relevant authorities to ensure smooth implementation of the Project and ensure that the undertakings for the Project shall be taken care by relevant authorities properly and on time. The organization chart is shown in Annex 2.

5. Contents of the Draft Report
   After the explanation of the contents of the Draft Report by the Team, the Ugandan side agreed to its contents, subject to approval of the Draft Report by the Design Committee of MoWE.

6. Cost estimate
   Both sides confirmed that the cost estimate including the contingency and the amount of VAT based on the cost estimate described in Annex 3 are provisional. The amount of grant will be examined further by the Government of Japan for its approval.

The cost to cover VAT will be examined by the Ugandan Government.
The contingency would cover the additional cost against natural disaster, unexpected natural conditions, etc. including increased cost due to environmental and other conditions that are beyond the assumption made at the design stage.

7. Confidentiality of the cost estimate and technical specifications
Both sides confirmed that the cost estimate and technical specifications in the Draft Report should never be duplicated or disclosed to any third parties except for Ministry of Finance, Planning and Economic Development (MoFPED) until all the contracts under the Project are concluded.

8. Timeline for the project implementation
The Team explained to the Ugandan side that the expected timeline for the project implementation is as attached in Annex 4. Project duration is estimated to be 26 months. The Project is expected to start from April 2017, subject to the cabinet approval of Japanese Government and Exchange of Notes.

9. Expected outcomes and indicators
Both sides agreed that key indicators for expected outcomes are as follows based on the result of the Preparatory Survey. The Ugandan side shall monitor the progress based on those indicators targeted year 2022.
[Quantitative indicators]
- Water supply amount by the facilities to be constructed in the Project would be at least 581 m^3 per day in the target RGCs.
- The served population in the target RGCs would increase from 13,800 (as of 2015) to 24,738 (as of 2022).

Breakdown of the target values mentioned above is shown in Annex 11.
[Qualitative indicators]
- The burden of water pumping and fetching by local people in the target RGCs shall be decreased.
- The number of cases of water-borne disease shall be decreased due to the supply of safe water.
- Operation and maintenance capability of the water supply facilities shall be enhanced through technical assistance of the Project.

In addition, MoWE explained their target to construct 1,000 service connections to individual households.

10. Technical assistance ("Soft Component" of the Project)
Considering the sustainable operation and maintenance of the products and services granted through the Project, technical assistance described in Annex 5 is planned under the Project. The Ugandan side confirmed to conduct necessary undertakings which are appropriate and competent in terms of its purpose of the technical assistance as described in Attachment 13 in Draft Outline Design Report.

11. Undertakings of the Project
Both sides confirmed the undertakings of the Project as described in Annex 6. Additional details are as follows:

[Taxes]
Both sides noted that treatment of taxes and duties for this project shall be in accordance with the agreement to be concluded between the Government of Japan and the Government of Uganda. MoWE shall take necessary measures according to the agreement.

[Environmental Approval]
The Ugandan side shall have the responsibility for obtaining the Formal Approval of the implementation of the Project from environmental aspects by the end of December, 2016. It is the condition for having the cabinet meeting of the Government of Japan to make the final decision of the Project.

[Project Code]
The Ugandan side shall have the responsibility for obtaining Project Code of the Project from MoFPED. It is one of the important conditions on approval process of the Project in the cabinet meeting of the Government of Japan. Costs such as allowance and accommodation fee for the counterparts who shall be deployed from MoWE for the Project implementation shall be covered by MoWE's budget to be secured by the Project Code. MoWE explained that they would add this Project as an additional activity line to the existing Project Code.

[Connection of electricity lines from existing grid]
The Ugandan side shall have the responsibility to ensure the connection of electricity lines to the borehole sites from nearby existing grid for operating water supply facilities from UMEME in the RGCs of Naigobya, Kyanvuma, Kassassira, Kapala and Kidetok before May 2018. The Team requested to provide the progress and

evidence by January 2018

[Protection of the boreholes]
The both sides agreed that the boreholes which were dedicated to be used as the water sources in the Project shall be protected properly by MoWE before the contractor will take them over. In case the boreholes become unusable before taking-over due to other than the borehole structures, the Ugandan side has the responsibility to prepare an alternative boreholes ready-to-use. Such boreholes should be the same or better capacity and quality than the former ones.

[Land for temporary stockyard]
The Ugandan side such as MoWE, DWO and Sub-County in each district shall have the responsibility for lending the land to the Project for temporary stockyard without any compensation.

[Land for construction]
MoWE has already got permission during the Preparatory Survey which prescribes that the land owner shall permit to construct facilities on the land. To make the construction smoothly, the Ugandan side such as MoWE shall promote its permission in case that land owner appeals opposite opinion.

[Permission for using road]
MoWE shall support the contractor to obtain required permission such as construction permit and occupation permit from Uganda National Road Authority (UNRA). The contractor is responsible for the restoration of the roads to the original condition.

[Procurement from third country and Japan]
The Ugandan side shall support for custom clearance in the process of procurement in the Project.

[Working permission]
MoWE shall support to obtain working permit of the members of the Project working in Uganda from the Ministry of Internal Affairs, Directorate of Citizenship and Immigration Control, Immigration Control Department.
MoWE shall also support to obtain temporary registration from the engineering registration board for the consultants (chief consultant and resident engineer) and the

contractors.
Number and qualification of the members will be determined when the contracts between MoWE and the contractor and the consultant are concluded.

[Personnel dispatch]
Both sides agreed that Ugandan side shall dispatch counterpart personnel to supervise the construction of the project with the consultant during the Project period and the dispatch shall be conducted at the expense of Ugandan side.
The Ugandan side assured to take the necessary measures and coordination including allocation of the necessary budget which are preconditions of implementation of the Project. It is further agreed that the costs are indicative, i.e. at Outline Design level. More accurate costs will be calculated at the Detailed Design stage.
Both sides also confirmed that the Annex 6 will be used as an attachment of G/A.

12. Monitoring during the implementation
The Project will be monitored by the Executing Agency and reported to JICA by using the form of Project Monitoring Report (PMR) attached as Annex 7. The timing of submission of the PMR is described in Annex 6. MoWE shall supervise overall construction, procurement and technical assistance based on the contracts with the contractor and the consultants. JICA shall supervise the disbursement of the grant and its proper use.

13. Project completion
Both sides confirmed that the Project completes when all the facilities constructed, equipment procured, and operation and management arrangement established by the grant are in operation.
The completion of the Project will be reported to JICA promptly, but in any event not later than six months after completion of the Project.
After the completion of the Project, the defect liability period will be 12 months.
Upon completion of the Project, Certificate of Completion will be issued by MoWE to the contractor and the consultant. Final completion certificate will be issued after the defect liability period.

14. Ex-Post Evaluation
JICA will conduct ex-post evaluation after three (3) years from the project completion, in principle, with respect to five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact, and Sustainability). The result of the evaluation will be publicized.

The Ugandan side is required to provide necessary support for the data collection.

15. Schedule of the Survey

JICA will finalize the Preparatory Survey Report based on the confirmed items. The report will be sent to the Ugandan side around February 2017.

16. Environmental and Social Considerations

16-1 General Issues

16-1-1 Environmental Guidelines and Environmental Category

Based on 'JICA Guidelines for Environmental and Social Considerations (April 2010)' (hereinafter referred to as "the Guidelines"), the Project is categorized as B because the Project is not located in a sensitive area, nor has sensitive characteristics, nor falls into sensitive sectors under the JICA guidelines for environmental and social considerations (April 2010), and its potential adverse impacts on the environment are not likely to be significant.

16-1-2 Environmental Checklist

The environmental and social considerations including major impacts and mitigation measures for the Project are summarized in the Environmental Checklist attached as Annex 8. Both sides confirmed that in case of major modification of the content of the Environmental Checklist, the Ugandan side shall submit the modified version to JICA in a timely manner. MoWE will submit the Environmental Checklist to NEMA.

16-2 Environmental Issues

16-2-1 Environmental permission

Both sides confirmed the Formal Approval for the Environment Permission of the Project should be obtained from National Environment Management Authority (NEMA) by December 2016.

16-2-2 Environmental Management Plan and Environmental Monitoring Plan

Both sides confirmed that Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMoP) of the Project are as Annex 9, respectively.

Both sides agreed that environmental mitigation measures and monitoring shall be conducted based on the EMP and EMoP, which may be updated during the detailed design stage.

MoWE will submit EMP and EMoP to NEMA.

16-3 Land Acquisition

Both sides confirmed the 0.9 ha of land as described in Annex 12 would be acquired due to the implementation of the Project. And both sides agreed that the acquisition of land would be conducted as per the Ugandan laws and be the responsibility of the Ugandan Government.

16-4 Environmental and Social Monitoring

16-4-1 Environmental Monitoring

Both sides agreed that the Ugandan side will submit results of environmental monitoring to JICA by using the monitoring form including not only environmental aspects but also social aspects attached as Annex 10. The timing of submission of the monitoring form is described in Annex 6.

16-4-2 Information Disclosure of Monitoring Results

Both sides confirmed that the Ugandan side will disclose results of environmental and social monitoring to local stakeholders through their website.

The Ugandan side agreed JICA will disclose results of environmental and social monitoring submitted by the Ugandan side as the monitoring forms attached as Annex 10 on its website.

17. Other Relevant Issues

17-1. Disclosure of Information

Both sides confirmed that the Preparatory Survey Report from which the project cost is excluded will be disclosed to the public after completion of the Preparatory Survey. The comprehensive report including the project cost will be disclosed to the public after all the contracts under the Project are concluded.

17-2. Connection to households and expansion of water supply areas

Both sides agreed that the Ugandan side has the responsibility of service connections (yard tap) to individual households but the design will cover all demands by users for connections. When construction of household service connection is conducted after hand-over, MoWE is responsible for any defects related to such work.

And both sides agreed that when it comes to expand water supply areas, the Ugandan side would need to check the latest water demand and the capacity of the facilities in order to avoid overload damage to the facilities.

17-3. Responsibility for the test boreholes handed over to MoWE

As mentioned in the Technical Notes (No.4) signed May 24, 2016, the test boreholes drilled in the Preparatory Survey were already handed over to MoWE from the Team. The Team reconfirmed that MoWE has responsibility for these boreholes. Those which are not used as the water source for the Project shall be properly utilized by MoWE or kept sealed to prevent any accident.

17-4. Test run

MoWE requested 3-month test run. The Team requested to provide the guidelines which require it.

17-5. Disinfection facilities

MoWE strongly requested to include chlorine dosing equipment for disinfection. The Team explained that JICA does not accept the chlorine dosing equipment. MoWE will provide the equipment and the contactor will install it.

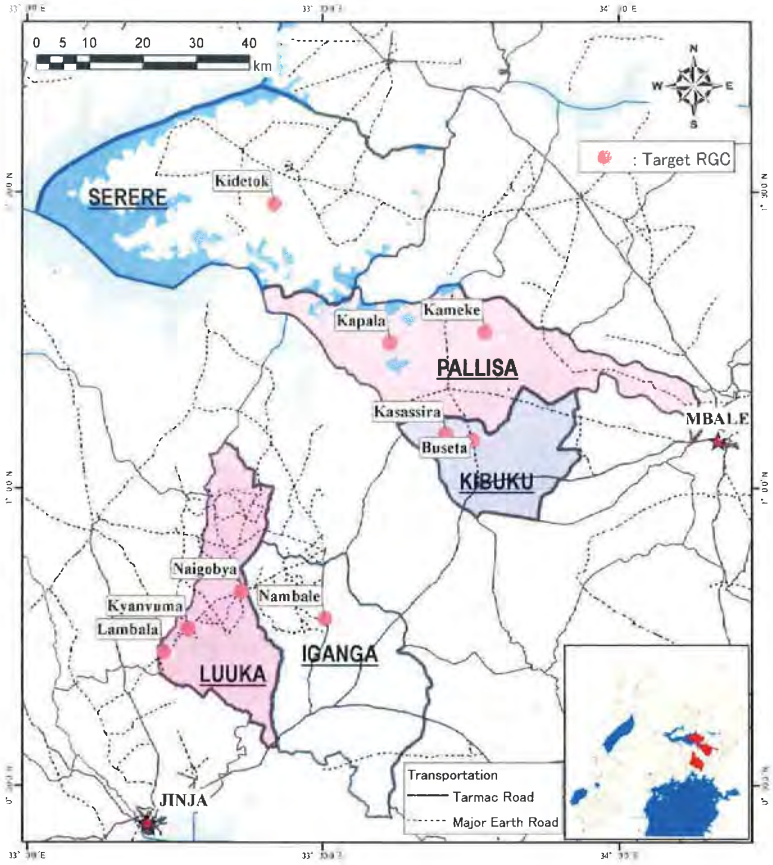
17-6. Pump capacity

MoWE requested to consider using submersible motor pumps with larger capacity in preparation for outages of power supply and future increase of demand in RGCs which have boreholes with large safe yield. The Team explained that the design of the pump capacity is in accordance with Design Manual 2nd edition, 8.6 Operation Time, which says that "the optimal number of pumping hours per day should be determined after carrying out appropriate technical and economic analyses. The analyses should take into consideration of the capital costs of the pumps. A borehole pump should normally work for 24 hours a day as this, for a given yield, reduce the required pump speed and/or pump size, and it usually results in optimal utilization of the borehole." Considering the lowest electricity tariff of off-peak hours during night, operation hours are set as 6 hours if the safe yield is enough. As for the solar pumps, the efficient sunshine hours are considered.

Annex 1 Project Site
Annex 2 Organization Chart
Annex 3 Estimated Project Cost (confidential)
Annex 4 Project Implementation Schedule
Annex 5 Plan of Technical Assistance (Soft Component)
Annex 6 Major Undertakings to be taken by the Government of Uganda
Annex 7 Project Monitoring Report (template)
Annex 8 Environmental Check List
Annex 9 Environmental Management Plan/Environmental Monitoring Plan
Annex 10 Environmental and Social Monitoring Form
Annex 11 Breakdown of the target values on expected outcomes and indicators
Annex 12 Land acquisition

Annex-1

The Project for Rural Water Supply Phase III in Lake Kyoga Basin, Eastern Uganda in the Republic of Uganda



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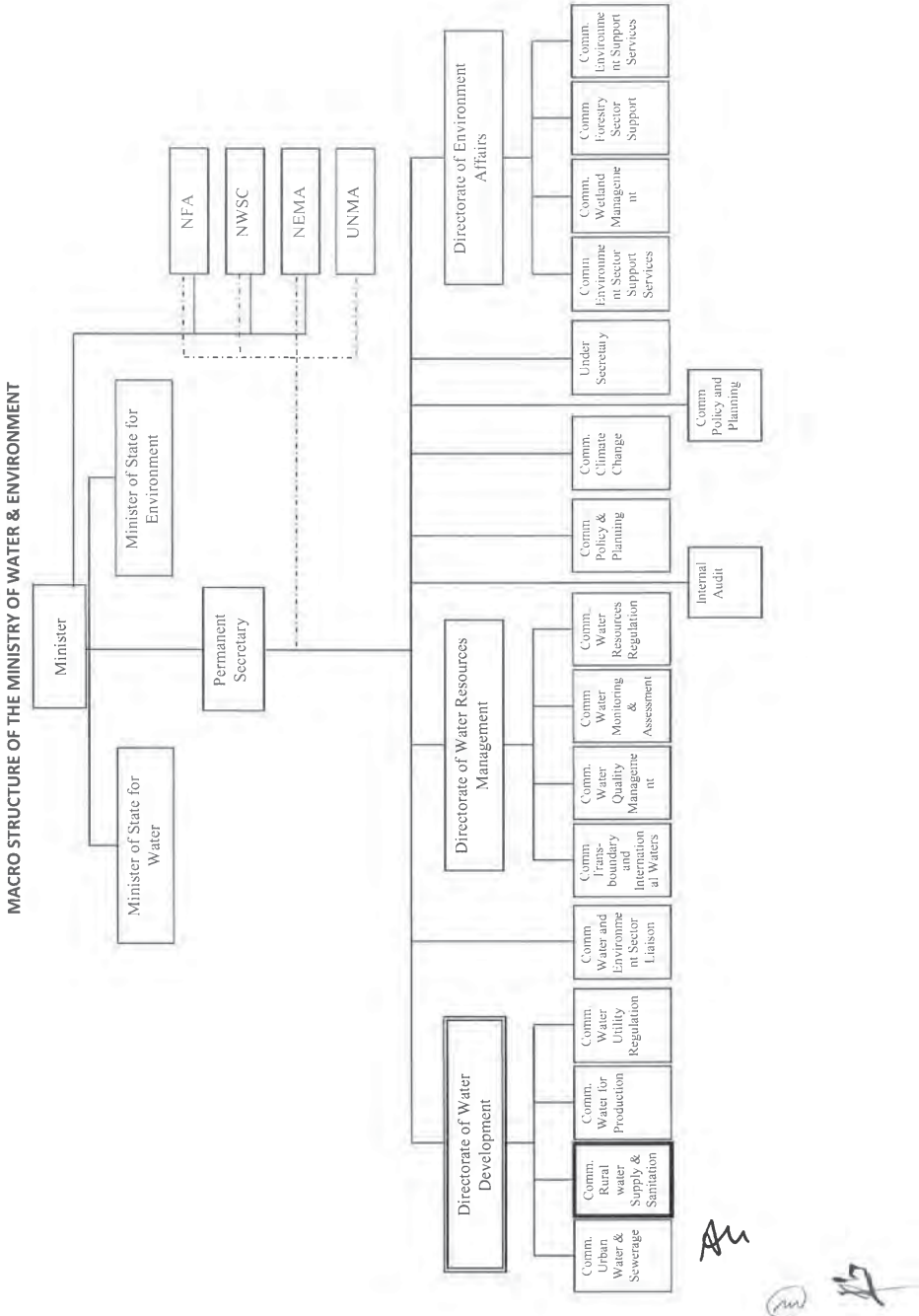
Annex-2



Annex 3

Confidential

Estimated Project Costs

The total project cost required for the components to be covered by Japanese side is estimated at approx. [redacted] Japanese yen. It is, however, noted that this does not indicate the amount of grant which will be shown in the Exchange of Note.

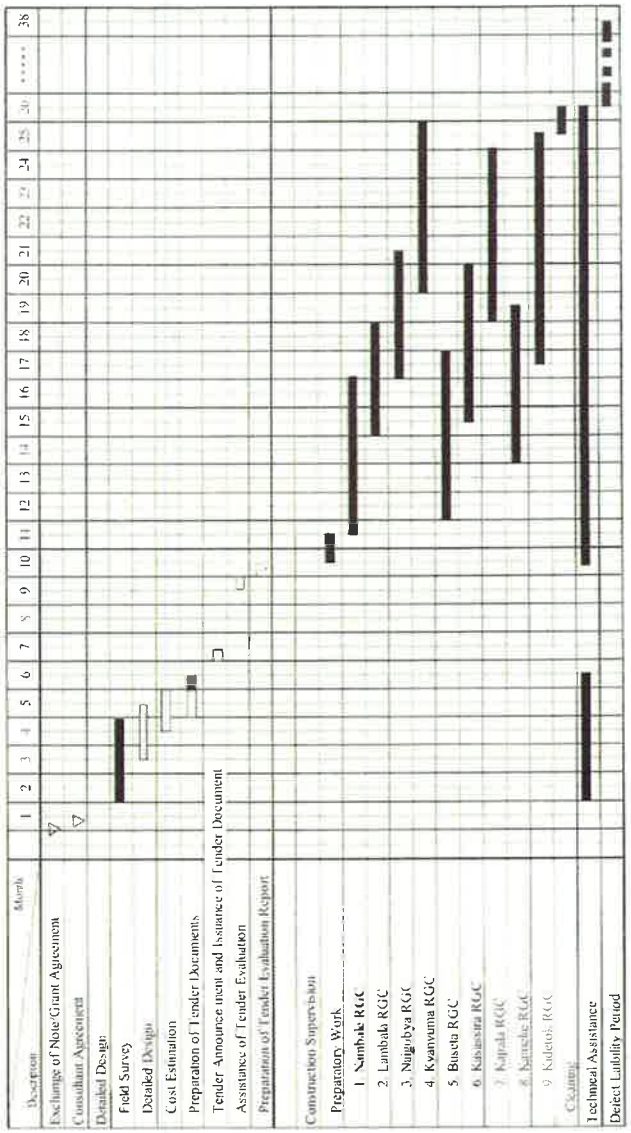
Total Project Cost: Approx. [redacted] Japanese yen

Items				Project Costs (Mil. JPY)
Construction and Procurement Costs	Construction Costs	Civil Works	9 RGCs: - Intake Borehole (12 nos.) - Transmission Pipelines (22.4km) - Elevated Tanks (9 nos.), Distribution Pipelines (42.9km) - Yard Tap Connections (Public Facilities) (99 nos.)	[redacted]
		Architectural Works	9 RGCs: - Water Kiosks (70 nos.) - Generator House (1 no.) - Guard Houses (4 nos.)	
	Procurement Costs of Equipment	Diesel Engine Generator (20kVA) and Fuel Tank (90L) for Kasassira RGC		
Engineering Fees for Detailed Design, Assistance in Tendering, Construction Supervision, and Soft Component (Technical Assistance)				
Sub-total				
Contingency (5%)				
Total Project Cost				

The cost to cover VAT is estimated as follows:

[redacted]

Project Implementation Schedule



Annex 5

Plan of Technical Assistance (Soft Component)
(Project Design Matrix)

Project Name: *Rural Water Supply Phase III in Lake Kyoga Basin Eastern Uganda in the Republic of Uganda*

Period of Implementation:

Target Group: Residents of target RGCs, WSSB, Scheme Operators, Kiosk attendants

Target Country: Uganda

Date: October 2016

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Project purpose (Overall Goal)			
• To improve safe water coverage in rural water supply sector	• Safe water coverage • Supply amount of the system	• Water supply database of MOWE • Monthly report of O&M	Water policy or national development policy doesn't change
• To reduce the load for fetching water of women and children who are socially vulnerable	• Enrollment of school	• Data of Sub county office	
Purpose of Software Component			
• Basic activities such as water fee collection are done smoothly and the facilities are operated on financially stable conditions	• Rate of water fee collection (Sales amount) • Balance of income and expenditure	• Record of water fee collection, account book • Monthly report for operation and maintenance	Residents, staff of local government, staff of DWD and Umbrella organization continue their activity
• The piped water supply facilities constructed under the project are used cleanly and continuously under proper operation and maintenance (inspection and repair)	• Amount of water supply by the system • Status and frequency of repair and check by Scheme Operators	• Operation records of this system • Record of repair and check	
Outputs			
1 Villagers understand the importance of safe water and the relations among safe water, and health and sanitation	• Adoption rate of toilet, dish shelf, soak pit for household effluent	• Interview from Ugandan counterpart	Member of WSSB and staff of local government are not reshuffle frequently
2 Administrative officers and villagers understand the importance and roles of WSSB, scheme operators, kiosk attendants and Umbrella organization	• Frequency of meeting of WSSB and residents • Number of participation for residents meeting	• Report of implementation	Trained Scheme Operators continue to work
3 Members of WSSB including scheme operators and kiosk attendants understand objectives of WSSB, roles of each member, and method of organizational operation	• Selection of Scheme Operators • Registration to Umbrella • Decided water fee • Opening of bank account	• Record of selection for Scheme Operator • Registration card of Umbrella • By-laws of WSSB (including rule of water fee) • Bank Account Book	Residents continue to participate in this activity
4 Members of WSSB including scheme operators and kiosk attendants learn about the technical knowledge and skills for the operation and maintenance of the piped water supply facilities such as structures, inspection and repair of the facilities	• Record of submersible pump • Yield of borehole • Sold water amount of Kiosk • Frequency of periodical check • Number of minor repair • Existence of monthly report	• Monthly report for operation and maintenance	Residents' life doesn't change much by natural hazard, etc
5 Members of WSSB including scheme operators and kiosk attendants understand water charge collection at kiosk, reading flow meter, importance of cleaning kiosk and soak pit	• Record of flow meter at Kiosk • Collected amount of water fee • Status of cleaning around Kiosk and Soak Pit	• Monthly report for operation and maintenance • Site investigation	
Activities	Inputs (Japan)	Inputs (Uganda)	Pre-conditions
Mobilization and Sensitization for residents ①Phase 1 Pre-construction: Holding several workshops to promote awareness and organization against representatives of RGCs, member of Project implementation committee, staff of sub county and residents. Training for WSSB (including Scheme Operator and Kiosk Attendants) ②Phase 2 During Construction: Holding several workshops about basic of operation and maintenance, training "on the job" practically ③Phase 3 Post Construction: Following up the practices by several workshop and on-the-job training for WSSB, scheme operator and Kiosk Attendant	• Sub-contract and employ local consultants • Dispatch Japanese Consultant	• Staff of DWD who are in charge of mobilization, sensitization and health promotion • Staff of DWO who are in charge of mobilization, sensitization and health promotion • Community Development Assistant (CDA) and Health Assistant (HA) belonging to DWO • Staff of Umbrella East	Residents in the target RGCs are not adverse to the construction of water supply facility

Annex 6

Major Undertakings to be taken by the Government of Uganda

1. Specific obligation of the Government of Uganda which will not be funded with the Grant

(1) Before the Tender

NO.	Items	Deadline	In charge	Estimated Cost (1,000UGX)	Ref.
1	To open bank account (B/A)	within 1 month after the signing of the G/A	MoWE	[redacted]	M/D1
2	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the consultant	within 1 month after the signing of the contract	MoWE		M/D1
3	To obtain Formal Approval for the Environment Aspects of the Project and secure the necessary budget for implementation	before the cabinet meeting of the Government of Japan	MoWE		M/D1
4	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be borne by its designated authority without using the Grant	during the Detail Design	MoWE		M/D1
5	To secure the following lands 1) project sites 2) temporary construction yard and stock yard near the Project area 3) disposal site near the Project area	before start to make Detailed Design	MoWE		M/D1
6	To support to obtain required permission such as construction permit and occupation permit from UNRA if necessary	before notice of the bidding document	MoWE		M/D1
7	To submit Project Monitoring Report (with the result of Detail Design and social monitoring)	before preparation of bidding documents	MoWE		M/D3 (12)
8	To dispatch counterpart personnel to supervise the soft-component and bear the cost such as allowance, accommodation fee and transportation	during the Detail Design	MoWE		M/D3 (11)
9	To connect electricity lines to the borehole sites from nearby existing grid	before notice of the bidding document	MoWE		M/D1
10	To protect the water sources for the piped water supply systems	before handing over it to the Contractor	MoWE		M/D3 (11)

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

(M/D1: Minutes of Discussion (22nd May 2015), M/D3: Minutes of Discussion (23rd November 2016))

* The figure is the sum of allowance and accommodation fee. And the transportation fee needs to be added.

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost (1,000UGX)	Ref.
1	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the Contractor(s)	within 1 month after the signing of the contract(s)	MoWE	[redacted]	M/D1
2	To bear the following commissions to a bank in Japan for the banking services based upon the B/A		MoWE		M/D1
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)	MoWE		M/D1
	2) Payment commission for A/P	every payment	MoWE		M/D1
3	To ensure prompt customs clearance and to assist the Supplier(s) with internal transportation in recipient country	during the Project	MoWE		M/D1
4	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	MoWE		M/D1
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted and VAT be borne by its designated authority without using the Grant	during the Project	MoWE		M/D1
6	To dispatch counterpart personnel to supervise the construction and soft-component and bear the cost such as allowance, accommodation fee and transportation	during the Project	MoWE		M/D3 (11)
7	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project	MoWE		M/D1
8	1) To submit Project Monitoring Report	every month	MoWE		M/D3 (12)
	2) To submit Project Monitoring Report (final)	within one month after signing of Certificate of Completion for the works under the contract(s)	MoWE		M/D3 (12)
9	To submit a report concerning completion of the Project	within six months after completion of the Project	MoWE		M/D3 (13)
10	To implement EMP and EMoP	during the construction	MoWE		M/D3 (16)
11	To submit results of environmental monitoring to JICA, by using the monitoring form, on a quarterly basis as a part of Project Monitoring Report	during the construction	MoWE		M/D3 (12)
12	To procure chlorine dosing equipment	during the construction	MoWE		M/D3 (17)

*The figure is the sum of allowance and accommodation fee. And the transportation fee needs to be added.

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost (1,000UGX)	Ref.
1	To implement EMP and EMoP	for a period based on EMP and EMoP	MoWE	[redacted]	M/D3 (16)
2	To submit results of environmental monitoring to JICA, by using the monitoring form, semiannually - The period of environmental monitoring may be extended if any significant negative impacts on the environment are found. The extension of environmental monitoring will be decided based on the agreement between MoWE and JICA.	for three years after the Project	MoWE		M/D3 (16)
3	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Support to keep the operation and maintenance structure if necessary 2) Routine check/Periodic inspection by Umbrella organization	After completion of the construction	MoWE		M/D1
4	To be responsible for any defects related to construction of connections to households and yard taps	During the defect liability period	MoWE		M/D3 (17)

2. Other obligations of the Government of Uganda funded with the Grant

	Items	Deadline	Amount (Million Japanese Yen)*
1	To construct piped water supply systems for 9 RGCs	by the Project completion	[redacted]
2	To implement detailed design, bidding support and construction supervision (Consulting Service)		
	Total		

* The amount is provisional. This is subject to the approval of the Government of Japan

Project Monitoring Report
on
The Project for Rural Water Supply in Lake Kyoga Basin
Grant Agreement No. XXXXXXX

20XX, Month

Organizational Information

Signer of the G/A (Recipient)	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:
Executing Agency	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:
Line Ministry	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:

General Information:

Project Title	The Project for Rural Water Supply in Lake Kyoga Basin
E/N	Signed date: Duration:
G/A	Signed date: Duration:
Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____

1: Project Description

1-1 Project Objective

1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

1-3 Indicators for measurement of "Effectiveness"

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr)	Target (Yr)
Qualitative indicators to measure the attainment of project objectives		

2: Details of the Project

2-1 Location

Components	Original *(proposed in the outline design)*	Actual
1.		

2-2 Scope of the work

Components	Original* *(proposed in the outline design)*	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)

2-3 Implementation Schedule

Items	Original		Actual
	(proposed in the outline design)	*(at the time of signing the Grant Agreement)*	

Reasons for any changes of the schedule, and their effects on the project (if any)

2-4 Obligations by the Recipient

2-4-1 Progress of Specific Obligations

See Attachment 2.

2-4-2 Activities

See Attachment 3.

2-4-3 Report on RD

See Attachment 11.

2-5 Project Cost

2-5-1 Cost borne by the Grant(Confidential until the Bidding)

Components			Cost (Million Yen)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

2-5-2 Cost borne by the Recipient

Components			Cost (1,000 Taka)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

2-6 Executing Agency

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original *(at the time of outline design)* name: role: financial situation: institutional and organizational arrangement (organogram): human resources (number and ability of staff):
Actual *(PMR)*

2-7 Environmental and Social Impacts

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

3: Operation and Maintenance (O&M)

3-1 Physical Arrangement

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

Original *(at the time of outline design)*
Actual *(PMR)*

3-2 Budgetary Arrangement

- Required O&M cost and actual budget allocation for O&M

Original *(at the time of outline design)*

Actual *(PMR)*

4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

Assessment of Potential Risks *(at the time of outline design)*

Potential Risks	Assessment
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:

	Contingency Plan (if applicable):
Actual Situation and Countermeasures	
(PMR)	

5: Evaluation and Monitoring Plan (after the work completion)

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

Attachment

1. Project Location Map
2. Specific obligations of the Recipient which will not be funded with the Grant
3. Monthly Report submitted by the Consultant

Appendix - Photocopy of Contractor's Progress Report (if any)
- Consultant Member List
- Contractor's Main Staff List

4. Check list for the Contract (including Record of Amendment of the Contract/Agreement and Schedule of Payment)
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final)only)
8. Pictures (by JPEG style by CD-R) (PMR (final)only)
9. Equipment List (PMR (final)only)
10. Drawing (PMR (final)only)
11. Report on RD (After project)

Attachment 6

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

	Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment	
						Price (Decreased) E=C−D	Price (Increased) F=C+D
1	Item 1	●●t	●	●	●	●	●
2	Item 2	●●t	●	●	●		
3	Item 3						
4	Item 4						
5	Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

	Items of Specified Materials	1st ●month, 2015	2nd ●month, 2015	3rd ●month, 2015	4th	5th	6th
1	Item 1						
2	Item 2						
3	Item 3						
4	Item 4						
5	Item 5						

(3) Summary of Discussion with Contractor (if necessary)

-
-
-

Attachment 7

Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
(Actual Expenditure by Construction and Equipment each)

		Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost		(A/D%)	(B/D%)	(C/D%)	
	Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
	others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost		(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost		(A/D%)	(B/D%)	(C/D%)	
Total		(A/D%)	(B/D%)	(C/D%)	

Annex 8

Environmental Check List

Environmental check list is shown in the following table.

Table Environmental Check List

Environment Items	Main Check Items	Yes: Y No: N	Confirmation of Environmental and Social Considerations (Reasons, Mitigation Measures, etc.)
1. Permits and explanations			
(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a) Project brief on piped water supply system was prepared. MOWE which is the main operation office submitted the project brief to NEMA, the examination authority of Environmental and Social Consideration, on October 2016. (b) Currently, Environmental and Social Consideration procedure is ongoing in compliance with regulations in Uganda. It is expected that project brief will be approved by the end of November 2016. (c) (d)
(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) The stakeholder meetings were held in each project site. The component of outline design for water supply system (composition of water supply facility, borehole for water source, pumping facility, location of elevated tank, transmission and distribution pipes and kiosk) and adverse impact anticipated by the project implementation were explained. Moreover comments from the stakeholders were obtained. (b) Comments from the stakeholders were reflected to the project design.
(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	(a) Zero option (not to implement the project) was considered.
2. Pollution Control			
(1)Air Quality	(a) Is there a possibility that chlorine from chlorine storage facilities and chlorine injection facilities will cause air pollution? Are any mitigating measures taken? (b) Do chlorine concentrations within the working environments comply with the country's occupational health and safety standards?	(a) N (b) Y	(a) Chlorine storage facilities and chlorine injection facilities will not be used, since the water source is groundwater. However, manual chlorine injection will be conducted in the elevated tank at the cleaning around every six monthes, and for slightly long time retaining water due to a little large capacity of the elevated tank as a measure against the interruption of the electric power supply if necessary,. But no impact on air quality is expected because of small input amount of chlorine. (b) Same as the above

Environment Items	Main Check Items	Yes: Y No: N	Confirmation of Environmental and Social Considerations (Reasons, Mitigation Measures, etc.)
(2)Water Quality	(a) Do pollutants, such as SS, BOD, COD contained in effluents discharged by the facility operations comply with the country's effluent standards?	(a) Y	(a) In the kiosk, surplus water from pumped groundwater will be soaked into the ground through the soak pit in compliance with the standard of Uganda. Sensitization activity on sanitation and hygiene in this project and sensitization activity by health assistant of sub-county will be conducted so that the household wastewater is appropriately disposed.
(3)Wastes	(a) Are wastes, such as sludge generated by the facility operations properly treated and disposed in accordance with the country's regulations?	(a) Y	(a) Wastes, such as sludge will not be generated by the facility operations.
(4)Noise and Vibration	(a) Do noise and vibrations generated from the facilities, such as pumping stations comply with the country's standards?	(a) Y	(a) Problems on noise and vibration are not anticipated because pumping facility consists of small submersible motor pump and its power source is either solar power generation or commercial electricity supply. On the other hand, noise and vibration will be expected to some extent by the generator as the back-up power source of submersible pump. However there is no significant adverse impact by noise and vibration to local residents because the generator will be installed in the house to reduce them. Noise level of National Environment (Noise Standards and Control) Regulations (21st March 2003) will be complied.
(5)Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) N	(a) There is no possibility of ground subsidence by the decrease of groundwater level around boreholes because very shallow bedrock is prevailing in the surrounding area.
3. Natural Environment			
(1) Protected Areas	(a) Is the project site or discharge area located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) Project site is not located in the protected area.
(2)Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., wetland)? (b) Does the project site or discharge area encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that the amount	(a) N (b) N (c) N (d) N	(a) Project site does not encompass the primeval forests, tropical rain forests or ecologically valuable habitats (e.g., wetland). (b) Project site does not encompass the protected habitats of endangered species designated by the laws of Uganda and international treaties and conventions. (c) Significant ecological impacts are not anticipated because project site is located in developed area. (d) The water source in the project is the groundwater pumped from boreholes. The amount of groundwater used by this project is determined within a safe yield of each borehole so as not to

Environment Items	Main Check Items	Yes: Y No: N	Confirmation of Environmental and Social Considerations (Reasons, Mitigation Measures, etc.)
	of water used (e.g., surface water, groundwater) by project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?		adversely affect groundwater level of project site and its surrounding. Therefore there will be negligibly small impact on aquatic environments of project site and its surrounding.
(3)Hydrology	(a) Is there a possibility that the amount of water used (e.g., surface water, groundwater) by the project will adversely affect surface water and groundwater flows?	(a) N	(a) Main water source in the project is borehole. Based on the results of the pumping test, the amount of water used by this project is determined within the amount that will not adversely affect the ground water level of project site and its surrounding. Therefore there is no possibility that this project will affect the groundwater and surface water in the surrounding area.
4. Social Environment			
(1)Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Is the compensations going to be paid prior to the resettlement? (e) Is the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) N (b) N (c) N (d) N (e) N (f) N (g) N (h) N (i) N (j) N	(a) No resettlement is needed because there are enough vacant lots for the construction of the water supply system in each site. The land required in order to construct the water supply system is determined after discussion between each community and MOWE to avoid resettlement so that resettlement should not occur. Furthermore, according to a custom of the rural water supply project in Uganda, local government of district and sub-county has responsibility to prepare the required land, and community assists to provide the land. In accordance with this custom, the lands for water supply facilities in this project were provided free of charge. (b)、(c)、(d)、(e)、(f)、(g)、(h)、(i)、(j) Not applicable.

Environment Items	Main Check Items	Yes: Y No: N	Confirmation of Environmental and Social Considerations (Reasons, Mitigation Measures, etc.)
(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that the amount of water used (e.g., surface water, groundwater) by the project will adversely affect the existing water uses and water area uses?	(a) N (b) N	(a) Due to improving water supply system, it is expected that condition of hygiene is improved, and that women and children save their time for fetching water. (b) Existing condition of water use will be improved because the project will solve the existing unsafe water uses, carrying the water tank for a long distance, and fetching water from point water sources
(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There is no cultural heritage in the project site.
(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) There is no local landscape to be considered in the project site.
(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) Y (b) Y	(a),(b) There is no ethnic minority and indigenous people in the project site.
(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a) Y (b) Y (c) Y (d) Y	(a), (b), (c), (d) These check items for working condition are well considered and reflected in the detailed design. MOWE and contractor will take these measures.
5. Others			

Environment Items	Main Check Items	Yes: Y No: N	Confirmation of Environmental and Social Considerations (Reasons, Mitigation Measures, etc.)
(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? (d) If the construction activities might cause traffic congestion, are adequate measures considered to reduce such impacts?	(a) Y (b) N (c) Y (d) Y	(a) Noise and vibration, air pollution (sand dust) and wastes (surplus soil and rock) are expected during construction. Measures taken to the above impacts are as follows. <Noise and vibration> ・ To instruct driver to drive carefully, to limit speed voluntarily, and to do regular maintenance of construction machinery and vehicle ・ To select low noise machinery <Dust> ・ To reduce dust by sprinkling water ・ To cover truck bed by scattering prevention seat <Surplus soil and rock> ・ To instruct driver to dispose soft rock at the licensed disposal site Additionally, a reception for complaints from local residents and its receptionist will be set and deployed in addition to the above measures (it is to respond the complaints quickly). (b) Construction activities will not adversely affect the natural environment because project site is located in developed area. (c) There is a possibility that crimes and infectious diseases will increase due to the influx of workers into the project site. It is necessary to do adequate measures such as sensitization activity regarding public safety and risk of infectious disease so that crimes and infectious diseases patients will not increase. (d)There is a possibility that construction activities cause traffic congestion. It is necessary to do adequate measures such as ensuring passable road on one side, instructing driver and worker to keep traffic safety and advance disclosure of work schedule in order to reduce traffic congestion. In case of pipe crossing on main road, the jacking method is used so as not to prevent traffic flow.
(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?	(a) Y (b) Y (c) Y (d) N	(a) (b) (c) (d) A reception and its receptionist will be set in order to implement the monitoring by receiving requests and complaints from local residents about the impact on natural and social environment as well as the impact during construction. The proponent will plan to implement the monitoring based on monitoring plan. This monitoring implementation framework will be prepared by the proponent.

Environment Items	Main Check Items	Yes: Y No: N	Confirmation of Environmental and Social Considerations (Reasons, Mitigation Measures, etc.)
	(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?		
6. Note			
Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Dam and River Projects checklist should also be checked.	(a)	(a) Not applicable.
Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a)	(a) No impact to transboundary or global issues is anticipated.

Annex 9

Environment Management Plan

Table Environment Management Plan (EMP)

Adverse Impacts	Proposed Mitigation Measures	Implementing Organizations	Responsible Organizations
Construction Phase			
Air Pollution	<Sand Dust from un-paved road and carrying construction material> ・ To reduce dust by sprinkling water ・ To cover truck bed by scattering prevention seat ・ To set reception for complaint and respond it	Contractor	Implementing Organization
Waste	<Surplus soil and rock resulting from excavation work> ・ To instruct driver to dispose soil and rock at the licensed disposal site ・ To set reception for complaint and respond it	Contractor	Implementing Organization
Noise and Vibration	<Noise and vibration by operation of construction machinery and vehicle> ・ To instruct driver to drive carefully, to limit speed voluntarily, and to do regular maintenance of construction machinery and vehicle ・ To select low noise machinery ・ To set reception for complaint and respond it	Contractor	Implementing Organization
Existing Social Infrastructure and Services	<Traffic obstruction with pipe installing work > ・ To disclose work schedule in advance ・ To instruct driver and worker to keep traffic safety ・ To use jacking method in case of pipe crossing on main paved road ・ To secure one side traffic in case of pipe crossing on un-paved road. ・ To set reception for complaint and respond it	Contractor	Implementing Organization
Infectious Diseases such as HIV/AIDS	<Infectious disease due to the influx of workers> ・ To conduct sensitization activity to worker regarding risk of infectious diseases	Contractor	Implementing Organization
Working Environment	<Occupational accident during construction> ・ To provide safety training and education to worker ・ To instruct worker to comply with the act of working environment <Crime by worker> ・ To conduct sensitization activity to worker	Contractor	Implementing Organization

Adverse Impacts	Proposed Mitigation Measures	Implementing Organizations	Responsible Organizations
	regarding public safety		
Accidents	<Traffic accident by operation of construction machinery and vehicle> ・ To disclose work schedule in advance ・ To instruct driver to drive carefully, to limit speed voluntarily ・ To instruct driver and worker to keep traffic safety ・ To set reception for complaint and respond it	Contractor	Implementing Organization
Operation Phase			
Hydrology	<Decrease of groundwater level>		Implementing Organization
	・ The groundwater utilization plan, which allows pumping groundwater within its safe yield, is developed considering so as not to adversely affect groundwater in the project site and its surrounding. ・ Training of WSSB for operation and maintenance of a water supply facility in order to comply with this plan will be conducted.	Consultant	
	・ To monitor the amount of pumped water	WSSB	

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Annex 10

Draft Monitoring Form

Draft monitoring forms are shown in the following tables. Requests and complaints from the resident through the monitoring and necessary measures to be taken are described.

(1) Monitoring Form (Under Construction)

(a) Measures taken by MOWE to the requests and complaints from the residents

Monitoring Item	Monitoring Result
Number and contents of request and complaint from the residents	
Number and contents of countermeasures by MOWE	

(b)Pollution

➢ Air Pollution

Monitoring Item	Monitoring Result	Measures to be taken
Generation status of sand dust by visual inspection		

➢ Waste

Monitoring Item	Monitoring Result	Measures to be taken
Disposal methods of surplus soil and rock		

➢ Noise

Monitoring Item (Area-wise)		Measured value (Max)	Ugandan Standard (Daytime)	International Standards	Note (Location, Frequency, Method etc.)
Degree of noise level	Residential		60 dB	85 dB*	
	Commercial		75 dB		
	Industrial		85 dB		

* Standard for Japan (Construction phase) Environment Agency Notification No.16, March 28, 2000

➢ Vibration

Monitoring Item	Monitoring Result	Measures to be taken
Degree of vibration level		

(c)Social Environment

➢ Existing Social Infrastructure and Services

Monitoring Item	Monitoring Result	Measures to be taken
Generation status of traffic		

obstruction		

- Infectious Diseases such as HIV/AIDS

Monitoring Item	Monitoring Result	Measures to be taken
Attack rate		

- Working Environment

Monitoring Item	Monitoring Result	Reason	Measures to be taken
Number of occupational accident			

(d) Others

- Accidents

Monitoring Item	Monitoring Result	Reason	Measures to be taken
Number of traffic accident			

(2) Draft Monitoring Form (Operation Phase)

(a)Natural Environment

- Hydrology (Yield of borehole for water source)

Monitoring Item	Measured Date and Time	Monitoring Result (m^3)
Amount of pumped water		

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Breakdown of the target values on expected outcomes and indicators

No.	Name	District	Water Supply Amount (m^3)	Population (2022)
1	Nambale	Iganga	37	1,863
2	Lambala	Luuka	35	1,742
3	Naigobya	Luuka	34	1,711
4	Kyanvuma	Luuka	65	3,228
5	Kasassira	Kibuku	199	5,676
6	Kameke	Pallisa	31	1,546
7	Kapala	Pallisa	55	2,735
8	Buseta	Kibuku	46	2,276
9	Kidetok	Serere	79	3,961
Total			581	24,738

Land Area aquired for the Project

No.	Code	RGC Name	Water Source		Kiosk		Elevated Tank	Solar Generator
			No.	3×3=9m²	No.	3×5=15m²	(m²)	20×20=400m²
1	I-03	Nambale	2	18	6	90	900	within the Elevated Tank Area
2	I-06	Lambala	1	9	5	75	900	400
3	I-07	Naigobya	1	9	7	105	400	-
4	I-09	Kyanvuma	1	9	9	135	808	-
5	P-02	Kasassira	1	9	11	165	900	-
6	P-03	Kameke	1	9	7	105	884	within the Elevated Tank Area
7	P-04	Kapala	2	18	7	105	700	-
8	P-05	Buseta	1	9	9	135	900	within the Elevated Tank Area
9	S-01	Kidetok	2	18	9	135	900	-
Area (m²)			108		1,050		7,292	400
Grand Total (m²)								8,850