Chapter 5

Test Well Drilling

5 Test Well Drilling

5.1 Purpose and Methodology

5.1.1 Purpose

The well drilling and pumping test works were conducted in order to estimate water amounts and water quality of deep groundwater at the target villages in the study area.

5.1.2 Methodology

Test drilling and pumping test works were carried out by the DRILLING AND DAM CONSTRUCTION AGENCY (DDCA), the local subcontractor, under the direction of the drilling supervisor of the Study team.

The work schedule is shown in Table 5.1-1. Test drilling work started on the 24th of July (as it was explained drilling started on the 27th of July), and all drilling and pumping tests ended on the 18th of November 2005.

a. Test Well Drilling

a.1 Equipment

One (1) to two (2) drilling machines worked simultaneously during the survey period. The drilling depth was planned as 80m on average per hole, or a total of 800m. The specification of the drilling equipment applied to this survey is shown in Table 5.1-2.

The drilling rigs have been used for more than 30 years; therefore, there have been many breakdowns. Moreover, the compressor has been used for two years, although it has not been in good working condition. Moreover, the Study team was not informed that the logging equipment, previously provided by JICA, has developed troubles since last year or some years back.

Table 5.1-2: Specification of Drilling Equipment Used in This Study

Item	Name	Capacity/Specification
Drilling rig	SCHRAMN T.64	Max. drilling depth: 200m
Compressor	ATLASCOPCO XRVS 345 ATLASCOPCO XRVS 720	21.5kgf/cm^2 (350PSI)
Geophysical well logging equipment	OYO GOOLOGER 3030 MARK-2	Resistivity logging Spontaneous Potential logging
	ABEM TERRAMETER SAS300B	Electric resistivity survey equipment (Resistivity logging)
	OYO McOHM-EL	Electric resistivity survey and logging (resistivity and Spontaneous Potential loggings) equipment
Submergible motor pump for pumping test	GRUNDFOS SP17 etc.	0.3 – 3 m^3/hour
		1 – 10 m ^{3}/hour
		1.5 – 19 m^3/hour

a.2 Procedures for Test Drilling

Test drilling was carried out according to the procedures mentioned below.

- Preparation work
  - To confirm access road conditions for transportation of machines and equipment
  - To measure the well construction sites
  - To determine the drilling points and drainage direction
  - To explain the agreement for well construction
  - To instruct safety measures
- Drilling
  - To record drilling speed and mud water volume
  - To inspect cutting samples and prepare geological columnar sections
  - To determine drilling depth with consideration of discharge and geology
- Vertical geophysical logging
  - To measure resistivity (ρ) log (long: 12", short: 48")
  - To measure spontaneous polarization (SP)
- Preparation of casing program
  - To determine the depth for screen installation, cement grouting, clay sealing, gravel packing, etc.
  - To prepare well casing program

  Casing pipe used in the Study is 3m in length including joint part (net length 2.82-2.96m).
- Screen Pipe Installation
  - Orifice ratio of screen pipe used in the Study is more than 5%.
- Well Developing
  - To clean inside the well using air-lift
  - To observe the change of discharge, water level, and turbidity during the development work

b. Pumping Test

A pumping test is carried out after installation of casing pipes and screens. It comprises three (3) types of tests: a step-drawdown test, a continuous drawdown test and a recovery test.

The step drawdown test was conducted prior to the continuous pumping test. It was conducted in accordance with five (5) steps in increasing pumping rate, and five (5) steps in decreasing pumping rate. The duration of each step was three (3) hours.

The duration of the continuous pumping test was forty eight (48) hours. The recovery test started immediately after the continuous pumping test, and the duration of the recovery test was twenty-four (24) hours.

During the pumping test, groundwater for water quality analysis was sampled. At the same

time, water level, pH, ORP and EC were measured.

5.1.3 Test Well Drilling Points

The number of the requested villages is 929.

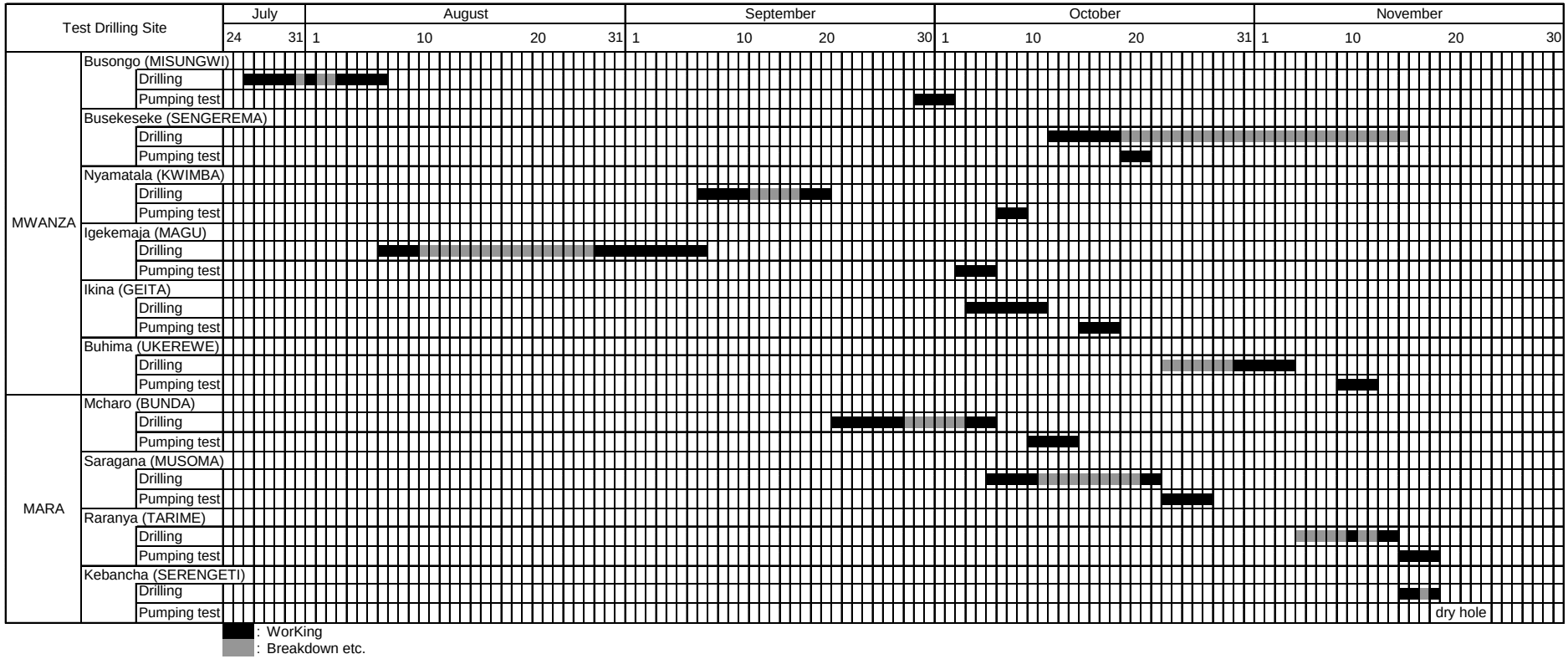
In the original plan, 428 villages were selected for the target villages for groundwater development planning and 50 villages were selected for the target villages for the electric sounding survey.

These 50 villages were surveyed to make a selection of the candidate sites for test drilling. Based on the results of the field survey, 10 villages were determined as the target villages (Figure 5.1-1). The criteria for selecting the target villages were: (1) geology, (2) geological structure, (3) lineament distribution, and (4) geographical features.

Prior to the test drilling, the agreement on the construction of the test well was concluded between the counterpart/JICA study team and the chairman/land-owner of the village.

The results of the test drilling for 10 villages are summarized in Table 5.1-3. 10 test boreholes were drilled. Out of the 10 boreholes, 4 boreholes were successfully drilled, while 5 boreholes had poor yield (not dry) and 1 borehole was dry. Having the results, 9 boreholes were converted to monitoring wells.

Table 5.1-1: Work Schedule



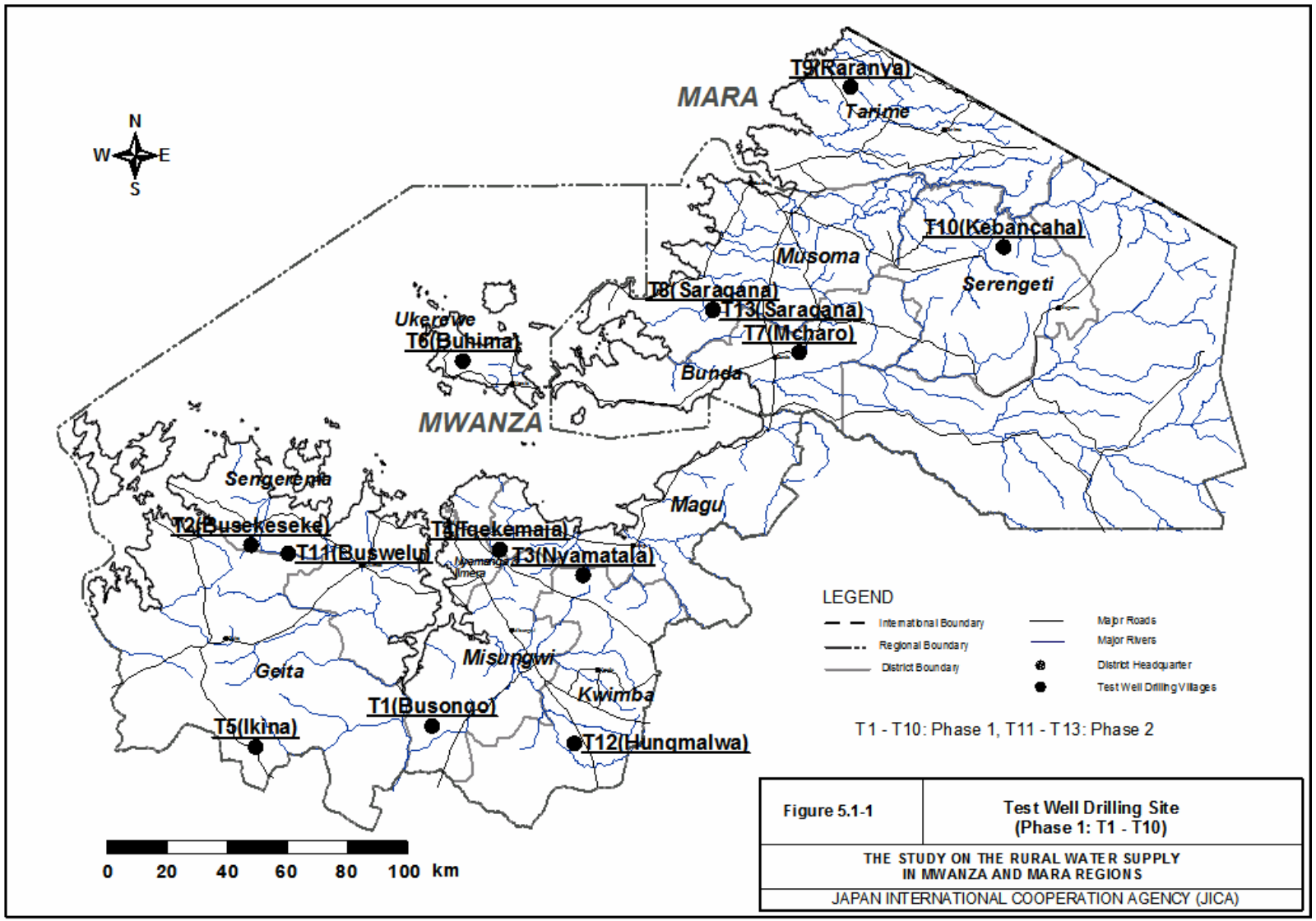


Figure 5.1-1	Test Well Drilling Site (Phase 1: T1 - T10)
THE STUDY ON THE RURAL WATER SUPPLY IN MWANZA AND MARA REGIONS	
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	

Table 5.1-3: Villages for Test Drilling

No.	Region	District and No. by district	Ward	Village	Geology[*1]	Coordinate		Depth[*2]	SWL	Water quality		
						Easting	Northing	(GL-m)	(GL-m)	pH	EC (mS/m)	ORP (mv)
T1	MWANZA	MISUNGWI 25	Busongo	Busongo	GrU	493339	9653900	50.00 50.00	8.07 on 29/09/05	8.50	96.5	287
T2		SENGERENA 83	Kalebezo	Busekeseke	Gr	423083	9713765	76.00 72.00	1.00 on 21/10/05	7.81	21.1	337
T3		KWIMBA 69	Nugulla	Nyamatala	Gr/GrU	533648	9704138	61.00 49.00	8.84 on 07/10/05	7.84	71.5	315
T4		MAGU 37	Kisesa	Igekemaja	Gr	505862	9712746	78.00 53.28	5.49 on 03/10/05	7.87	33.2	327
T5		GEITA 27	Bukoli	Ikina	N/GrU	423859	9647130	80.00 80.00	1.30 on 15/10/05	7.69	22.0	328
T6		UKEREWE 73	Ndulima	Buhima	Gr	493257	9775450	86.00 86.00	9.23 on 09/11/05	8.62	12.6	361
T7	MARA	BUNDA 33	Mcharo	Mcharo	Ngr	605574	9778322	40.00 27.00	4.07 on 10/10/05	7.97	85.8	301
T8		MUSOMA 35	Nyambono	Saragana	Zv	576858	9792662	101.00 80.00	9.00 on 20/10/05	8.23	37.6	309
T9		TARIME 133	Mkoma	Raranya	Gr	622764	9866796	110.00 90.00	12.58 on 14/11/05	8.21	43.0	325
T10		SERENGETI 67	Kibanchabancha	Kebancha	B	673869	9813480	118.00 —	Dry hole			

[*1] Gr: Lower granite group
GrU: Upper granite group
B: Bukoban system (sedimentary rock unites)
Zv: Basic metavolcanics (Metabasite)
Ngr: Alluvium (talus and lateritic soils derived from granitic rocks)
N: Alluvium (Neogene superficies sand, gravel, silt and gray soils))

[*2] upper: drilling depth, lower: well depth

5.2 The Result of Test Well Drilling

5.2.1 Hydrogeologic Features

The test drilling point in each village, and geology and well structure of the test drilling wells are shown in Data Book Chapter 4.

Groundwater intake screens were installed at the horizon of the aquifer for each test drilling hole. Table 5.2-1 shows the results.

a. T1 (Busongo village: Misungwi 25)

The upper granite group including parts of weathered rock, and talus deposits are distributed in this village.

- **Geology**

  GL-0m – 1.5m: Top soil
  GL-1.5m – 7.0m: Strongly weathered granite
  GL-7.0m – 9.0m: Weathered granite
  GL-9.0m – 26.0m: Weakly fissured granite
  GL-26.0m – 32.0m: Weathered granite
  GL-32.0m – 41.0m: Weakly weathered granite
  GL-41.0m – 46.0m: Weathered granite
  GL-46.0m – 50.0m: Weakly weathered granite

- **Geophysical logging**

  Firstly, the contractor conducted geophysical logging by using the OYO GEOLOGGER 3030 MARK-2. However correct data could not be obtained because the probe and/or measuring module were broken.

  As an alternative, the contractor then tried to measure the normal resistivity by using geophysical survey tools (ABEM TERRAMETER SAS300B). However, doubt remains over the credibility of the data because the output voltage was small.

- **Screen position**

  It is difficult to refer to the results of the geophysical logging due to the above-mentioned reasons. The position of the screen was, therefore, decided based on the observation of the cutting and the changes in the volume of water under drilling.

  GL-27.44m – 30.26m
  GL-35.90m – 47.18m

- **Static water level**

  GL-14.10m on September 29th, 2005

b. T2 (Busekeseke village: Sengerema 83)

The lower granite group including parts of weathered rock is mainly distributed in this village. Quaternary deposits rest thinly on granitic rocks around the lowlands.

- **Geology**

  GL-0m – 3.5m: Top soil
  GL-3.51.5m – 7.0m: Strongly weathered granite
  GL-7.0m – 26.5m: Weathered granite

GL-26.5m – 52.5m: Weathered granite that fissure exists in part
GL-52.5m – 59.5m: Weathered granite
GL-59.5m – 63.5m: Weakly weathered granite
GL-63.5m – 68.5m: Weathered granite
GL-68.5m – 76.0m: Weakly weathered granite

A boundary is made at 68.5m, and the kind of granite is different above and below that depth.

- **Geophysical logging**

Logging was carried out by using OYO McOHM-EL (electrical prospecting function: the reason for using this function is described in the next section).

Long normal was not able to acquire an appropriate value though short normal showed the result of reflecting the layer.

- **Screen position**

The target position is the weathered part of granite ranging in depth from 63.5m to 68.5m.

GL-63.12m – 69.04m

- **Static water level**

GL-1.00m on October 21st, 2005

c. T3 (Nyamatala village: Kwimba 69)

This village is located where the geological features are the boundary of the lower and upper granite groups, and alluvium (talus and lateritic soils derived from granitic rocks).

- **Geology**

GL-0m – 4.5m: Top soil - laterite
GL-4.5m – 7.5m: Strongly weathered granite
GL-7.5m – 46.5m: Weathered granite
GL-46.5m – 61.0m: Weakly weathered granite

A boundary is made at 46.5m, and the kind of granite is different above and below that depth.

- **Geophysical logging**

First, the contractor conducted geophysical logging by using the well logging function of the OYO McOHM-EL. However, there were discrepancies between the measurement value on the display and the value that is recorded in this equipment. Therefore logging was done by using the function of the electrical prospecting.

- **Screen position**

The position of the screen was decided based on the result of logging, the observation of the cutting and the change in volume of water under drilling. The screen was installed in the part where the fracture developed in relatively hard granite.

GL-37.16m – 46.04m

- **Static water level**

GL-8.84m on October 7th, 2005

d. T4 (Igekemaja village: Magu 37)

The late granite group is distributed in this village.

- **Geology**

GL-0m – 2.5m: Top soil
GL-2.5m – 11.5m: Strongly weathered granite
GL-11.5m – 16.5m: Weathered granite
GL-16.5m – 41.5m: Weakly weathered granite
GL-41.5m – 43.5m: Weathered granite
GL-43.5m – 50.0m: Weakly weathered granite
GL-50.0m – 53.5m: Weakly fissured granite
GL-53.5m – 59.5m: Weakly weathered granite
GL-59.5m – 63.5m: Weakly fissured granite
GL-63.5m – 78.0m: Weathered granite

- **Geophysical logging**

The contractor measured the normal resistivity by using geophysical survey tools (ABEM TERRAMETER SAS300B). However, doubt remains over the credibility of the data because the output voltage is small.

- **Screen position**

It is difficult to refer to the result of the geophysical logging due to the above-mentioned reasons. The position of the screen was, therefore, decided based on the observation of the cutting and the change in volume of water under drilling.

As a result, screen positions were designed from 49.58m to 55.22m and from 58.04m to 63.68m respectively. However, caving of the borehole wall occurred while working. Due to the low level of technique by the contractor, protection was incomplete. As an alternative, the screen was installed at the following position.

GL-35.52m – 41.44m
GL-44.40m – 50.32m

- **Static water level**

GL-5.49m on October 3rd, 2005

e. T5 (Ikina village: Geita 27)

The upper granite group including parts of weakly weathered rock is mainly distributed in this village. Quaternary deposits rest thinly on granitic rocks around the lowlands.

- **Geology**

GL-0m – 2.5m: Top soil
GL-2.5m – 5.5m: Rudaceous sand (Alluvium)
GL-5.5m – 8.5m: Weakly weathered granite
GL-8.5m – 23.5m: Weakly weathered massive granite
GL-23.5m – 31.5m: Weakly weathered granite
GL-31.5m – 37.5m: Weakly weathered massive granite
GL-37.5m – 41.5m: Weakly weathered granite
GL-41.5m – 43.5m: Weakly weathered massive granite
GL-43.5m – 52.5m: Weakly weathered granite
GL-52.5m – 63.5m: Weakly weathered massive granite

GL-63.5m – 65.5m: Weakly weathered granite
GL-65.5m – 68.5m: Weakly weathered massive granite
GL-68.5m – 70.5m: Weakly weathered granite
GL-70.5m – 74.5m: Weakly weathered massive granite
GL-74.5m – 76.5m: Weakly weathered granite
GL-76.5m – 80.0m: Weakly weathered massive granite

- **Geophysical logging**

Logging was carried out by using OYO McOHM-EL (electrical prospecting function).

- **Screen position**

The target position is the weakly weathered part of granite (not massive granite) ranging in depth from 63.5m to 76.5m.

GL-62.24m – 71.12m
GL-74.08m – 77.04m

- **Static water level**

GL-1.30m on October 15th, 2005

f. T6 (Buhima village: Ukerewe 73)

The lower granite group including parts of weakly weathered rock is mainly distributed in this village. Talus deposits rest relatively thickly on the granitic rocks.

- **Geology**

GL-0m – 5.5m: Top soil
GL-5.5m – 15.5m: Rudaceous sand (talus deposits)
GL-15.5m – 22.5m: Weathered granite
GL-22.5m – 25.5m: Weakly weathered granite
GL-25.5m – 26.5m: Weakly weathered granite with micro fissure
GL-26.5m – 32.5m: Weakly weathered granite
GL-32.5m – 37.5m: Weakly weathered granite with micro fissure
GL-37.5m – 41.5m: Weakly weathered granite
GL-41.5m – 77.5m: Weakly weathered granite with micro fissure
GL-77.5m – 86.0m: Weakly weathered granite

- **Geophysical logging**

Logging was carried out by using OYO McOHM-EL (electrical prospecting function).

- **Screen position**

The target position is the weakly weathered and micro fissured parts ranging in depth from 77.0m to 84.5m, based on the observation of the cutting and the change in the volume of water under drilling.

GL-77.12m – 83.04m

- **Static water level**

GL-9.23m on November 9th, 2005

g. T7 (Mcharo village: Bunda 33)

This village is located where the geological features are the boundary of the lower granite group and alluvium (talus and lateritic soils derived from granitic rocks).

- **Geology**

  GL-0m – 2.5m: Top soil
  GL-2.5m – 5.5m: Rudaceous sand
  GL-5.5m – 20.5m: Rudaceous sand (arkose)
  GL-20.5m – 40.0m: Rudaceous sand (arkose) intercalated thin silt layer

- **Geophysical logging**

  Logging was carried out by using OYO McOHM-EL (electrical prospecting function).

  The value of electric logging is small. It is presumed that this value indicates the resistivity value not of the formation but of muddy water.

- **Screen position**

  Screen positions were designed from 28.16m to 37.04 in depth. However, caving in of the borehole wall occurred while working. Due to the low level of technique by the contractor, protection was incomplete. As an alternative, the screen was installed at the following position.

  GL-21.08m – 24.04m

- **Static water level**

  GL-2.96m on October 10th, 2005

h. T8 (Saragana village: Musoma 35)

This village is located where the geological features are the boundary of the Nyanzan system (basic metavolcanics and metabasite) and alluvium (Neogene superficial sand, gravel, silt and gray soils)).

- **Geology**

  GL-0m – 3.5m: Top soil
  GL-3.5m – 5.5m: Strongly weathered metabasite
  GL-5.5m – 8.5m: Weathered metabasite
  GL-8.5m – 24.5m: Fissured metabasite
  GL-24.5m – 27.5m: Weathered metabasite
  GL-27.5m – 33.5m: Fissured metabasite
  GL-33.5m – 38.5m: Weathered metabasite
  GL-38.5m – 41.5m: Micro fissured metabasite
  GL-41.5m – 47.5m: Weathered metabasite
  GL-47.5m – 50.5m: Micro fissured metabasite
  GL-50.5m – 68.5m: Weathered metabasite with fissure
  GL-68.5m – 70.5m: Micro fissured metabasite
  GL-70.5m – 71.5m: Weakly weathered metabasite
  GL-71.5m – 74.5m: Weathered metabasite
  GL-74.5m – 75.5m: Weakly weathered metabasite
  GL-75.5m – 79.5m: Micro fissured metabasite
  GL-79.5m – 81.5m: Weathered metabasite
  GL-81.5m – 92.5m: Fissured metabasite with quartz vein (missing water)

GL-92.5m – 94.5m: Weathered metabasite
GL-94.5m – 96.5m: Fissured metabasite with quartz vein
GL-96.5m – 100.0m: Weathered metabasite
GL-100.0m – 101.0m: Micro fissured metabasite

- **Geophysical logging**

Logging was carried out by using OYO McOHM-EL (electrical prospecting function).

Long normal was not able to acquire an appropriate value although short normal showed the result of reflecting the layer.

- **Screen position**

Water was missing from the fractures with quartz vein that are distributed deeper than 81.5m. Therefore, the target position is the micro fissured parts ranging in depth from 68.5m to 79.5m

GL-65.20m – 77.04m

- **Static water level**

GL-9.00m on October 23rd, 2005

i. T9 (Raranya village: Tarime 133)

The lower granite group including parts of weakly weathered rock is distributed in this village.

- **Geology**

GL-0m – 5.5m: Top soil
GL-5.5m – 12.5m: Strongly weathered granite
GL-12.5m – 22.5m: Micro fissured granite
GL-22.5m – 26.5m: Weakly weathered granite
GL-26.5m – 30.5m: Micro fissured granite
GL-30.5m – 34.5m: Weakly weathered granite
GL-34.5m – 40.5m: Micro fissured granite
GL-40.5m – 43.5m: Weakly weathered granite
GL-43.5m – 46.5m: Micro fissured granite
GL-46.5m – 49.5m: Weakly weathered granite
GL-49.5m – 56.5m: Weathered granite
GL-56.5m – 61.5m: Micro fissured granite
GL-61.5m – 110.0m: Weakly weathered granite with partially micro fissured rock

- **Geophysical logging**

Logging was carried out by using OYO McOHM-EL (electrical prospecting function). As the groundwater level was low, the measurement was conducted only near the bottom of the well.

- **Screen position**

The groundwater level was GL-78.30m when drilling was done up to 90m. Afterwards, the groundwater ran away while drilling was continued. Therefore, the hole deeper than 90m was refilled and the screen was installed in the upper part of refilling.

GL-81.12m – 87.04m

- **Static water level**

  GL-12.58m on November 14th, 2005

j. T10 (Kebancha village: Serengeti 67)

The Bukoban system is distributed in this village. It comprises mainly of sandstone in this area.

- **Geology**

  GL-0m – 0.5m: Top soil
  GL-0.5m – 8.5m: Relatively ferruginous sandstone (mainly hard sandstone)
  GL-8.5m – 9.5m: Silt
  GL-9.5m – 17.5m: Relatively ferruginous sandstone (mainly hard sandstone)
  GL-17.5m – 35.5m: Relatively ferruginous soft sandstone
  GL-35.5m – 44.5m: Relatively ferruginous hard sandstone
  GL-44.5m – 52.5m: Relatively ferruginous sandstone composed of soft and hard stones
  GL-52.5m – 64.5m: Relatively ferruginous sandstone (mainly soft sandstone)
  GL-64.5m – 71.5m: Relatively ferruginous hard sandstone
  GL-71.5m – 75.5m: Relatively ferruginous soft sandstone
  GL-75.5m – 82.5m: Relatively ferruginous hard sandstone
  GL-82.5m – 88.5m: Relatively ferruginous soft sandstone
  GL-88.5m – 102.5m: Alternating beds of relatively ferruginous hard and soft sandstones
  GL-102.5m – 118.0m: Relatively ferruginous soft sandstone

- **Geophysical logging**

Geophysical logging was not conducted because of dry hole.

- **Screen position**

The casing and screens were not installed because of dry hole.

- **Static water level**

  Dry hole

Table 5.2-1: Screen Installed Horizon of Test Wells

Test Drilling Site					Main Screen Position		Yield (Q) (L/min.)
No.	Region	District and No. by district	Ward	Village	Depth (GL-m)	Horizon	
T1	MWANZA	MISUNGWI 25	Busongo	Busongo	27.44 - 30.26, 35.90 - 47.18	GrU (Weathered granite)	50
T2		SENGERENA 83	Kalebezo	Busekeseke	63.12 - 69.04	Gr (Weathered – weakly weathered granite)	less than 8
T3		KWIMBA 69	Nugulla	Nyamatala	37.16 - 46.04	Gr/GrU (The part where the fissure developed in relatively hard granite)	less than 5
T4		MAGU 37	Kisesa	Igekemaja	35.52 - 41.44, 44.40 - 50.32	Gr (Weathered granite, originally weakly fissured granite was selected)	less than 5
T5		GEITA 27	Bukoli	Ikina	62.24 - 71.12, 74.08 - 77.04	GrU (Weakly weathered granite)	15
T6		UKEREWE 73	Ndulima	Buhima	77.12 - 83.04	Gr (Weakly weathered granite)	less than 2
T7	MARA	BUNDA 33	Mcharo	Mcharo	21.08 - 24.04	Ngr (Coarse sand (arkose))	83
T8		MUSOMA 35	Nyambono	Saragana	65.20 - 77.04	Zv (Microfissured and weathered metabasite)	50
T9		TARIME 133	Mkoma	Raranya	81.12 – 87.04	Gr (Weakly weathered granite)	3
T10		SERENGETI 67	Kibanchabancha	Kebancha	Dry hole		

Gr: Lower granite group, GrU: Upper granite group, B: Bukoban system, (sedimentary rock unites), Zv: Basic metavolcanics (Metabasite),
Ngr: Alluvium (talus and lateritic soils derived from granitic rocks)

5.3 Pumping Test

The Pumping test was not executed at T10 (Kebancha) because of dry hole.

5.3.1 Step-Drawdown Test

The step drawdown test is conducted according to five (5) steps in increasing pumping rate and five (5) steps decreasing pumping rate. The duration of each step is three (3) hours.

However, this test was discontinued in the following three sites where the drawdown was big although the output of the submerged pump was minimized:

T2 (Busekeseke), T3 (Nyamatala), T6 (Buhima)

In addition, because the drawdown is large and a breakdown of the measuring tool occurred, the test was discontinued in the following site:

T1 (Busongo)

The specific capacity value of each step was obtained from the test, and then the aquifer loss coefficient (B) and well loss coefficient (C) were computed. The well efficiency of each pumping step was also calculated.

The graphical interpretations of the step-drawdown test are presented in Data Book Chapter 4.

5.3.2 Continuous Pumping Test and Recovery Test

The continuous drawdown test was continued for forty-eight (48) hours. The pumping rate was directed by the drilling supervisor of the Study team based on the step drawdown test. After the continuous drawdown test, the recovery of water level was measured for twenty-four (24) hours.

However, this test was discontinued in the following four sites where the drawdown was big:

T1 (Busongo), T2 (Busekeseke), T3 (Nyamatala), T4 (Igekemaja), T6 (Buhima)

The results of the continuous pumping test and recovery test are summarized in Table 5.3-2. The values of transmissivity (coefficient of transmissibility) were obtained by the Cooper-Jacob Method and the Recovery Method. The values of storativity (storage coefficient) were obtained by the Cooper-Jacob Method.

The graphical interpretation of the continuous pumping test (Cooper-Jacob method) and recovery test (Recovery method) are presented in Data Book Chapter 4.

On this occasion, the wells where the groundwater is produced from a fracture of the bedrock are the majority (T7 (Mucharo) is excluded). Therefore, a lot of wells are outside the coverage of the above-mentioned equations.

The data sheet of the pumping test is attached in Data Book Chapter 4.

Table 5.3-1: Summary of Step-Drawdown Pumping Test

Test Well NO.	Village	Drilling Depth (m)	Well Depth (m)	Screen Length (m)	Screen Depths (m)	Aquifer Type *1	Date (dd/mm/yy)	Static Water Level (m)	Step-1	Step-2	Step-3	Step-4	Step-5	Step-6	Step-7	Step-8	Step-9	Aquifer Loss Coefficient $B(h/m^2)$	Well Loss Coefficient $C(h^2/m^5)$	Average Well Efficiency (%)
									$Q_1(m^3/h)$ $S_1(m)$ $Sc_1(m^2/h)$ $Ew_1(\%)$	$Q_2(m^3/h)$ $S_2(m)$ $Sc_2(m^2/h)$ $Ew_2(\%)$	$Q_3(m^3/h)$ $S_3(m)$ $Sc_3(m^2/h)$ $Ew_3(\%)$	$Q_4(m^3/h)$ $S_4(m)$ $Sc_4(m^2/h)$ $Ew_4(\%)$	$Q_5(m^3/h)$ $S_5(m)$ $Sc_5(m^2/h)$ $Ew_5(\%)$	$Q_6(m^3/h)$ $S_6(m)$ $Sc_6(m^2/h)$ $Ew_6(\%)$	$Q_7(m^3/h)$ $S_7(m)$ $Sc_7(m^2/h)$ $Ew_7(\%)$	$Q_8(m^3/h)$ $S_8(m)$ $Sc_8(m^2/h)$ $Ew_8(\%)$	$Q_9(m^3/h)$ $S_9(m)$ $Sc_9(m^2/h)$ $Ew_9(\%)$			
T1	Busongo	50.00	50.00	14.10	27.44 – 30.26 35.90 – 47.18	Type-2 (weathering)	29/09/05 - 30/09/05	7.83	6.00 17.03 0.352 221.4	7.00 27.53 0.254 159.8	5.00 27.53 0.254 159.8	4.50 20.78 0.227 143.0	4.00 17.73 0.226 141.8	3.50 15.63 0.224 140.7	3.00 14.73 0.204 128.0	2.50 14.14 0.177 111.1	-	6.29×10^{-3}	-4.23×10^{-7}	147.8
T2	Busekeseke	76.00	72.00	5.92	63.12 – 69.04	Type-3 (weathering)	19/10/05 - 20/10/05	1.00	0.48 15.30 0.031 -7.6	0.60 29.75 0.020 -4.3	0.70 37.53 0.019 -4.5	0.80 47.00 0.017 -4.1	0.90 58.00 0.016 -3.8	0.80 55.76 0.014 -3.5	-	-	-	-2.43	8.00×10^{1}	-4.7
T3	Nyamatala	61.00	49.00	8.88	37.16 – 46.04	Type-3 (weathering)	07/10/05	8.84	0.30 15.10 0.020 -1432.3	0.32 32.56 0.610 -708.5	-	-	-	-	-	-	-	-	-	-
T4	Igekemaja	78.00	53.28	11.84	35.52 – 41.44 44.40 – 50.32	Type-4 (weathering)	03/10/05 - 04/10/05	5.28	0.33 15.94 0.021 -571.1	0.34 19.43 0.017 -483.2	0.35 21.85 0.015 -423.0	0.36 28.26 0.013 -351.8	0.37 32.07 0.012 -318.6	0.36 28.84 0.012 -344.7	0.35 27.50 0.013 -351.5	0.34 25.65 0.013 -366.1	0.33 25.51 0.013 -357.2	2.76×10^{2}	9.81×10^{2}	-396.4
T5	Ikina	80.00	80.00	11.84	62.24 – 71.12 74.08 – 77.04	Type-3 (weathering)	15/10/05 - 16/10/05	1.30	0.60 1.39 0.432 -841.7	0.90 4.57 0.197 -384.0	1.20 14.46 0.083 -161.8	1.40 40.58 0.035 -67.3	1.50 48.60 0.031 -60.2	1.40 32.52 0.043 -83.9	1.20 22.38 0.054 -104.6	0.90 3.65 0.247 -480.8	0.60 2.48 0.242 -471.8	-1.95×10^{1}	3.16×10^{1}	-295.1
T6	Buhima	86.00	86.00	5.92	77.12 – 83.04	Type-2/Type-3 (weathering)	09/11/05	9.23	0.17 6.26 0.027 -1485.9	0.20 20.78 0.010 -526.6	0.22 39.67 0.006 -303.4	0.23 566.9 0.004 -222.0	-	-	-	-	-	-5.47×10^{2}	3.36×10^{3}	-634.5
T7	Mcharo	40.00	27.00	2.96	21.08 – 24.04	Type-1 (coarse sand)	10/10/05 - 11/10/05	3.77	2.00 2.92 0.685 75.3	2.50 3.84 0.651 71.6	3.50 6.28 0.557 61.3	4.00 8.53 0.469 51.5	5.00 9.67 0.517 56.8	4.00 5.07 0.789 86.7	3.50 2.56 1.367 150.3	1.20 1.60 0.750 82.4	0.90 0.80 1.125 123.7	1.10	1.98×10^{-1}	84.4
T8	Saragana	101.00	80.00	11.84	65.20 – 77.04	Type-2 (fracture and weathering)	23/10/05 - 25/10/05	9.00	1.80 2.95 0.610 32.0	2.40 4.29 0.559 29.4	3.00 5.33 0.563 29.6	4.00 8.14 0.491 25.8	5.00 14.45 0.346 18.2	4.00 7.95 0.503 26.4	3.00 5.20 0.577 30.3	2.40 3.74 0.642 33.7	1.80 1.59 1.132 59.4	5.25×10^{-1}	4.22×10^{-1}	31.6
T9	Raranya	110.00	90.00	5.92	81.12 – 87.04	Type-2/Type-3 (weathering)	14/11/05 - 15/11/05	12.58	0.18 5.42 0.033 27.2	0.20 12.58 0.016 13.0	0.23 22.07 0.010 8.5	0.30 29.66 0.010 8.3	0.48 62.71 0.008 6.3	0.30 70.61 0.004 3.5	0.23 71.03 0.003 2.6	0.20 70.87 0.003 2.3	0.17 59.05 0.003 02.4	8.18	2.72×10^{2}	8.2
T10	Kebancha	Dry hole																		

*1: Refer to the next section.

Table 5.3-2: Summary of Continuous Pumping Test and Recovery Test

Test Well NO.	Village	Drilling Depth (m)	Well Depth (m)	Screen Length (m)	Screen Depths (m)	Aquifer Type *1	Continuous Pumping Test and Recovery Test											Remarks
							Date (dd/mm/yy)	Static Water Level (m)	Pumping Rate Q (m^3/hour)	Pumping Duration (hours)	Final Drawdown s (m)	Specific Capacity Sc (m^2/day)	Cooper-Jacob Method			Recovery Method		
													T (m^2/day)	k (m/day)	S	T (m^2/day)	k (m/day)	
T1	Busongo	50.00	50.00	14.10	27.44 – 30.26 35.90 – 47.18	Type-2 (weathering)	30/09/05 - 02/10/05	8.77	3.50	24.50	26.04	3.226	1.73	1.23×10^{-1}	4.20×10^{3}	1.09	7.73×10^{-2}	Continuous pumping test was stopped before it became 48 hours, because the drawdown is too big.
T2	Busekeseke	76.00	72.00	5.92	63.12 – 69.04	Type-3 (weathering)	20/10/05 - 21/10/05	1.00	0.48	18.65	56.95	0.202	2.03×10^{-1}	3.43×10^{-2}	1.01×10^{2}	4.91×10^{-2}	8.29×10^{-3}	Continuous pumping test was stopped before it became 48 hours, because the drawdown is too big.
T3	Nyamatala	61.00	49.00	8.88	37.16 – 46.04	Type-3 (weathering)	08/10/05 - 09/10/05	9.00	0.30	7.00	32.10	0.224	5.21×10^{-2}	5.87×10^{-3}	4.63×10^{2}	1.98×10^{-2}	2.23×10^{-3}	Continuous pumping test was stopped before it became 48 hours, because the drawdown is too big.
T4	Igekemaja	78.00	53.28	11.84	35.52 – 41.44 44.40 – 50.32	Type-4 (weathering)	04/10/05 - 06/10/05	9.38	0.30	27.92	31.61	0.228	1.47×10^{-1}	2.68×10^{-2}	3.82×10^{2}	5.20×10^{-2}	9.47×10^{-3}	Continuous pumping test was stopped before it became 48 hours, because the drawdown is too big.
T5	Ikina	80.00	80.00	11.84	62.24 – 71.12 74.08 – 77.04	Type-3 (weathering)	16/10/05 - 18/10/05	1.30	0.90	48.00	40.10	0.539	1.17×10^{-1}	9.88×10^{-3}	9.78×10^{2}	1.10×10^{-1}	9.29×10^{-3}	
T6	Buhima	86.00	86.00	5.92	77.12 – 83.04	Type-2/Type-3 (weathering)	10/11/05 - 12/11/05	9.23	0.12	30.00	65.77	0.044	8.48×10^{-3}	1.43×10^{-3}	7.09×10^{2}	1.57×10^{-2}	2.69×10^{-3}	Continuous pumping test was stopped before it became 48 hours, because the drawdown is too big.
T7	Mcharo	40.00	27.00	2.96	21.08 – 24.04	Type-1 (coarse sand)	11/10/05 - 14/10/05	3.77	5.00	48.00	13.63	8.804	3.72	1.26	1.19×10^{4}	3.53	1.19	
T8	Saragana	101.00	80.00	11.84	65.20 – 77.04	Type-2 (fracture and weathering)	25/10/05 - 27/10/05	9.00	3.00	48.00	26.89	2.678	1.87	1.58×10^{-1}	3.08×10^{3}	1.00	8.45×10^{-2}	
T9	Raranya	110.00	90.00	5.92	81.12 – 87.04	Type-2/Type-3 (weathering)	15/11/05 - 18/11/05	12.58	0.20	48.00	48.77	0.098	1.08	1.83×10^{-1}	4.95×10^{3}	6.53×10^{-1}	1.10×10^{-1}	
T10	Kebancha	Dry hole																

*1: Refer to the next section.

5.4 Correlation of Well Drilling Results with Geophysical Survey

5.4.1 Resistivity Structure of Test Well Drilling Point

Concerning villages that had test borings, we used the results of layer structure analysis to make a resistivity section (see Figure 5.4-1 to Figure 5.4-10). For drilling points in these villages, we selected measurement points that indicated low resistivity. We also set a drilling depth by adding several tens of meters to the lower side depth of the low resistivity layer. It seems that low resistivity layers are chiefly made of weathered granite layers or sediments of earth and sand while the high resistivity beds beneath these beds consist of basement rock.

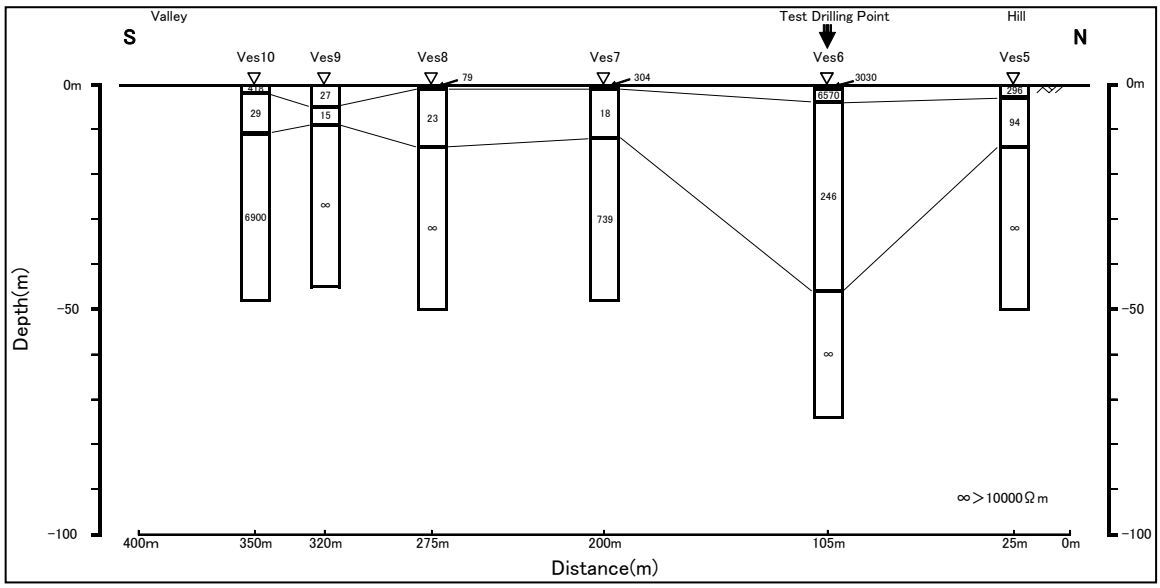


Figure 5.4-1: Resistivity Section (T1: Busongo Village)

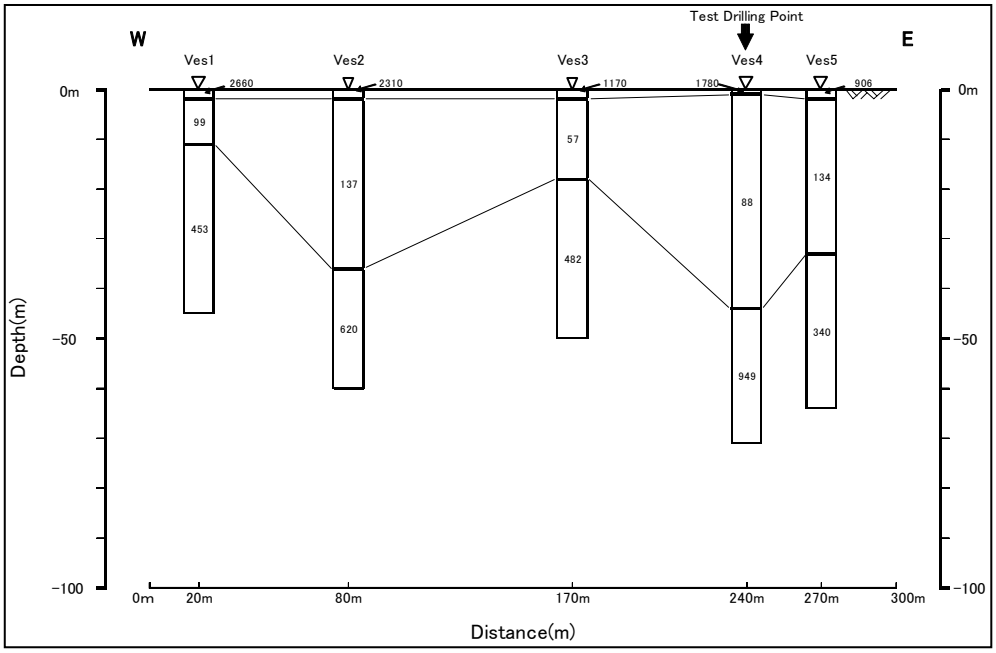


Figure 5.4-2: Resistivity Section (T2: Busekeseke Village)

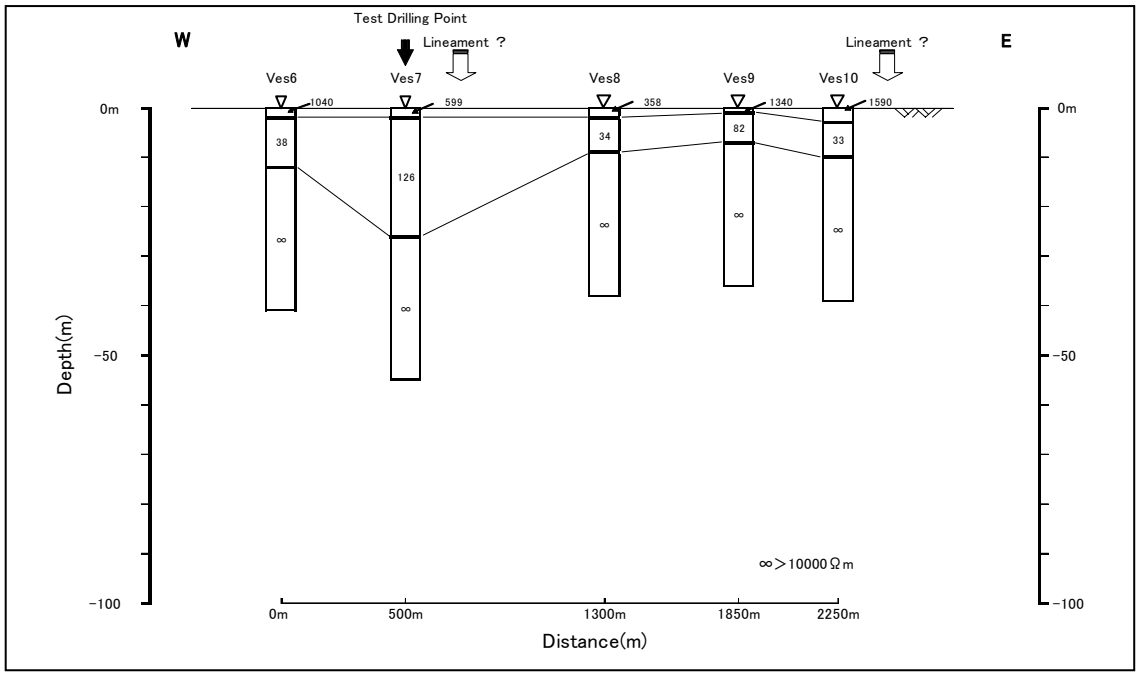


Figure 5.4-3: Resistivity Section (T3: Nyamatala Village)

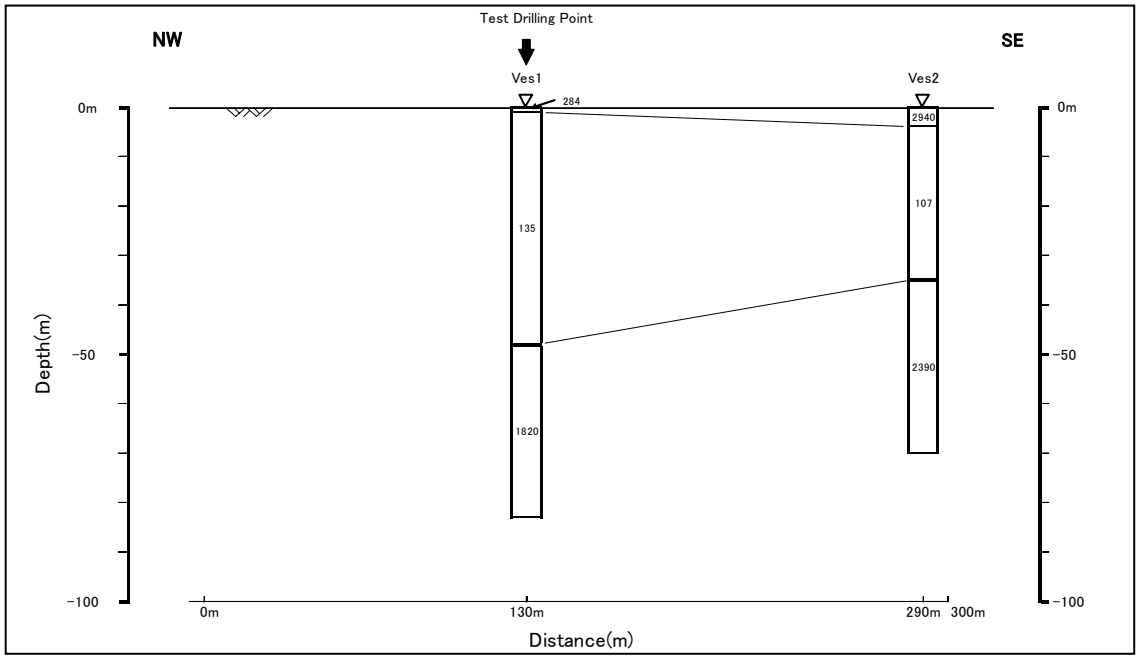


Figure 5.4-4: Resistivity Section (T4: Igekemaja Village)

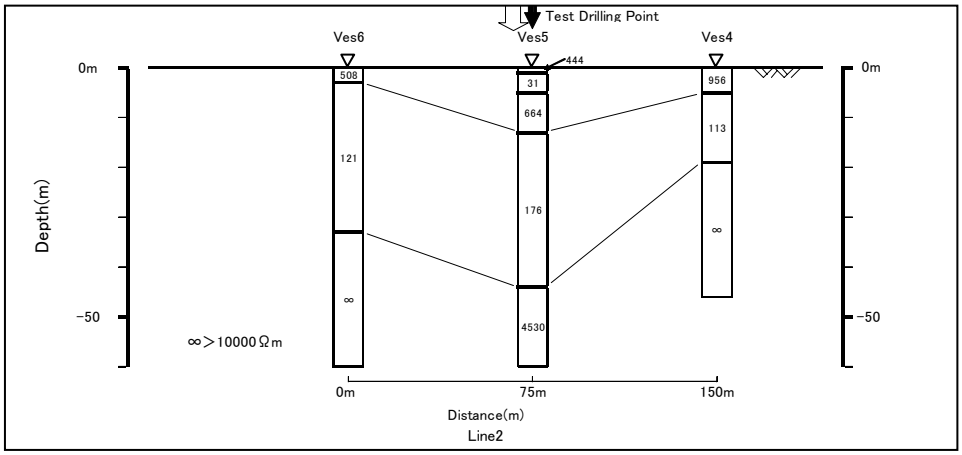


Figure 5.4-5: Resistivity Section (T5: Ikina Village)

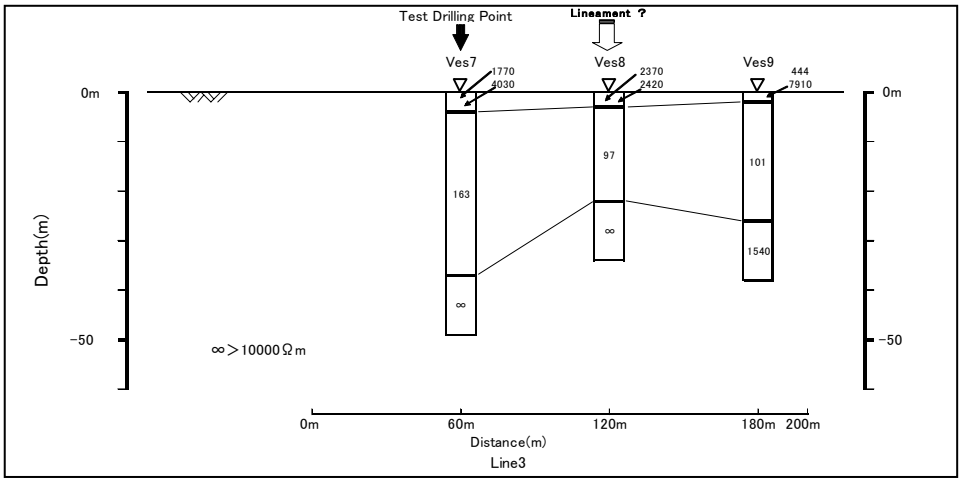


Figure 5.4-6: Resistivity Section (T6: Buhima Village)

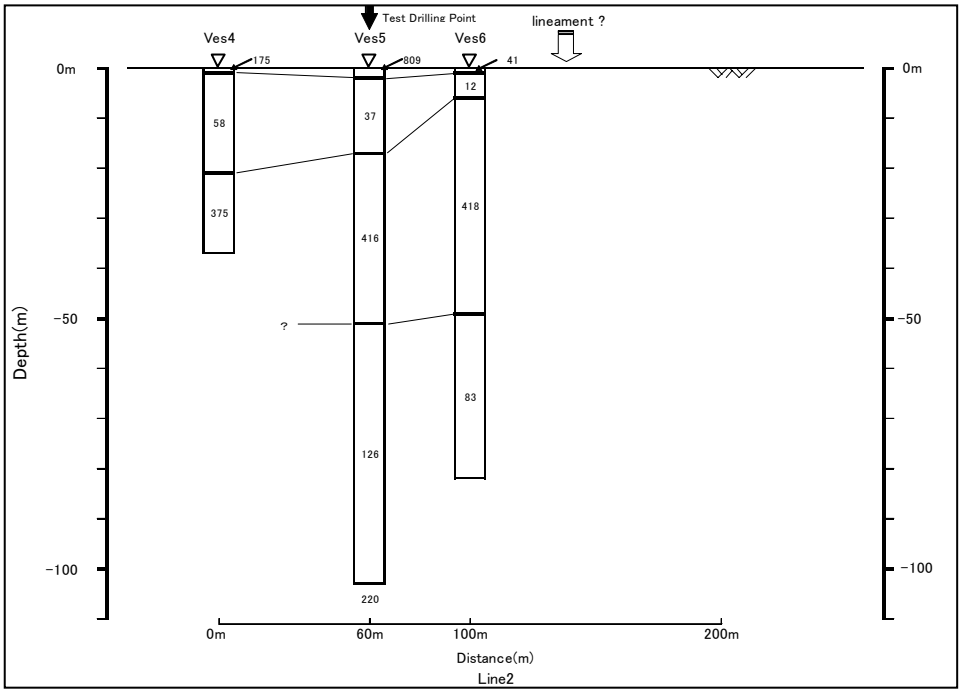


Figure 5.4-7: Resistivity Section (T7: Mcharo Village)

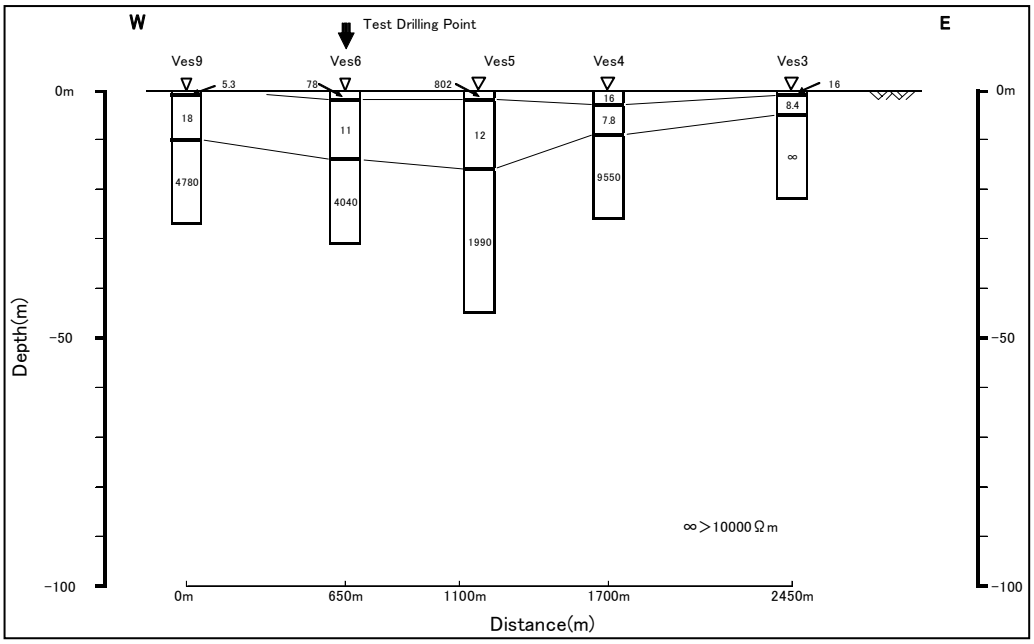


Figure 5.4-8: Resistivity Section (T8: Saragana Village)

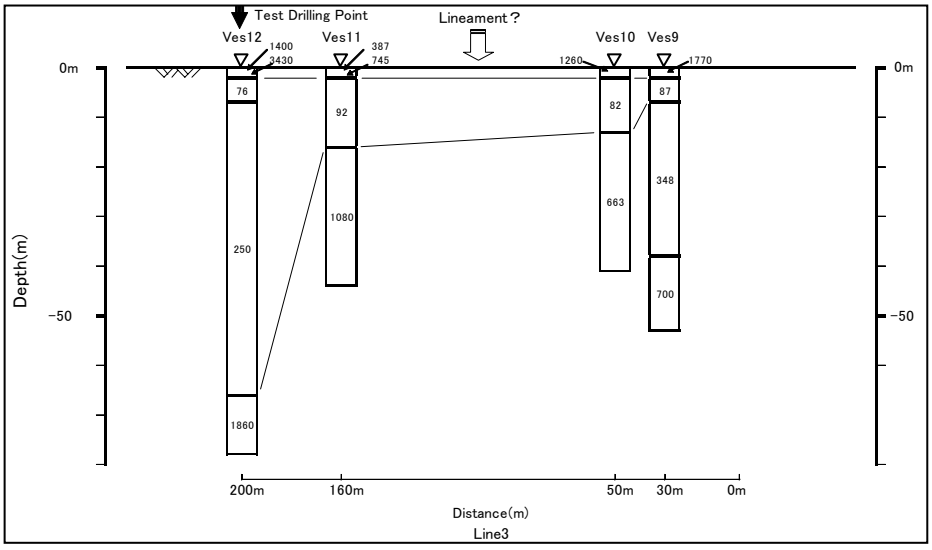


Figure 5.4-9: Resistivity Section (T9: Raranya Village)

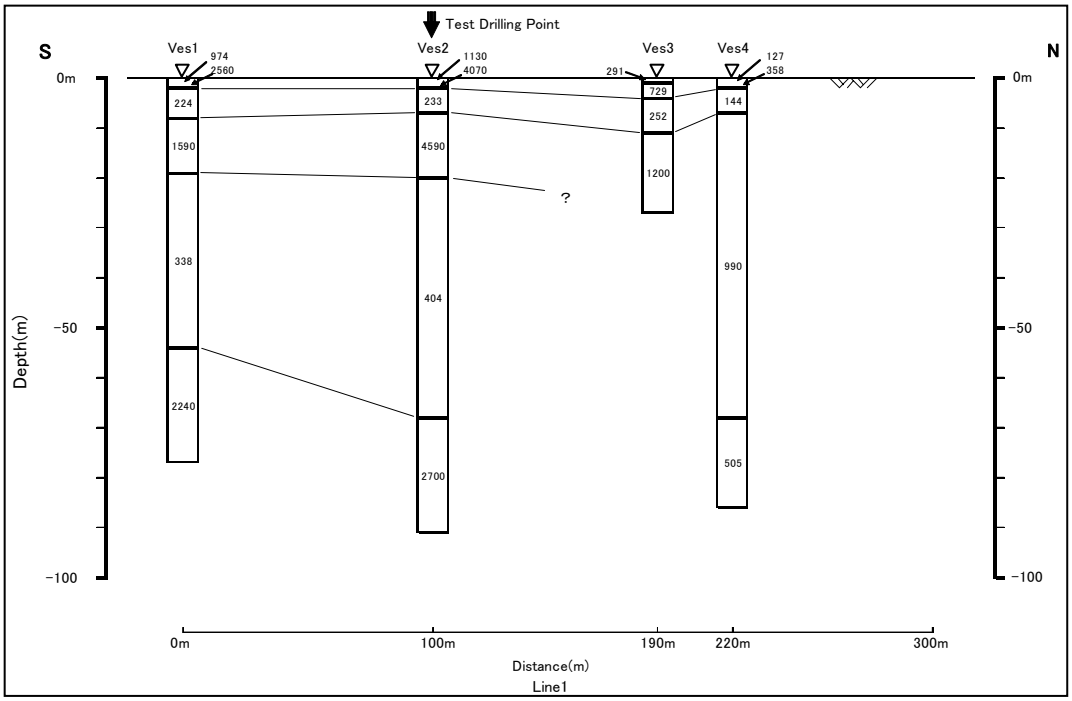


Figure 5.4-10: Resistivity Section (T10: Kebancha Village)

5.4.2 Correlation of Well Drilling Results with VES

The results of VES (vertical electric sounding) are shown in Figure 5.4-11 to Figure 5.4-20, and are compared with the results of the test well drilling.

a. T1: Busongo (Ves6 point)

The resistivity layer was divided as follows by the analysis of the vertical electric sounding.

- GL-0 to 1.0m: 3,030 Ohm-m
- GL-1.0 to 3.6m: 6,570 Ohm-m
- GL-3.6 to 46m: 246 Ohm-m
- GL-46m -: ∞ Ohm-m

The main target position in this point was assumed to be the low resistivity part up to 46m in depth according to the result of the electric sounding.

As a result of test well drilling, the following was clarified.

Weathered－weakly weathered granite with fissures is distributed from 26m to 46m in depth and relatively fresh granite is distributed deeper than 46m.

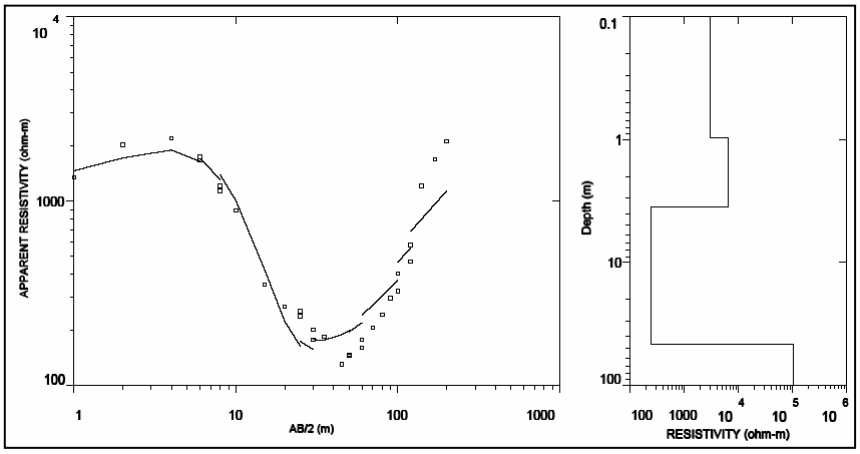


Figure 5.4-11: Result of Vertical Electric Sounding (T1: Busongo Village, Ves6 point)

b. T2: Busekeseke (Ves4 point)

The resistivity layer was divided as follows by the analysis of the vertical electric sounding in the following.

- GL-0 to 0.3m: 346 Ohm-m
- GL-0.3 to 0.9m: 1,780 Ohm-m
- GL-0.9 to 44m: 88 Ohm-m
- GL-44m -: 949 Ohm-m

The main target position in this point was assumed to be the low resistivity part up to 44m in depth, and the scattering part of the apparent resistivity value deeper than 60m, according to the result of the electric sounding.

As a result of test well drilling, the following was clarified.

Weathered granite is mainly distributed up to 52.5m in depth and relatively fresh granite (granite different from the upper part) is distributed deeper than 68.5m, and weathered and weakly weathered granites are repeatedly distributed from 52.5m to 68.5m in depth. The scattering of the resistivity value from 30m to about 60m in depth is presumed to reflect the repetition of the weathered parts.

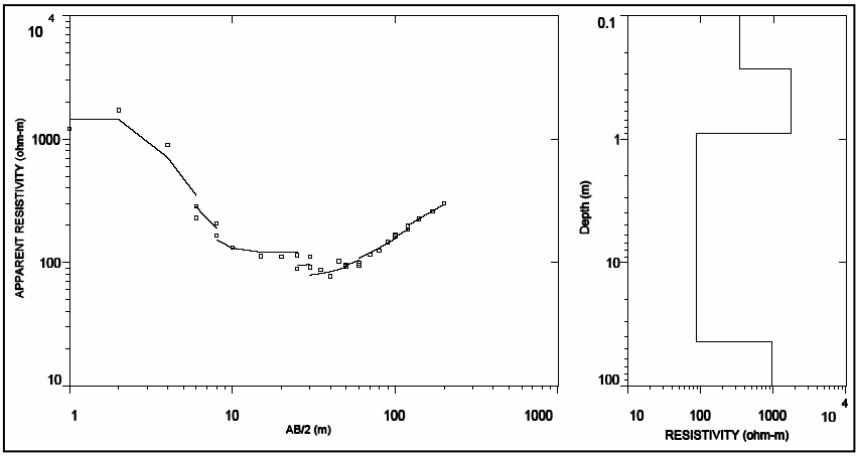


Figure 5.4-12: Result of Vertical Electric Sounding (T2: Busekeseke Village, Ves4 point)

c. T3: Nyamatala (Ves7 point)

The resistivity layer was divided as follows by the analysis of the vertical electric sounding.

- GL-0 to 2.0m: 599 Ohm-m
- GL-2.0 to 26m: 126 Ohm-m
- GL-26m -: ∞ Ohm-m

The main target position in this point was assumed to be the low resistivity part up to 26m in depth, and the scattering part of the apparent resistivity value from 50m to 60m in depth, according to the result of the electric sounding.

As a result of test well drilling, the following was clarified.

Weathered granite is mainly distributed up to 25.5m in depth and weathered–weakly weathered granites are distributed deeper than 46m. Moreover, a boundary is made at 46.5m in depth, and the type of granite is different above and below that.

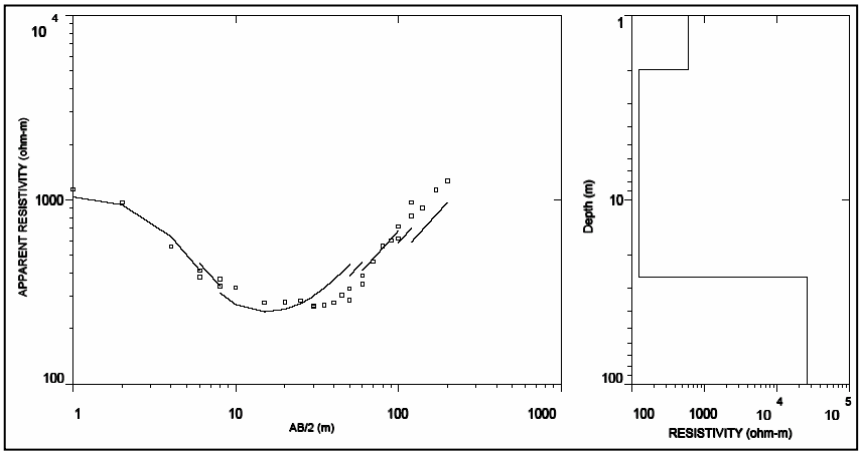


Figure 5.4-13: Result of Vertical Electric Sounding (T1: Nyamatala Village, Ves7 point)

d. T4: Igekemaja (Ves1 point)

The resistivity layer was divided as follows by the analysis of the vertical electric sounding

- GL-0 to 1.3m: 284 Ohm-m
- GL-1.3 to 48m: 135 Ohm-m
- GL-48m -: 1.820 Ohm-m

The main target position in this point was assumed to be the scattering part of the apparent resistivity value from 40m to 70m in depth, according to the result of the electric sounding.

As a result of test well drilling, the following was clarified.

Granite with fissures is distributed from 50m to 63.5m in depth.

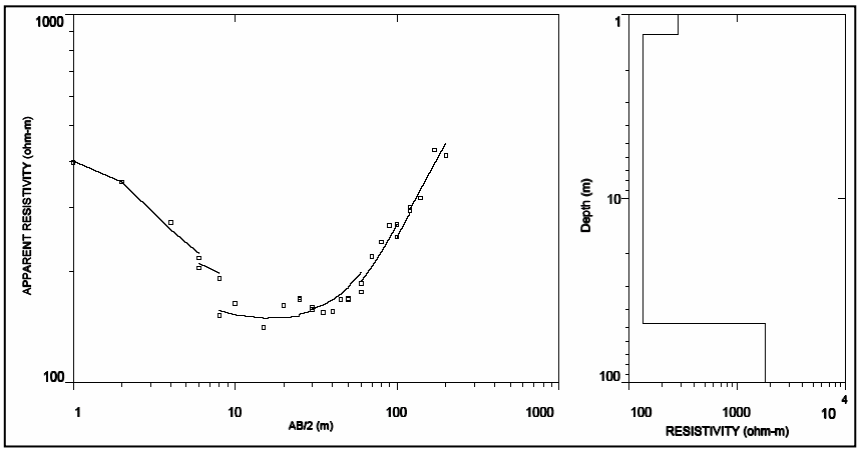


Figure 5.4-14: Result of Vertical Electric Sounding (T4: Igekemaja Village, Ves1 point)

e. T5: Ikina (Ves5 point)

The resistivity layer was divided as follows by the analysis of the vertical electric sounding:

- GL-0 to 0.4m: 91 Ohm-m
- GL-0.4 to 1.1m: 444 Ohm-m
- GL-1.1 to 3.5m: 31 Ohm-m
- GL-3.5 to 13m: 664 Ohm-m
- GL-13 to 44m: 176 Ohm-m
- GL-44m -: 4,530 Ohm-m

The main target position in this point was assumed to be the low resistivity part up to 44m in depth, and the scattering part of the apparent resistivity value up to 80m in depth, according to the result of the electric sounding.

As a result of test well drilling, the following was clarified.

Weakly weathered granite is mainly distributed from 23.5m to 52.5m in depth, and weathered and weakly weathered granites are repeatedly distributed deeper than 63.5m.

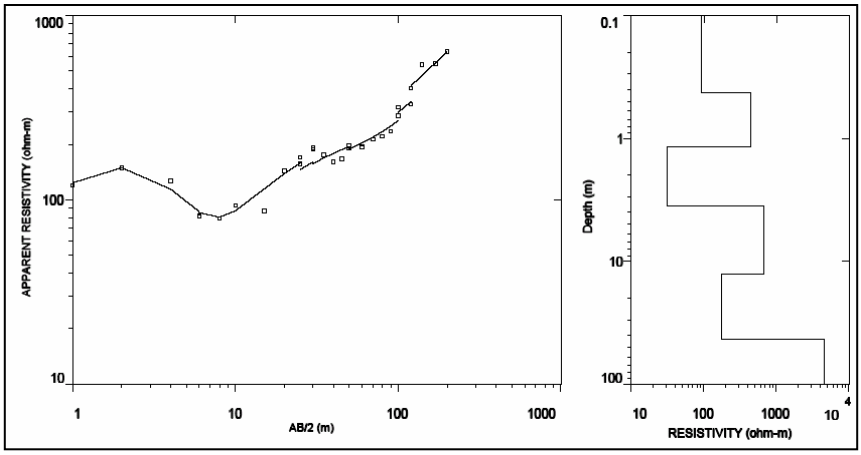


Figure 5.4-15: Result of Vertical Electric Sounding (T5: Ikina Village, Ves5 point)

f. T6: Buhima (Ves7 point)

The resistivity layer was divided as follows by the analysis of the vertical electric sounding:

- GL-0 to 0.1m: 1,770 Ohm-m
- GL-0.1 to 4.2m: 4.030 Ohm-m
- GL-4.2 to 37m: 163 Ohm-m
- GL-37m -: ∞ Ohm-m

The main target position in this point was assumed to be the low resistivity part up to 37m in depth.

As a result of test well drilling, the following was clarified.

Weakly weathered granite with micro fissures is distributed from 22.5m to 25.5m and from 32.5m to 37.5 in depth. Additionally, micro fissured granites are repeatedly distributed deeper than 41.5m.

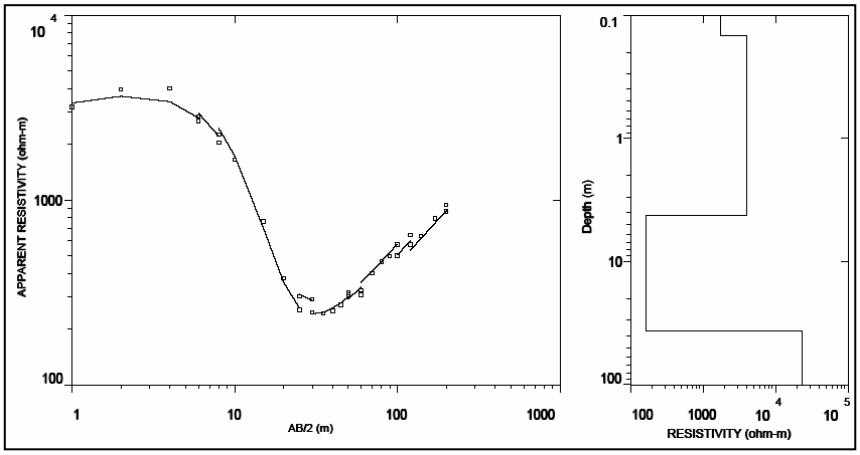


Figure 5.4-16: Result of Vertical Electric Sounding (T6: Buhima Village, Ves7 point)

g. T7: Mcharo (Ves5 point)

The resistivity layer was divided as follows by the analysis of the vertical electric sounding:

- GL-0 to 1.9m: 809 Ohm-m
- GL-1.9 to 17m: 37 Ohm-m
- GL-17 to 51m: 416 Ohm-m
- GL-51 to 103m: 126 Ohm-m
- GL-103m -: 220 Ohm-m

At first, it was assumed that granite was distributed at this point. Therefore, the main target position was the low resistivity part from 51m to 103m in depth, according to the result of the electric sounding.

As a result of test well drilling, the following was clarified.

A large amount of groundwater was produced from rudaceous sand distributed deeper than 5.5m. In addition, drilling was discontinued at 40m in depth because of the danger of caving in of the borehole.

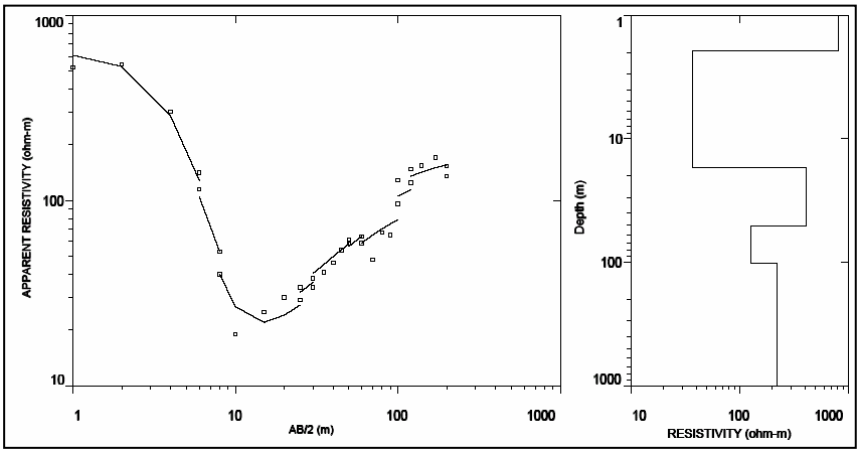


Figure 5.4-17: Result of Vertical Electric Sounding (T7: Mcharo Village, Ves5 point)

h. T8: Saragana (Ves6 point)

The resistivity layer was divided as follows by the analysis of the vertical electric sounding:

- GL-0 to 1.5m: 78 Ohm-m
- GL-1.5 to 14m: 11 Ohm-m
- GL-14m -: 4,040 Ohm-m

The main target position in this point was assumed to be the scattering part of the apparent resistivity value from 60m to 100m in depth.

As a result of test well drilling, the following was clarified.

Fractures accompanied with quartz vein are distributed from 60m to 100m in depth, and water was missing in this part. The groundwater was produced from the metabasite with micro fissures distributed from 68.5 to 79.5m in depth.

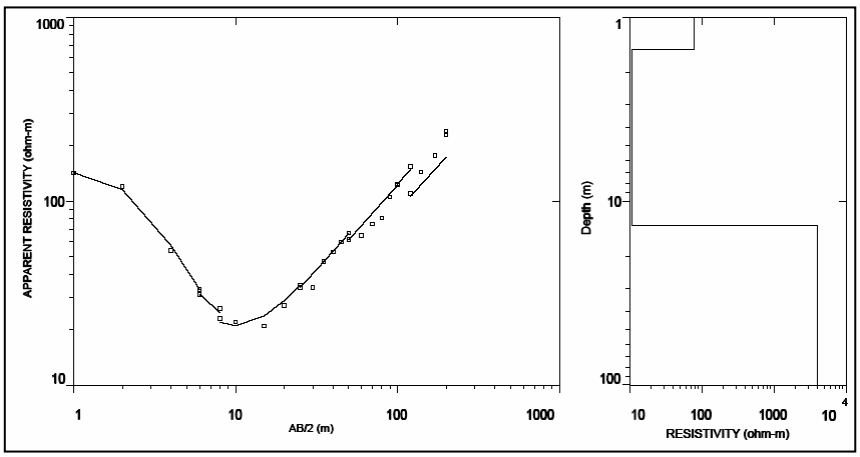


Figure 5.4-18: Result of Vertical Electric Sounding (T8: Saragana Village, Ves6 point)

i. T9: Raranya (Ves12 point)

The resistivity layer was divided as follows by the analysis of the vertical electric sounding:

- GL-0 to 0.7m: 1,400 Ohm-m
- GL-0.7 to 1.6m: 3,430 Ohm-m

- GL-1.6 to 6.4m: 76 Ohm-m
- GL-6.4 to 66m: 250 Ohm-m
- GL-66m -: 1,860 Ohm-m

The main target position in this point was assumed to be the scattering part of the apparent resistivity value from 70m to 100m in depth.

As a result of the test well drilling, the following were clarified.

Micro fissured granite is predominantly distributed up to 61.5m in depth. In contrast, massive granite without fractures is dominant deeper than 61.5m.

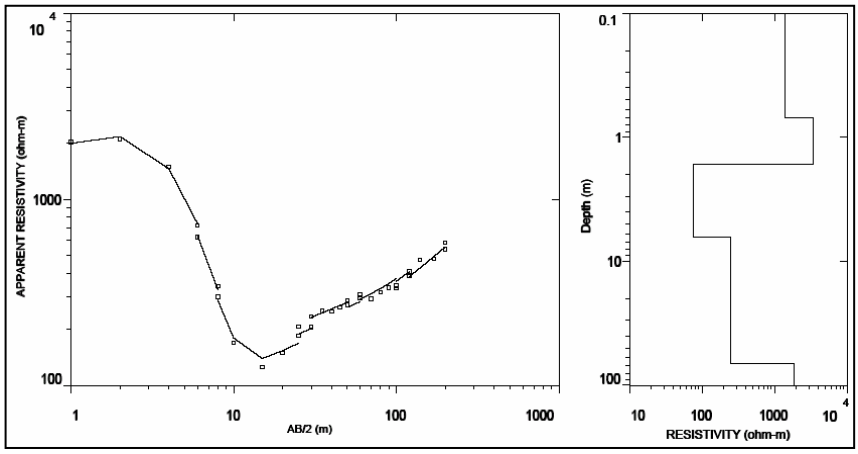


Figure 5.4-19: Result of Vertical Electric Sounding (T9: Raranya Village, Ves12 point)

j. T10: Kebancha (Ves2 point)

The resistivity layer was divided as follows by the analysis of the vertical electric sounding:

- GL-0 to 0.9 m: 1,130 Ohm-m
- GL-0.9 to 2.2 m: 4,070 Ohm-m
- GL-2.2 to 6.8 m: 233 Ohm-m
- GL-6.8 to 21 m: 4,590 Ohm-m
- GL-21 to 69 m: 404 Ohm-m
- GL-69m -: 2,700 Ohm-m

The main target position in this point was assumed to be the scattering part of the apparent resistivity value deeper than 50m.

As a result of the test drilling, the following were clarified.

Soft sandstone is predominantly distributed from 17.5m to 64.5m. Scattering of the apparent resistivity value is presumed to reflect the repetition of hard and soft sandstone.

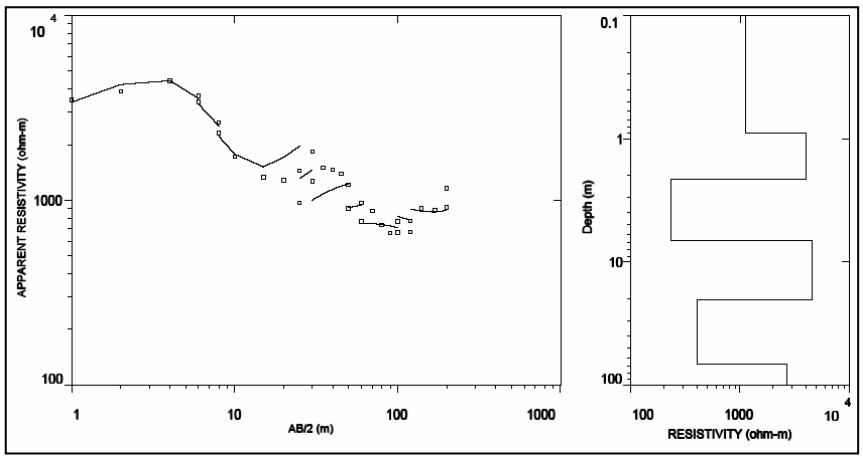


Figure 5.4-20: Result of Vertical Electric Sounding (T10: Kebancha Village, Ves2 point)

5.4.3 Guideline for the Drilling Site Selection

Table 5.4-1 shows the geological and geographical features in the test well drilling sites. Moreover, the groundwater reserve is classified as follows:

- Type-1

This is groundwater in the coarse deposits that accumulated thickly in the neighborhood of the fault and the flexure structure, etc. caused by tectonic movement. This coarse sediment is a good aquifer and the yield is rich.

- Type-2

The fracture zone often develops to the foot and neighborhood of monadnocks and outcrops (especially, quartz vein, etc.) distributed in the lineament in parallel. The yield from this fracture zone is relatively rich.

- Type-3

Though lineaments are interpreted in the aerial photograph, small valleys and/or depressions are only verified at the site. Points exist where the fracture zone develops and/or the weathered layer is thick. However, the fracture zone of this type is smaller than that of Type-2. The reserve of the groundwater is limited.

- Type-4

The region where existing wells are distributed exists, though no lineament is interpreted in the aerial photograph. The Quaternary deposits, overlying weathered and/or fissured rocks are extensively distributed. Obtaining groundwater is possible at the point where this weathered layer is thick and/or the fracture zone is distributed.

The flow for the investigation of the groundwater reserve of Type-1 to Type-4 is shown in Figure 5.4-21, and the investigation method is summarized as follows.

- Type-1
  - The geological structure that relates to the aquifer of Type-1 is large and clear. Therefore, the position of the tectonic line can be detected by the satellite image and the drawing where SRTM were processed.

- The aerial photograph interpretation of the surrounding area of the tectonic line clarified by the above-mentioned is carried out, and the point where the electric prospecting is conducted is decided.
- The point where the coarse deposits accumulated thickly is detected by using the horizontal electric profiling method and vertical electric sounding method, and this point is to be the drilling site.

- Type-2
  - The distribution of lineaments and monadnocks is identified by aerial photograph interpretation.
  - The distribution of monadnocks and outcrops is confirmed by field reconnaissance, and the point where the electric prospecting is conducted is decided.
  - In the analysis of the electric prospecting, the cross section where the observation situation of outcrops, etc. is considered is made, and the drilling site is examined.
- Type-3
  - The distribution of lineaments is identified by aerial photograph interpretation.
  - The distribution of small valleys and depressions, etc. is detected by field reconnaissance, and the point where the electric prospecting is conducted is decided. It is necessary to set the execution area of electric prospecting more widely than in the case of Type-2, because the fault and the fracture zones are often distributed more at the foot of a mountain than at the bottom of a ravine.
  - The distribution of the fracture zone, and/or the point where the weathered layer is thick are presumed based on the electric prospecting result. The drilling site is to be this presumed point.
- Type-4
  - The region where lineament is not distributed but a lot of existing wells are distributed, is clarified.
  - The geographical features (for instance, center of the small basin) around existing wells are understood by site investigation.
  - The region with geographical features similar to that of the existing well surroundings is detected, and the point where the electric prospecting (the horizontal electric profiling method[1], and vertical electric sounding method) is to be conducted is decided.
  - The distribution of the fracture zone, and/or the point where the weathered layer is thick are presumed based on the electric prospecting result. The drilling site is to be this presumed point.

[1] When the thickness of the weathered layer is determined, the horizontal method is unnecessary.

Table 5.4-1: Yield, and Geological and Geographical Features

	Type-1	Type-2		Type-3				Type-4
		monadnock and quartz vein	monadnock	gentle slope	slope	small torrent	bottom of a ravine	
Granitic rocks	–	–	T1 (Busongo) 50 l/min.	T6 (Buhima) less than 2 l/min. T9 (Raranya) 3 l/min.	T3 (Nyamatala) less than 5 l/min.	T2 (Busekeseke) less than 8 l/min.	T5 (Ikina) 15 l/min.	T4 (Igekemaja) less than 5 l/min.
Basic metavolcanics (metabasite)	–	T8 (Saragana) 50 l/min.	–	–	–	–	–	–
Bukobam (sandstone, shale and mud)	–	–	–	–	T10 (Kebancha) Dry hole	–	–	–
Alluvium (arkose)	T7 (Mcharo) 83 l/min.	–	–	–	–	–	–	–

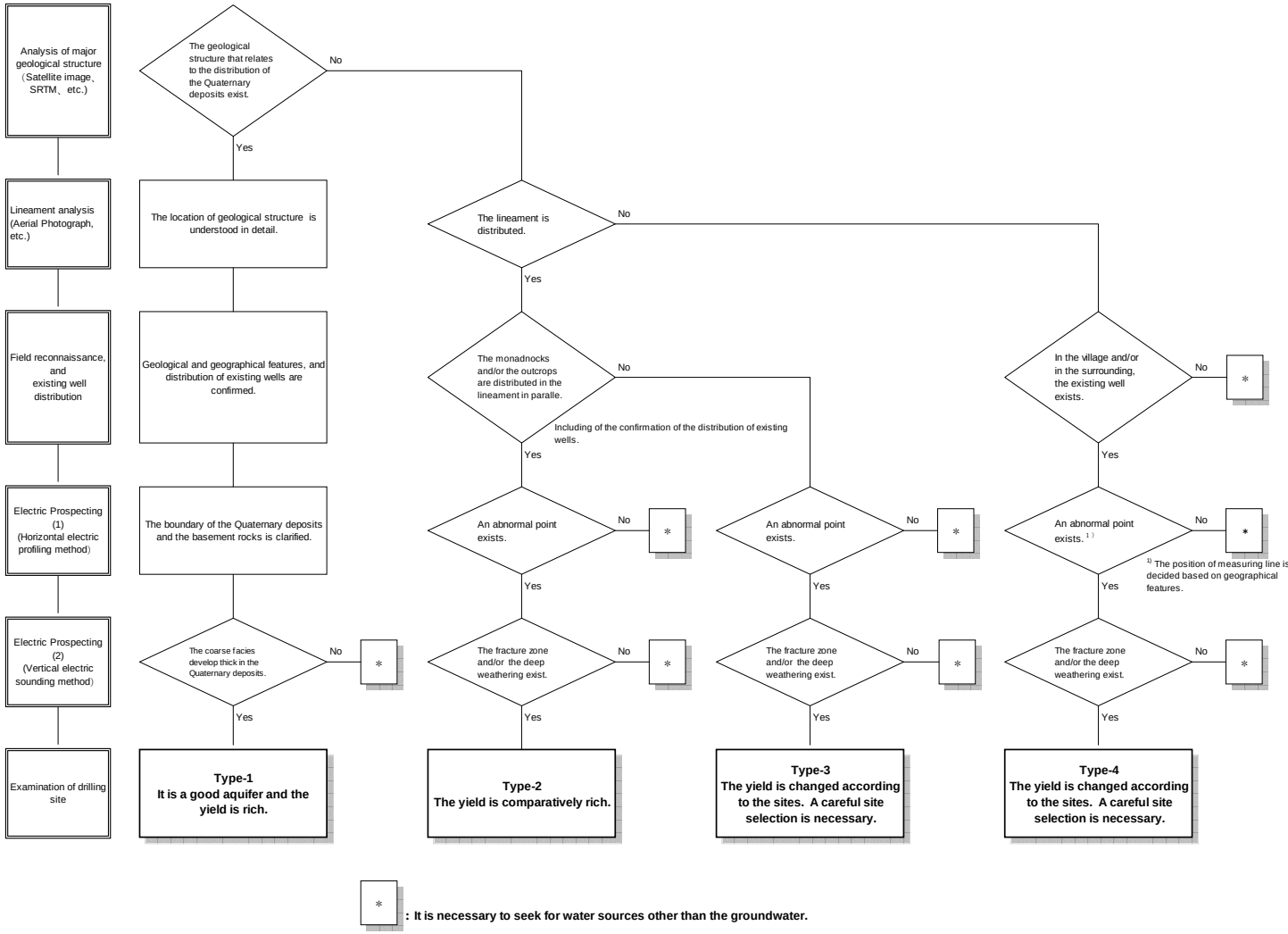


Figure 5.4-21: Investigation Flow for the Drilling Site Selection

5.5 Groundwater Level Monitoring

Groundwater level is an essential parameter not only for groundwater development planning but also for groundwater flow analysis. In general, groundwater level fluctuates over time in accordance with the balance of groundwater inflow and outflow. When the amount of groundwater inflow exceeds the amount of groundwater outflow, the groundwater level rises according to the surplus volume of water.

The depth of the groundwater level from the ground surface is particularly important for well design and pump selection. The distribution of the groundwater table provides important information on the groundwater flow system. The changes in groundwater level are also important for designing the groundwater development plan as well as for understanding the groundwater characteristics.

However, it was found that there are no groundwater monitoring wells in the Study area. As an alternative, the ten test wells drilled in the Study are being used as groundwater monitoring wells. The contents of the monitoring program are shown in the following table (Table 5.5-1). The data from the monitoring will be used for groundwater fluctuation analysis.

Table 5.5-2 shows the change in the groundwater level after the pumping test.

Table 5.5-1: Contents of Groundwater Level Monitoring

Item	Test Well
Target	Ten (10) test wells
Aim	To monitor fluctuations in groundwater level and overall water quality
Duration of groundwater level monitoring	About one year after installation
Method of groundwater level monitoring	Regular monthly monitoring using portable water level meter
Water quality testing in the field	Monthly after installation
Parameters tested in the field*	Electrical conductivity (EC), pH, oxidation-reduction potential (ORP)

*: in the case of possible of water sampling

Table 5.5-2: Results of Groundwater Monitoring

		September	October	November		December	January	February	March	April
T1	Date	29th	24th	14th		4th		19th	12th	20th
Busongo	GWL(GLm)	−7.83	−8.44	−8.24		−8.31		−8.45	−8.47	−8.18
	pH	8.50						9.15	8.11	7.27
	EC(mS/m)	96.5						94.9	93.3	89.9
	ORP(mV)	287						201	199	164
	T(℃)							26.8	27.9	27.9
T2	Date		19th	9th		3rd		23rd	28th	21st
Busekeseke	GWL(GLm)		−1.00	−0.55		−0.66		−0.87	−0.275	−0.16
	pH		7.81					8.95	8.81	7.41
	EC(mS/m)		21.1					22.1	16.8	21.5
	ORP(mV)		337					224	292	234
	T(℃)							26.1	25.0	25.8
T3	Date		7th	16th		4th		21st	14th	25th
Nyamatala	GWL(GLm)		−8.84	−8.45		−7.67		−8.59	−8.10	−8.28
	pH		7.84					8.97	8.64	8.00
	EC(mS/m)		71.5					43.0	38.0	32.4
	ORP(mV)		315					232	255	219
	T(℃)							27.3	21.8	28.5
T4	Date		3rd	14th		2nd		21st	14th	25th
Igekemaja	GWL(GLm)		−5.28	−4.92		−4.90		−4.49	−4.49	−4.39
	pH		7.87					8.91	8.57	7.67
	EC(mS/m)		33.2					31.2	30.2	35.2
	ORP(mV)		327					210	219	210
	T(℃)							27.6	27.0	27.3
T5	Date		15th	9th		3rd		24th	30th	24th
Ikina	GWL(GLm)		−1.30	−0.66		−0.98		−0.77	−0.65	−0.46
	pH		7.69					8.51	8.45	7.40
	EC(mS/m)		22.0					29.1	38.6	40.6
	ORP(mV)		328					157	14	177
	T(℃)							24.9	24.3	25.3
T6	Date			9th		5th		26th	20th	24th
Buhima	GWL(GLm)			−9.23		−9.02		−9.26	−8.04	−8.33
	pH			8.62				8.29	8.14	8.69
	EC(mS/m)			12.6				10.2	5.8	29.8
	ORP(mV)			361				220	279	191
	T(℃)							26.0	24.7	25.4
T7	Date		10th	9th	30th			25th	18th	26th
Mcharo	GWL(GLm)		−3.77	−3.55	−3.10			−3.97	−3.72	−3.12
	pH		7.97					8.06	8.21	7.52
	EC(mS/m)		85.8					98.3	96.0	931
	ORP(mV)		301					215	226	235
	T(℃)							25.8	25.3	27.7
T8	Date		21st	9th		1st		25th	18th	26th
Saragana	GWL(GLm)		−9.00	−8.48		−8.40		−8.85	−8.905	−8.82
	pH		8.23					7.92	8.03	6.95
	EC(mS/m)		37.6					77.6	76.2	733
	ORP(mV)		309					189	188	200
	T(℃)							25.9	26.3	26.2
T9	Date			14th		1st		24th	19th	25th
Raranya	GWL(GLm)			−12.58		−10.00		−10.19	−10.17	−10.14
	pH			8.21				6.29	7.92	6.72
	EC(mS/m)			43.0				20.2	30.2	154.4
	ORP(mV)			325				20	35	23
	T(℃)							25.6	25.5	28.3

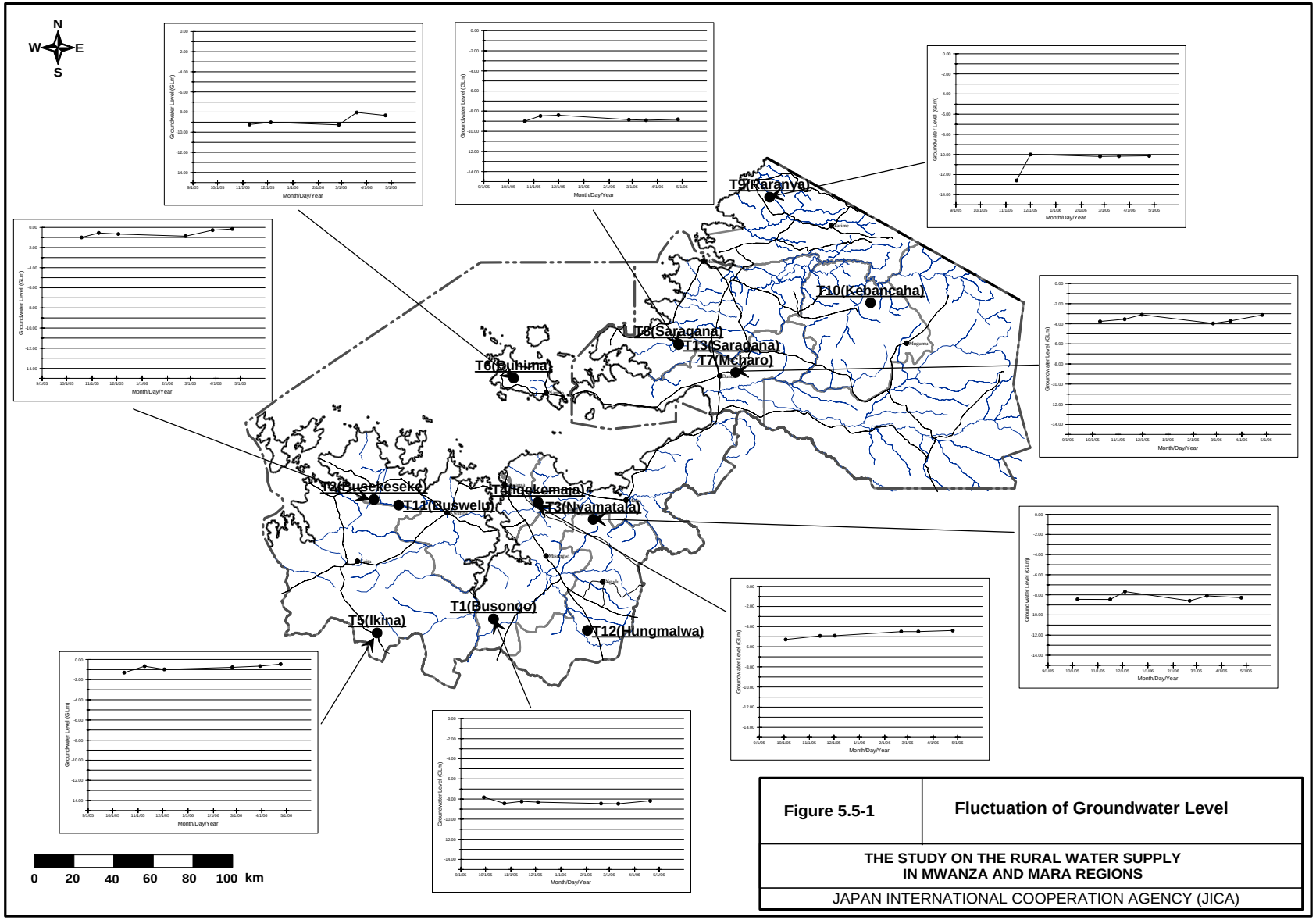


Figure 5.5-1	Fluctuation of Groundwater Level
THE STUDY ON THE RURAL WATER SUPPLY IN MWANZA AND MARA REGIONS	
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5.6 Supplementary Survey

5.6.1 General

a. Purpose

To improve the accuracy of the water resource development, test well drilling was conducted at the candidate piped scheme sites where boreholes are designed as the source.

b. Methodology

As well as Phase 1, test drilling and pumping test works were carried out by DRILLING AND DAM CONSTRUCTION AGENCY (DDCA), the local subcontractor, under the direction of the drilling supervisor of the Study team.

The method of well drilling and the pumping test is also the same as in Phase 1. The specification of the drilling equipment applied to this phase is shown in Table 5.6-1.

Table 5.6-1: Specification of Drilling Equipment Used in Phase 2

Item	Name	Capacity/Specification
Drilling rig	MAGRUSI	Max. drilling depth: 150m
Compressor	ATLASCOPCO XRVS 720	21.5kgf/cm^2 (350PSI)
Geophysical well logging equipment	ABEM TERRAMETER SAS300B and ABEM TERRAMETER SASLOG200	Resistivity logging Spontaneous Potential logging
Submergible motor pump for pumping test	GRUNDFOS SP17 etc.	0.3 – 3 m^3/hour
		1 – 10 m ^{3}/hour
		1.5 – 19 m^3/hour

5.6.2 Test Well Drilling

Test well drilling was carried out in three villages shown in Figure 5.6-1 as described in Chapter 3 and Chapter 4. Casing pipes and screens ware not installed at T13 (Saragana) because collapse occurred. Therefore, re-drilling (T13') was conducted near T13.

Instead of T12, it was carried out at an existing well (No.36/76) that is located in Runere.

The results of test drilling for 3 villages are summarized in Table 5.6-2. 3 test boreholes were drilled. Out of the 3 boreholes, 1 borehole was successfully drilled, while 2 borehole had poor yield (not dry). Having the results, 1 borehole was converted to monitoring wells.

The test drilling points in each village, and geology and well structure of the test drilling wells are shown in Data Book Chapter 4.

Groundwater intake screens were installed at the horizon of the aquifer for each test drilling hole.

Table 5.6-3 shows the results.

a. T11 (Buswelu village: Sengerema 75)

The lower granite group including parts of weathered rock, and Neogene deposits are distributed in this village.

- **Geology**

GL-0m – 2.0m: Top soil
GL-2.0m – 6.0m: Weathered granite
GL-11.0m – 14.0m: Fissured granite
GL-14.0m – 18.0m: Weakly weathered granite
GL-18.0m – 26.0m: Non-fractured granite
GL-26.0m – 31.0m: Fissured granite
GL-31.0m – 39.0m: Granite with weakly weathered zone
GL-39.0m – 45.0m: Micro fissured granite
GL-45.0m – 47.0m: Granite with weakly weathered zone
GL-47.0m – 53.0m: Weakly weathered granite
GL-53.0m – 58.0m: Granite with weakly weathered zone
GL-58.0m – 62.0m: Weakly weathered granite
GL-62.0m – 70.0m: Non-fractured granite
GL-70.0m – 74.0m: Weakly weathered granite
GL-74.0m – 76.0m: Fissured granite
GL-76.0m – 79.0m: Granite with weakly weathered zone
GL-79.0m – 83.0m: Weakly weathered granite
GL-83.0m – 88.0m: Micro fissured granite
GL-88.0m – 93.0m: Non-fractured granite
GL-93.0m – 97.0m: Weakly weathered granite
GL-97.0m – 100.0m: Granite with weakly weathered zone

- **Screen position**

The casing and screens were not installed because discharge rate is poor.

b. T12 (Hungumalwa village: Kwimba 22)

The lower granite group including parts of weathered rock, and Neogene deposits are distributed in this village.

- **Geology**

GL-0m – 3.0m: Top soil
GL-3.0m – 11.0m: Weakly weathered granite
GL-11.0m – 12.0m: Strongly weathered granite
GL-12.0m – 61.5m: Weakly weathered granite
GL-61.5m – 67.5m: Weakly weathered politic rock (basic rock?)
GL-67.5m – 100.0m: Weakly weathered granite

- **Screen position**

The casing and screens were not installed because discharge rate is poor.

- **Static water level**

GL-24.38m on March 25th, 2006

c. T13 (Saragana village: Musoma 35)

This village is located where the geological features are the boundary of the Nyanzan system (basic metavolcanics and metabasite) and alluvium (Neogene superficial sand, gravel, silt and gray soils).

- **Geology**

GL-0m – 3.0m: Top soil
GL-3.0m – 40.0m: Alluvium and strongly weathered metabasite
GL-40.0m – 65.0m: Weathered metabasite
GL-65.0m – 80.0m: Weakly weathered to weathered metabasite
GL-80.0m – 88.0m: Weathered metabasite
GL-88.0m – 100.0m: Weakly weathered to weathered metabasite

d. T13' (Saragana village: Musoma 35)

- **Geology**

GL-0m – 2.5m: Top soil
GL-2.5m – 22.50m: Alluvium and strongly weathered metabasite
GL-22.50m – 32.50m: Weathered metabasite
GL-32.50m – 54.0m: Weakly weathered to weathered metabasite
GL-54.0m – 76.0m: Weakly weathered metabasite
GL-76.0m – 88.0m: Metabasite
GL-88.0m – 100.0m: Weakly weathered to weathered metabasite

- **Screen position**

The target position is the weathered part of metabasite.

GL-23.30m – 35.10m
GL-46.90m – 52.80m
GL-79.35m – 82.30m
GL-94.10m – 97.05m

- **Static water level**

GL-8.54m on October 25th, 2006

5.6.3 Pumping Test

The pumping test was not executed at T11 (Buswelu) and T12 (Hungumalwa) because the discharge rate is poor.

Instead of T12, it was carried out at an existing well (No.36/76) that is located in Runere village (Figure 5.6-2). Figure 5.6-3 shows the well structure of No.36/76 wells.

a. Step-drawdown Test

The step drawdown test is conducted according to five (5) steps in increasing pumping rate and five (5) steps decreasing pumping rate. The duration of each step is three (3) hours.

The results of the continuous pumping test and recovery test are summarized in.Table 5.6-4

The specific capacity value of each step was obtained from the test, and then the aquifer loss coefficient (B) and well loss coefficient (C) were computed. The well efficiency of each pumping step was also calculated.

The graphical interpretations of the step-drawdown test are presented in Data Book Chapter 4.

b. Continuous Pumping Test and Recovery Test

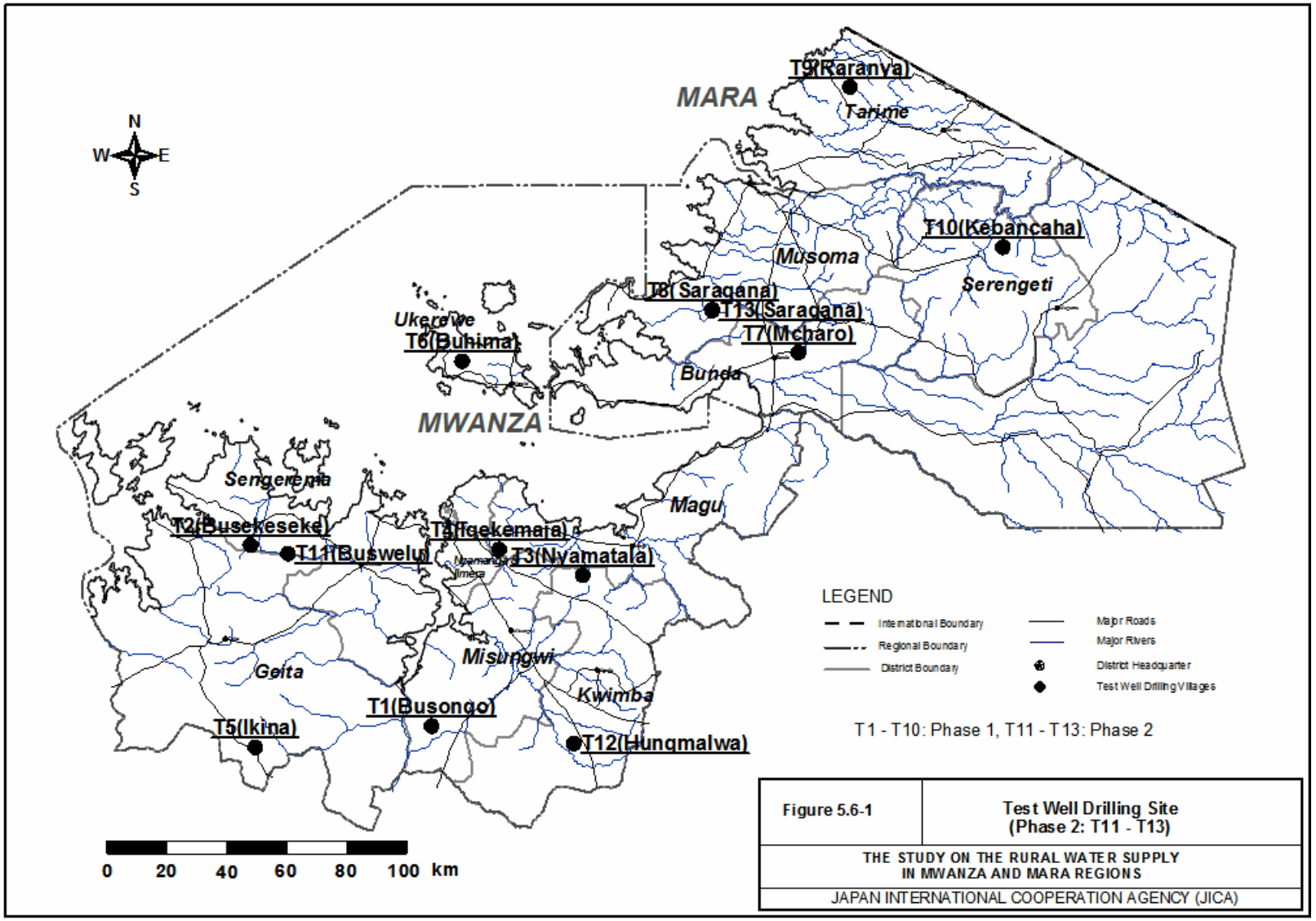
The continuous drawdown test was continued for forty-eight (48) hours. The pumping rate was directed by the drilling supervisor of the Study team based on the step drawdown test. After the continuous drawdown test, the recovery of water level was measured for

twenty-four (24) hours.

The results of the continuous pumping test and recovery test are summarized in Table 5.6-5. The values of transmissivity (coefficient of transmissibility) were obtained by the Cooper-Jacob Method and the Recovery Method. The values of storativity (storage coefficient) were obtained by the Cooper-Jacob Method.

The graphical interpretation of the continuous pumping test (Cooper-Jacob method) and recovery test (Recovery method) is presented in Data Book Chapter 4.

The data sheet of the pumping test is attached in Data Book Chapter 4.


MARA
MWANZA
N
W
E
S
T9(Raranya)
Tarime
T10(Kebancaha)
Musoma
Serengeti
T8(Saragana)
T13(Saragana)
T7(Mcharo)
Bunda
Ukerewe
T6(Buhima)
Sengerema
T2(Busekeseke)
T11(Buswelu)
T4(Igekemaja)
T3(Nyamatala)
Magu
Misungwi
Geita
Kwimba
T1(Busongo)
T5(Ikina)
T12(Hungmalwa)
LEGEND
International Boundary
Regional Boundary
District Boundary
Major Roads
Major Rivers
District Headquarter
Test Well Drilling Villages
T1 - T10: Phase 1, T11 - T13: Phase 2
0 20 40 60 80 100 km
Figure 5.6-1
Test Well Drilling Site
(Phase 2: T11 - T13)
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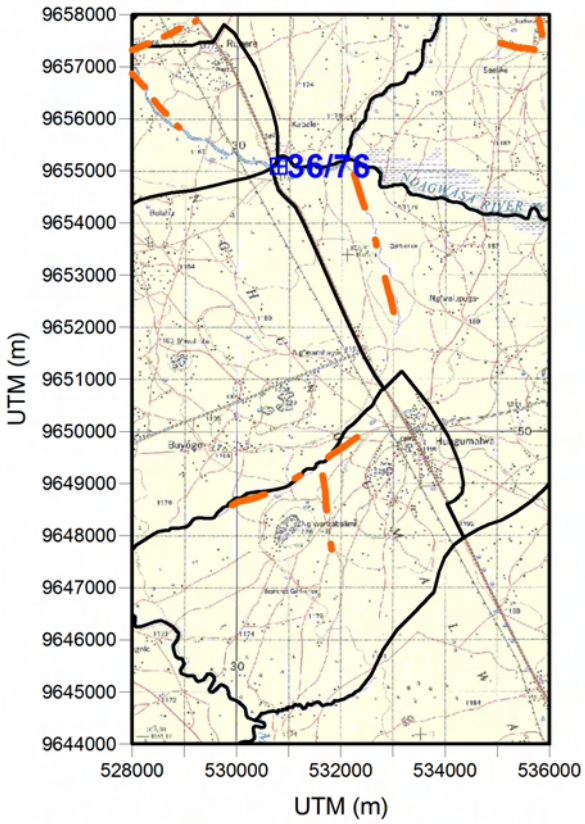
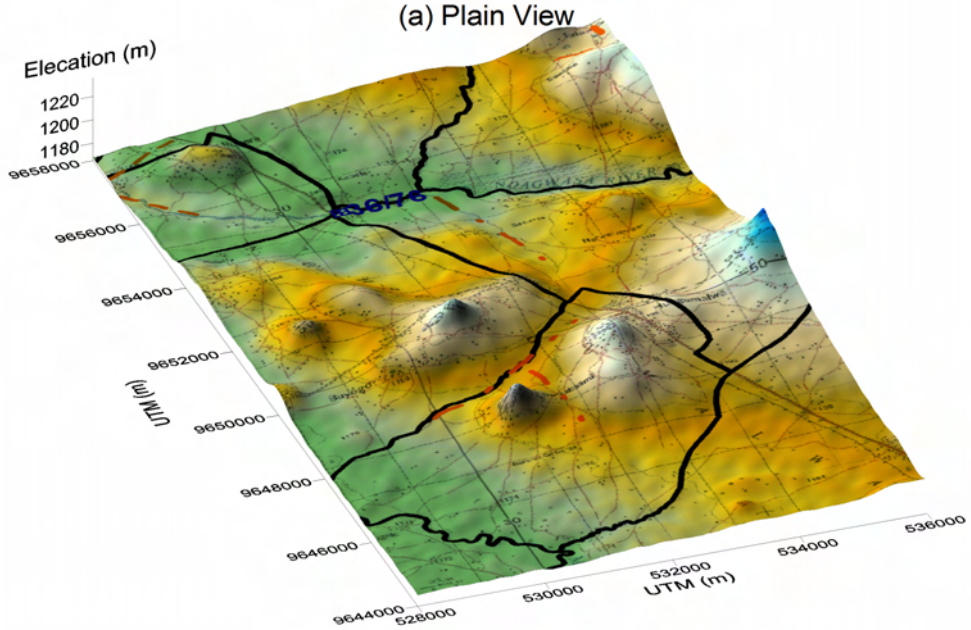


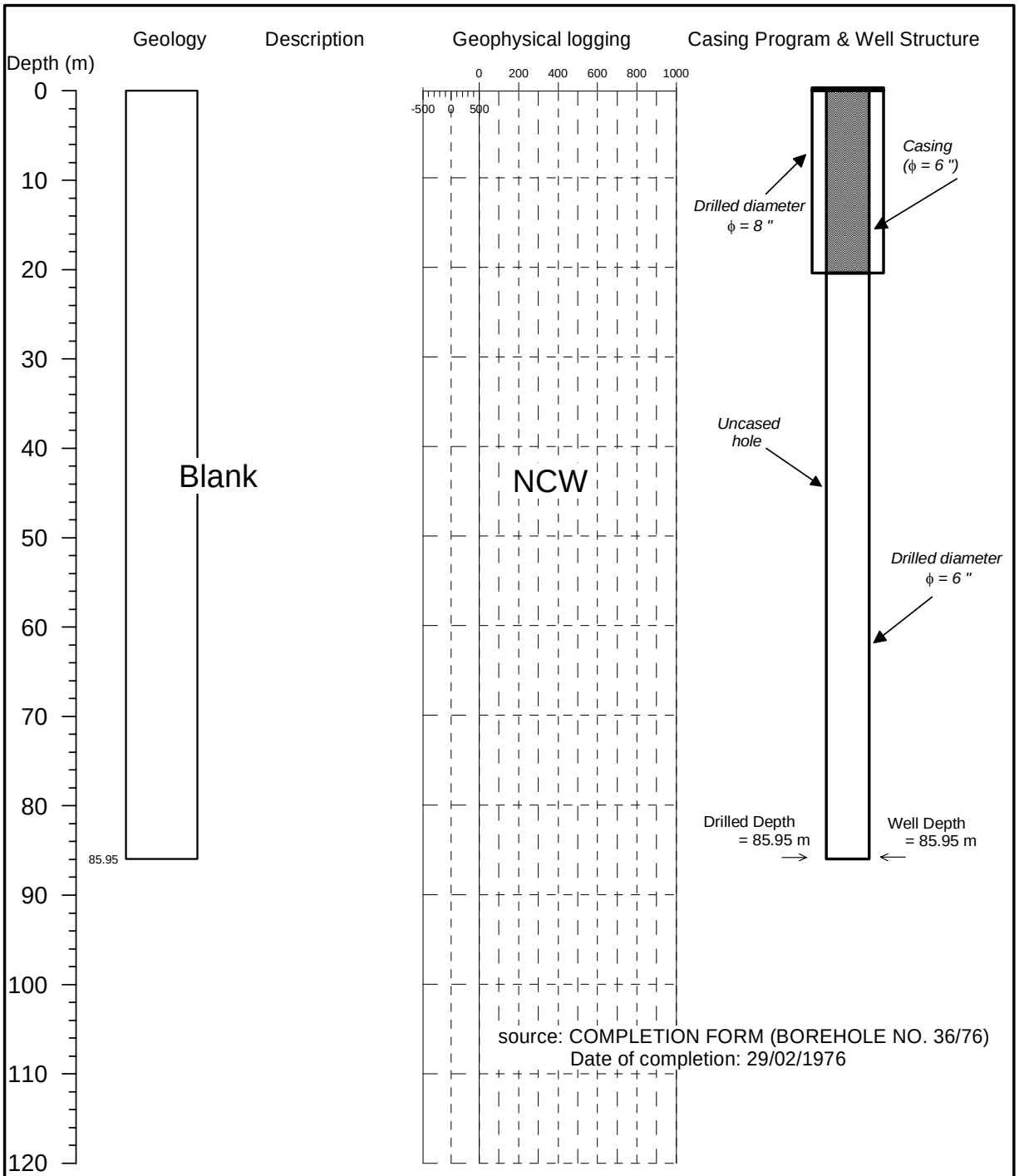
(a) Plain View



(b) Bird's Eye View

Lineament (Clear)
Lineament (Minor)
Lineament (Trace)
Village boundary

Figure 5.6-2	**Runere and Hungumalwa Villages (36/76 Existing Wel.)**
THE STUDY ON THE RURAL WATER SUPPLY IN MWANZA AND MARA REGIONS	
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	



WELL LOCATION

Location: Runere,
Kwimba District, Mwanza Region
Site No.: -
Well No.: 36/76

WELL SPECIFICATION

Well Depth: 85.95 m (282 ft)
Well Diameter: 6"
Screen Depths: none
Screen Length: none
SWL: GL- 2.44 m (8 ft)
on 07-03-1976

Figure 5.6-3 **Columnar Section and Well Structure at No. 36/76 Existing Well (RUNERE)**

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Table 5.6-2: Villages for Test Drilling (Phase 2)

No.	Region	District and No. by district	Ward	Village	Geology[*1]	Coordinate		Depth[*2]	SWL	Water quality[*3]		
						Easting	Northing	(GL-m)	(GL-m)	pH	EC (mS/m)	ORP (mv)
T11	MWANZA	SENGERENA 75	Nyanzenda	Buswelu	Gr			100.00 —	—	—	—	—
T12		KWIMBA 22	Hungumalwa	Hungumalwa	Gr	422973	9714204	100.00 100.00	24.38 on 25/03/06	—	—	—
T13	Mara	MUSOMA 35	Nyambono	Saragana	Zv	576718	9792522	100.00 —	—	—	—	—
T13'	Mara	MUSOMA 35	Nyambono	Saragana	Zv			100.00 100.00	8.54 on 25/05/06	7.64	47.40	190

[*1] Gr: Lower granite group
Zv: Basic metavolcanics (Metabasite)
[*2] upper: drilling depth, lower: well depth
[*3] Water of T12 test well was duty (discharge rate is very small), so the quality test was not conducted.

Table 5.6-3: Screen Installed Horizon of Test Wells (Phase 2)

Test Drilling Site					Main Screen Position		Yield (Q) (L/min.)
No.	Region	District and No. by district	Ward	Village	Depth (GL-m)	Horizon	
T11	MWANZA	SENGERENA 75	Nyanzenda	Buswelu	–	–	less than 1
T12		KWIMBA 22	Hungumalwa	Hungumalwa	–	–	less than 1
T13	MARA	BUNDA 33	Nyambono	Saragana	–	–	–
T13’	MARA	BUNDA 33	Nyambono	Saragana	23.30 – 35.10, 46.90 – 52.80, 79.35 – 82.30, 94.10 – 97.05	Zv (Microfissured and weathered metabasite)	93

Gr: Lower granite group, Zv: Basic metavolcanics (Metabasite),

Table 5.6-4: Summary of Step- Drawdown Pumping Test (Phase 2)

Test Well NO.	Village	Drilling Depth (m)	Well Depth (m)	Screen Length (m)	Screen Depths (m)	Date (dd/mm/yy)	Static Water Level (m)	Step-1	Step-2	Step-3	Step-4	Step-5	Step-6	Step-7	Step-8	Step-9	Aquifer Loss Coefficient $B(h/m^2)$	Well Loss Coefficient $C(h^2/m^5)$	Average Well Efficiency (%)
								$Q_1(m^3/h)$ $S_1(m)$ $Sc_1(m^2/h)$ $Ew_1(\%)$	$Q_2(m^3/h)$ $S_2(m)$ $Sc_2(m^2/h)$ $Ew_2(\%)$	$Q_3(m^3/h)$ $S_3(m)$ $Sc_3(m^2/h)$ $Ew_3(\%)$	$Q_4(m^3/h)$ $S_4(m)$ $Sc_4(m^2/h)$ $Ew_4(\%)$	$Q_5(m^3/h)$ $S_5(m)$ $Sc_5(m^2/h)$ $Ew_5(\%)$	$Q_6(m^3/h)$ $S_6(m)$ $Sc_6(m^2/h)$ $Ew_6(\%)$	$Q_7(m^3/h)$ $S_7(m)$ $Sc_7(m^2/h)$ $Ew_7(\%)$	$Q_8(m^3/h)$ $S_8(m)$ $Sc_8(m^2/h)$ $Ew_8(\%)$	$Q_9(m^3/h)$ $S_9(m)$ $Sc_9(m^2/h)$ $Ew_9(\%)$			
T11	Buswelu	100.00	Dry hole																
T12	Hungumalwa	100.00	Dry hole																
T13'	Saragana	100.00	100.00	23.60	23.30 – 35.10 46.90 – 52.80 79.35 – 82.30 94.10 – 97.05	25/05/06 - 26/05/06	8.54	2.00 5.34 0.375 35.4	3.60 7.38 0.488 46.1	4.50 12.57 0.358 33.8	5.58 20.88 0.267 25.3	7.20 36.07 0.200 18.9	5.58 18.68 0.299 28.2	4.50 8.64 0.521 49.2	3.60 5.82 0.619 58.5	2.00 3.54 0.565 53.4	9.45×10^{-1}	5.04×10^{-1}	38.7
36/76	Runere	85.95	85.95	uncased (65.53)	uncased (20.42 – 85.95)	09/04/06 - 10/04/06	3.73	3.00 2.35 1.277 71.1	6.00 4.22 1.422 79.2	8.00 6.12 1.307 72.8	10.00 7.85 1.274 70.9	14.40 13.17 1.093 60.9	10.00 9.42 1.062 59.1	8.00 8.36 0.957 53.3	6.00 5.86 1.024 57.0	3.00 3.60 0.833 46.4	5.57×10^{-1}	2.45×10^{-2}	63.4

Table 5.6-5: Summary of Continuous Pumping Test and Recovery Test (Phase 2)

Test Well NO.	Village	Drilling Depth (m)	Well Depth (m)	Screen Length (m)	Screen Depths (m)	Continuous Pumping Test and Recovery Test											Remarks
						Date (dd/mm/yy)	Static Water Level (m)	Pumping Rate Q (m^3/hour)	Pumping Duration (hours)	Final Drawdown s (m)	Specific Capacity Sc (m^2/day)	Cooper-Jacob Method			Recovery Method		
												T (m^2/day)	k (m/day)	S	T (m^2/day)	k (m/day)	
T11	Buswelu	100.00	Dry hole														
T12	Hungumalwa	100.00	Dry hole														
T13'	Saragana	10.00	100.00	23.60	23.30 – 35.10 46.90 – 52.80 79.35 – 82.30 94.10 – 97.05	27/05/06 - 29/05/06	5.58	5.58	48.00	25.12	5.331	1.30	1.10×10^{-1}	1.71×10^{4}	3.69	3.13×10^{-1}	
36/76	Runere	85.95	85.95	uncased (65.53)	uncased (20.42 – 85.95)	10/04/06 - 12/04/06	4.10	14.40	48.00	15.75	21.943	2.51×10^{1}	3.83×10^{-1}	3.64	2.27×10^{1}	3.48×10^{-1}	

Chapter 6

Socio-Economic Survey

6 Socio-Economic Survey

6.1 Introduction

6.1.1 Background

The current JICA study covers the target villages in seven districts[1] of Mwanza region and four districts[2] of Mara region. Out of more than 900 candidate villages in Mwanza and Mara region, 428 villages plus 57 existing piped schemes were selected for the formulation of a rural water supply plan. After careful scrutiny of these target villages, 205 villages and 17 existing piped schemes (covering 77 villages) were selected as the candidate villages for the detailed study (preliminary design study).

The socio-economic survey has been designed to obtain the basic socio-economic conditions in these selected villages (205 villages). Four local consulting firms were invited to present their technical as well as financial proposals to undertake the survey. As a result of a competitive bid, Norconsult (Tanzania) Ltd. was selected as the local consultant for the task.

The main objectives of the socio-economic survey are:

i) To obtain the basic data for the prioritization of the candidate villages for the rural water supply plan;

ii) To obtain information on socio-economic conditions in general, and the water use situation at the household level in these villages for the formulation of an effective operation and maintenance (O&M) plan as well as to assess the capability and willingness of the community people to pay for O&M activities; and

iii) To obtain qualitative information on present water use, perceived water needs, and experience on community organization.

6.1.2 Methodology and Survey Items

In conducting the socio-economic survey, the following four methodologies were designed.

a. Village Profile Survey in 205 Villages

An interview with questionnaire sheets was made in each village with the village leaders including, among others, a village chairperson, a village executive officer, village committee members, school teachers, traditional leaders, and group leaders on the basic socio-economic information of the village.

Survey items included, among others, demographic data, economic activities, rural institutions (e.g. water committee), existing development programs, the water use situation, water supply facilities, willingness to pay for the water charge, and health conditions.

b. Village Resource Mapping in 205 Villages

A village map showing roads, water supply facilities (if any), schools, churches or mosques, public houses, private houses, etc. was prepared for each village.

[1] Seven districts include Nyamagana (a part of Mwanza city), Magu, Ukerewe, Geita, Sengerema, Kwimba and Misungwi. Ilemela district is excluded as there is no target village in the district.
[2] Four districts include Musoma (rural), Bunda, Tarime and Serengeti. Musoma urban district is excluded as there is no target village in the district.

c. Sample Household Survey in 205 Villages

A sample household survey was conducted in 205 villages in parallel with the village profile survey. Four households were stratified in each village according to the wealth/poverty level. The sample households included a household from a higher income level, two from a moderate income level, and a household from a lower income level.

An interview with a questionnaire was made in each sample household. In most cases, housewives were the main interviewees in the presence of their husbands.

The main question items were family composition, collection of domestic water, distance to water sources, time to collect water, water consumption, water sources in the dry and rainy seasons, water fee (if any), household income and expenditure, health conditions, and willingness to pay for the water fee.

d. Focus Group Discussions (FGDs)

Focus group discussions (FGDs) were conducted in 36 villages. These villages were selected from 11 districts.

The main objective of the FGDs was to make a qualitative assessment on the specific issues to confirm the need for water supply development and to evaluate the capability of the community to sustain the water supply project.

Discussions were organized by a local consultant (facilitator) and were conducted among specific groups such as water committees, women's groups, youth groups, etc.

The topics in the discussion included: traditional land entitlement; perceived needs for water; traditional entitlement on water use; traditional roles on water management; possible water related conflicts; strategy to cope with water shortage stress in traditional ways; community organizations (type, membership, leadership, function); relationship with regional and district offices; relationship with surrounding villages; and socio-cultural barriers/norms confronting women (gender).

6.2 Result of the Socio-economic Survey

The socio-economic survey entrusted to the local consultant was commenced from the 17th of July 2005 in the Geita district located in the far western part of Mwanza region. At the first step, six team members including a team leader were deployed to undertake the task. After the team completed two districts (Geita and Sengerema), they were joined by two additional members. The team leader returned to Dar es Salaam to compile the data and write up the reports. The remaining team members continued the task to complete all the target villages in Mwanza region (98 villages) by the second week of August. The field survey in Mara region started from the 12th of August and completed all the target villages by the 10th of September 2005. Data compilation and data analysis were carried out between mid-September and mid-November 2005. A final report was prepared by the end of December 2005.

6.2.1 Village Profile Survey

a. Distribution of the Target Villages

A Village Profile Survey was conducted in 98 villages in Mwanza region and 107 villages in Mara region between the 17th of July 2005 and 10th of September 2005. The distribution of the villages is presented in the following table.

Table 6.2-1: Distribution of Villages for the Village Profile Survey in Mwanza Region

District	Total Villages	Target Villages for Village Profile Survey	Progress of Village Profile Survey
Geita	191	26	The field survey started from 17th of July 2005 and completed on 11th of August 2005. Subsequent data compilation and analysis were conducted in Dar es Salaam during September and November 2005.
Sengerema	124	40	
Misungwi	78	7	
Kwimba	107	10	
Magu	126	4	
Ilemela	17	1	
Ukerewe	69	10	
Total	712	98	

Note: The number of total villages is based on the 2002 Census Report.

Table 6.2-2: Distribution of Villages for the Village Profile Survey in Mara Region

District	Total Villages	Target Villages for Village Profile Survey	Progress of Village Profile Survey
Bunda	86	7	The field survey started from 12th of August 2005 and completed on 9th of September 2005. Subsequent data compilation and analysis were conducted in Dar es Salaam during September and November 2005.
Musoma Rural	106	34	
Serengeti	73	5	
Tarime	146	61	
Total	411	107	

Note: The number of total villages is based on the 2002 Census Report.

b. Survey Objectives

The Village Profile Survey was conducted with the following objectives:

(i) To obtain basic socio-economic data of the target villages through interviews with the village leaders;

(ii) To prepare village resource maps based on the information from the village resource persons;

(iii) To obtain general information on the availability of water resources, the present water use situation, the perceived needs and priorities for the water supply in the target villages;

(iv) To obtain general information on the economic activities, income source and income level of the target villages;

(v) To obtain general information on the capability of the respective villages in operation and maintenance of development activities including water supply projects;

c. Results from the Survey

The items for the Village Profile Survey include the following:

(1) Demographic data of each village (total population, male and female population, number of disabled, number of children, number of households, number of female-headed households, number of migrant households, etc.)

(2) Village government performance (year of village establishment, government organization, village water committees' activities, etc.)

(3) Community's institutions and villagers' activities (availability of rural institutions such as schools, churches or mosques, and activities of community organizations such as water user groups, HESAWA groups and any other groups

related to development projects).

(4) Energy source and transport conditions (main source of energy, availability of electricity and communication network, transport conditions, etc.)

(5) Economic activities (agricultural production, marketing of agricultural products, livestock situation, non-farm activities, etc.)

(6) Health and sanitation conditions (main health problems, availability of health facilities in the village and/or outside the village, medical staff in the village, availability of medical treatment for sick people, sanitary conditions for each household and public institutions, ,etc.)

(7) Water use situation (average water consumption per person or per household, water source for livestock, water source for gardening, etc.)

(8) Water supply situation (existing water supply facilities, main water sources, water quality in the dry season, measures taken in case of water shortage, etc.)

(9) Water supply maintenance situation (availability of water supply maintenance fund, water supply maintenance staff, availability of skills for water supply maintenance in the village, problems for water supply maintenance, measures taken in case of damage of water supply facilities, etc.)

(10) Water supply problems and preference (water supply problems, perceived needs for improvement of the existing water supply facilities, preference for the selection of improved water supply facilities, water supply situation for the disadvantaged people, etc.)

(11) Willingness and affordability to pay for the improved water supplies (affordability to pay for the improved water supplies and willingness to pay for the maintenance of water supply facilities per month and/or per bucket)

(12) Preparation of the resource map of each village surveyed

These results are summarized in the Appendix 3-1, Table 1-11.

6.2.2 Sample Household Survey

a. Distribution of Sample Households

The Sample Household Survey was conducted in 98 villages located in Mwanza region and 107 villages located in Mara region. Four households, including one each from a higher and lower income level and two from a moderate income level, were selected in each village based on the information provided by the village leaders.

The distribution of sample households is presented in the following table.

Table 6.2-3: Distribution of Sample Households in Mwanza and Mara Regions

District	Number of Villages for the Survey	Number of Sample Households
Geita	26	104
Sengerema	40	160
Misungwi	7	28
Kwimba	10	40
Magu	4	16
Ilemela	1	4
Ukerewe	10	40
Mwanza Region Sub-total	98	392
Bunda	7	28

Musoma Rural	34	136
Serengeti	5	20
Tarime	61	244
Mara Region Sub-total	107	428
Total	205	820

b. Survey Objectives

The sample household survey was conducted with the following objectives:

(i) To obtain basic socio-economic data at the household level through interviews with the household heads or housewives;

(ii) To obtain information on the availability of water resources, the present water use situation, perceived needs and priorities for the water supply at household level; and

(iii) To obtain information on the economic activities, income source and income level of the sample households;

c. Survey Results in Mwanza Region

Data on 392 households in Mwanza region were compiled in an Excel worksheet for further analysis. The major findings obtained from the compiled data are as follows:

(1) More than half the respondents were male members in the sample households with an educational background of more than 5 years.

(2) In most villages, the heads of households are male. The only exception is in Kishili village of Nyamagana district where female-headed households account for 50% out of 4 sample households. Most of the heads of households are engaged in farming.

(3) Household members consist of about 4 adults and 4 to 6 children on average. Christianity is the main religion, and other religions include Islam and Paganism with a minor percentage.

(4) Almost all the houses are owned by the dwellers. Usually the out-buildings are attached to the main houses. In most cases, mud bricks are used as the construction materials for walls in Kwimba and Magu districts, while concrete bricks are widely utilized in Nyamagana district. Metal roofs are extensively utilized, particularly in Nyamagana and Magu districts. Indoor kitchen and bathrooms are very rare.

(5) Malaria, respiratory infections, stomachaches and headaches are the leading causes of morbidity in the villages. Medical facilities such as dispensaries, health centres and hospitals are playing important roles to treat the sick persons. Villagers are also using traditional medicines (e.g. herbs) to cope with health problems.

(6) Stratification of income levels is categorized into i) low income level of less than US$30 per month; ii) medium income level of US$30 to US$90 per month; and iii) high income level of more than US$90 per month. Magu district indicates highest percentage of higher income level (37%), while Misungwi district indicates the lowest percentage of the same (7%).

(7) The monthly household income can be estimated from the monthly expenditures. It ranges from US$45 in Kwimba district to US$95 in Nyamagana district.

(8) In most villages, dug wells are the main water source. The secondary water sources include piped water, lake water, streams, ponds, and others.

(9) The distance to water sources varies according to the location of the villages. Most of the households are located within an hour's distance to water sources. In Nyamagana district, all the households are located within 20 minutes distance to water sources. In Ukerewe and Geita districts, 51% and 41% of households are located within the same distance to water sources.

(10) Water charges are not collected in most villages, except the area of the piped water schemes (e.g. Mbarika village in Misungwi district).

(11) About 60% of the water users are satisfied with the water quality (cleanness), while some users (e.g. Nyamagana district) are not satisfied with the water volume supplied.

(12) Water consumption ranges from 12 lcpd (litre per capita per day) in Magu district to 20 lcpd in Nyamagana district.

(13) In most households, water is stored in clay pots (42% to 62%) or buckets and plastic containers (25% to 46%).

(14) The percentage of households having purchased water from water venders is high in Nyamagana district (75%). In other districts, the percentage is 27 % or less.

(15) The main problems with water supply are water quality (dirty or salty water), long distance to water sources, and crowded situation around the water supply point. A higher percentage of dissatisfaction is expressed in the problem of water quality (57% to 75%).

(16) Concerning the desired water supply system, households in Magu and Kwimba districts prefer the piped water system (52% and 47%, respectively). In other districts, the households prefer borehole wells equipped with hand pumps or motor pumps (50% to 75%).

(17) The questions on the willingness to pay indicate the preference of households for monthly water rates of less than 500 shillings (23% to 38%), and 500 to 1,000 shillings (25% to 39%). In Magu district, however, the percentage is highest in the category of more than 2,000 shillings. A higher percentage in the category of more than 2,000 shillings per month might indicate an urgent need for the improved water supply.

The results of the household survey based on the 392 questionnaires in Mwanza region are summarized in the Appendix Appendix 3-2, Table 1.

d. Survey Results in Mara Region

Data on 428 households in Mara region were compiled in an Excel worksheet for further analysis. The major findings obtained from the compiled data are as follows:

(1) More than half the respondents were male members in the sample households with an educational background of more than 5 years.

(2) In most villages, the heads of households are male, accounting for more than 80 %. In Tarime district, the ratio of female-headed households is higher (26 %) than other districts. Most of the heads of households are engaged in farming.

(3) Household members consist of about 4 adults and 5 or 6 children on average. Christianity is the main religion, and other religions include Islam and Paganism with a minor percentage.

(4) Almost all the houses are owned by the dwellers. Usually the out-buildings are attached to the main houses. In most cases, mud bricks are used as the construction materials for walls, while concrete bricks are rarely utilized (less than 1%). In Serengeti, thatched roofs are extensively utilized (85%). In other districts, metal roofs are utilized in about 45% to 63% of houses. Indoor kitchen and bathrooms are very rare.

(5) Malaria, respiratory infections and stomach ache are the leading causes of morbidity in the villages. Medical facilities such as dispensaries, health centres and hospitals are playing important roles to treat the sick persons. Villagers are also using traditional medicines (e.g. herbs) to cope with health problems.

(6) Stratification of income levels is categorized into i) low income level of less than US$30 per month; ii) medium income level of US$30 to US$90 per month; and iii) high income level of more than US$90 per month. Musoma rural district indicates the highest percentage of high income level (63%), while Serengeti district indicates the lowest percentage of the same (35%).

(7) The monthly disposable household income can be estimated from the monthly expenditures. It ranges from Tsh. 29,379 in Bunda district to Tsh. 240,551 in Musoma rural district.

(8) In most villages, traditional dug wells are the main water source. In Serengeti, however, other water sources such as shallow wells (SWs), borehole wells (BHs) are also used. The secondary water sources include SWs, BHs, lake water, stream, pond, and others.

(9) The distance to water sources varies according to the location of the villages. Most of the households are located within an hour's distance to water sources. In Musoma, about 97% of households are located within 40 minutes distance. In Tarime, however, about 10% of households are located at a distance of more than 1 hour.

(10) Water charges are not collected in most villages except some portion (4% to 11%) of the payment for private operators. Collection of water charges by VWC is very rare (2 % or less).

(11) More than 56 % of the water users are satisfied with the reliability of water volume supplied. In Musoma, only 18% of water users are satisfied with water quality (cleanness), while 75% of users are satisfied with water cleanness in Serengeti.

(12) Water consumption ranges from 14 lpd (litre per capita per day) in Musoma district to 17 lpd in Tarime and Serengeti districts.

(13) Water is usually stored in clay pots (48% to 57%) or buckets and plastic containers (38% to 51%).

(14) The percentage of households having purchased water from water venders is high in Bunda district (25%). In other districts, the percentage is 15 % or less.

(15) The main problems in water supply are water quality (dirty or salty water), the long distance to water sources, and the crowded situation around the water supply point. A higher percentage of dissatisfaction is expressed in the problem of water quality (68% to 90%).

(16) Concerning the desired water supply system, most households (52% to 88%) prefer borehole wells equipped with hand pump or motor pump. In Musoma district, about

35% of households prefer piped water systems.

(17) In Bunda and Tarime districts, the questions on the willingness to pay indicates the preference of households for monthly water rates of 500 to 1,000 shillings (50 % to 53%), while in Serengeti the preference falls to a payment of less than 500 Tsh (45%). In Musoma, 28% of households indicated a preference to pay 1500 to 2000 Tsh.

The results of the household survey based on the 428 questionnaires in Mara region are summarized in the Appendix 3-2, Table 2.

6.2.3 Focus Group Discussions

a. Distribution of the Target Villages

The focus group discussions (FGDs) were conducted in 36 villages selected from the target villages in Mwanza and Mara regions. This study was conducted in parallel with the village profile survey. The target villages for the FGDs were selected randomly.

b. Survey Objectives

Focus group discussions were conducted with the following objectives.

(i) To obtain qualitative information on the water use, perceived needs, strategies for coping with water shortage stress, and experience of the communities in conducting project activities;

(ii) To obtain information on the operation and management capability of the target villages from such standpoints as: (a) frequency of communication with the relevant local government authorities and neighboring villages; (b) traditional roles on water management; and (c) social network for conflict resolution.

c. Major Findings

c.1 Traditional Organization and Resources Allocation and Management

c.1.1 Traditional Land Entitlement and Allocation

Out of the 36 villages where the interview surveys were conducted, individual land ownership under supervision of the clan is practiced in 25 villages (about 70%). The clan determines if the land can be allocated or not, that means land cannot be sold without consulting the clan heads. The clan makes the final decision of whether the land should be sold or not. The village government has the responsibility of overseeing that the proper transaction takes place and proper documentation is done. Those who wish to sell land have to pay taxes to the village government.

On the other hand there are two among 13 surveyed villages where a small piece of land is under the village government management. Such land could be allocated to those in need of land.

In some villages (e.g. Kasota village in Geita District) land pressure is high due to limited supply. In such cases people would buy land from individuals.

c.1.2 Traditional Water Entitlement and Allocation

Traditionally in almost all villages water sources and water catchments are mainly controlled communally. Neither clans nor individuals are allowed to own such areas unless one makes his/her own water well at his/her homestead and looks after it. In places where the communal ownership is not practiced a water source found in someone's farm or located on someone's land is the property of the farmer or landowner and people living near the water source.

However any one is allowed to fetch water without paying a charge.

c.1.3 Traditional Water Resource Management

The water source management is the responsibility of the village governments through sub village heads. Out of the total interviews 11 indicated to manage water sources by adopting this system. They mobilize communities to protect water sources and carry out cleaning on rotation bases, based on the sub villages and households particularly where caretakers have not been selected.

Generally, each sub village has a role to manage respective water sources. The chairperson of a sub village asks a group of people to dig wells and such wells become properties of the community. A caretaker selected by the community looks after the facility. In many cases villagers do the cleaning of the wells in turns.

In villages with improved water sources, where water users groups are established (Bugogo and Ikangala villages in Geita District), they have developed water management system by establishing water users groups at a sub-village level under the supervision of the village water committees. The village governments in collaboration with the community make decisions on the water uses including time for water fetching. In some villages the water fund collected is used for operation and maintenance of the water supply facilities.

c.1.4 Customary Resolution of Conflicts over Water

Villages with acute water shortages do experience conflict over water at water sources. It was reported that women sometimes quarrel at water wells as every one wants to fetch water. Some of the measures include removing buckets from the queue. In many cases they manage the conflicts and come up with practical solutions. If the women fail to solve the dispute, then it is reported to the village chairperson who normally gets assistance from the village elders. They have the power to fine or discipline the person who causes the dispute at the water source.

c.1.5 Customary Coping Mechanisms with Drought and Water Shortages

The following are coping mechanism of dealing with drought:

- The residents of 9 villages out of 13 cope with drought by mobilizing water users of a particular well to communally dig deeper the existing sources in order to get more water

- To fetch water from the water sources of neighbouring villages; these include Kisamwene and Kigera in Musoma Rural, Bugorola in Geita district and Nyang'aranga in Bunda district.

- Village chairpersons in collaboration with Village Executive officer develop water fetching rosters indicating lists of households and times for each to fetch water (rationing of water is practiced at each sub-vilage)

- Radienya and Burere villages in Tarime district and Bupandwa village in Sengerema district have never experienced drought.

c.1.6 Responsible Organization for Water Resources Management

In 80% of the interviewed villages, the village government controls water supply. The village government is responsible for protecting water sources for the public interests.

In other villages, traditional or customary organizations are responsible for water resources management. For example, in some villages, traditional guards known as "Sungusungu" look after water sources. Three villages out of 13 reportedly have customary organizations where traditional leaders of the clan have a certain responsibilities to protect the custom functions.

The community respects this traditional leadership. This type of customary arrangement was observed in Mara region. Customary organization is practiced in parallel with village government leadership.

In Bupandwa village in Sengerema District, every well has security guards paid by each sub-village. The entire village has 12 water users groups, one each at 12 sub-villages.

c.1.7 Relationship with District Offices

Out of 12 villages interviewed, 5 villages indicated to have weak relationship with District Council and not to have significant support from the authority. The remaining seven villages reported that district authorities support villages by providing social services such as health, education and water supply.

In the villages with weak relationship with district water authorities (DWE), they can get little support from them. “There is no strong bond between us and the district office on issues related to water and traditional water sources”. Villages only receive quarterly reports on water sources available in the district from the department. However, they lamented that the problem is bureaucracy of the authority that result in inefficiency in the providing services.

In the villages having good relationships with district, they communicate by exchanging information of the village government meetings. When the village government holds meetings, the minutes taken are then sent to the district office by the VEO. The report is then distributed by DED to the appropriate department. The contact with the district office is maintained monthly.

c.1.8 Relationship with Neighbouring Villages

Ten villages out of 12 interviewed reported to have good relationship with their neighbouring villages. There is no conflict of any nature or quarrels over any issue. During droughts water sources are shared among neighbouring villages and communal work such as the cleaning of water and digging of wells are done in collaboration. For example Kirongo village in Tarime District is planning with neighbouring villages to build a water pond for livestock.

However, only Bupandwa village of Sengerema District reported to have boundary issues with Kafunso and Itulabusiga villages.

c.2 Gender Issues

c.2.1 Examples of Socio-cultural Economic Barriers confronting Women

The following items have been pointed out by some participants during the discussions in the surveyed villages. It should be noted that the following items are not the opinions agreed by all the participants.

(1) It was pointed out by some participants that women are not allowed to have independent sources of income such as running their own businesses.

(2) Women are expected to stay at home to look after children

(3) Women are kept in the dark about the earnings and income of the household.

(4) Access to resources is limited for women. Where sharing is necessary, males tend to take the lion’s share even though women toil much more in production. Daughters are not allowed to inherit parent’s property resulting in gender inequalities and differences in economic development between men and women.

(5) Women are normally excluded from decision-making. Men do not allow women to

engage in extra curricular activities. They do not even allow women to go long distances for business trips.

(6) It was reported in Kisamwene village of Mara region that women are not allowed to fetch water from sources when menstruating. While in Sengerema mothers with twins are not allowed to dig traditional wells. In Tarime district women who have just given birth are not allowed to fetch water from traditional wells.

(7) Parents force girls to get married at a younger age.

(8) Women have to perform all household chores, having no time for leisure. Children, who used to support mothers in the household, now attend school, remaining few hours to support mothers at home. More than half of the participants reported that they are overwhelmed by household chores.

(9) It is likely that most men are not willing to adopt family planning methods.

(10) The price paid for brides is too high, forcing women to stay with husbands that mistreat them resulting in a miserable marriage and unhappy life.

(11) Polygamous and other means of production: Land is inherited from parents. When a husband dies the family members tend to control the wealth. All land belongs to individuals so it is difficult for women to purchase.

c.2.2 Change of Status for Girls and Women

There are some indications that show a better status for girls and women in rural life.

(1) Girls are now allowed to go to primary school and more to secondary school, and some have better jobs in towns.

(2) Incidences of domestic violence have a tendency to decrease.

(3) Girls are given equal opportunities in the education sector

(4) Many women/girls are involved in productive ventures like teashops, food selling, local brewing, tailoring and fish selling.

(5) Some women are trained as TBAs at village level and others as court advisers.

By contrast, there are some indications to show similar status of women as before.

(1) Few women are members of the village government and participate in decision-making.

(2) At the household level, women are still dominated by men that were mentioned in Serengeti District.

c.3 Findings from Women Groups Discussions

c.3.1 Control of Family Income

It has been pointed out by some participants that men are the main controllers of the family income. By contrast, some participants claimed that the family incomes are controlled equally by both husbands and wives.

In some cases, widows control the family income since they are the only remaining head of the family. This was pointed out by about 10 % of women participants. The same percent argued that though women are not the main controller of the family income in some families they are given opportunity to contribute ideas on how the money should be spent. At least they, have a say.

Unmarried women control the family income since they are the daily bread winners. In some cases, women are given a small portion of the income for their own use.

c.3.2 Problems in Women's Daily Activities

It was pointed out during the discussions that inadequate source of income is the main problem for them to carry out development activities. It was also mentioned by some participants that this is partially contributed by the fact that men control the household income leaving women with no support of any kind. There is an unequal distribution of income between men and women. For instance, men give little money to women for day to day expenditure if at all.

Some of the interviewed women's groups claimed that inadequate capital is a main setback for engaging in different income generating activities. Because of this, women are not able to buy agricultural inputs and expand farms let alone that accessibility to land is limited.

Some of the interviewed women claimed that women's workloads are too heavy. Women do not have time to rest resulting in body aches.

In many cases social services are not available in the villages; as a result women walk long distances for medical care, collecting firewood, fetching water, milling cereals and marketing farm produce.

The majority of rural women are not educated. Only a few young ones have reached standard seven while the old leaders are still traditionalists dominated by cultural beliefs, easily accepting men's chauvinism.

c.3.3 Women's Participation in Village Meetings

More than half of the interviewed women's groups reported to participate in village meetings while about 10% did not participate and the rest (about 20%) said nothing. In almost every village, seven women are members of the village government though attendance in these meetings is low. Some of the women who are members of the village government are also elected as members of village sub-committees.

The reasons for not participating in the meetings were that in some cases they were not invited to meetings and when invited, they had no time to do so because of many household chores. The results show that women's participation in village meetings is relatively good; although it was revealed that women usually do not express their views and tend to keep silent. There are many factors contributing to such behaviour including poor formal education background that cause a lack of confidence among women.

Nearly 30 % of the interviewed women's groups reported that they belong to economic/credit groups. They are involved in embroidery, livestock keeping and teashops. Group members range from seven to ten people.

c.3.4 Women Decision Making Roles at Household Level

Women make decisions on the behaviour of children and type of food to cook. Women's participation in decision-making depends on the issues to be discussed. For example, women can contribute nothing to decisions concerning money. Men at household level control decisions. Men even sell crops without telling their wives. In most families men make the decisions. Women are given instructions. In few households, however, there is collaboration between husbands and wives.

c.3.5 Members of Women's Groups

The survey revealed that 82% of the interviewed women reported to have women's groups in their villages. Their activities include, among others, tree planting, chore mobilization, credit groups, livestock keeping, fish selling, embroidery and gardening. 17% reported that they do not have any group.

c.3.6 Training Programme for Women's Groups

70.6% of the interviewee reported that no training programmes have ever been organized in their villages for women. The reason for the situation is not known. Only 29.6% reported to have training provided for women. For example, UVUMAKI in Tarime district provided training on how to use loans effectively for income generating activities. Other groups received training on book keeping, livestock keeping, and cotton farming.

c.3.7 Supporting Areas for Empowerment of Women

There are some supporting areas for the empowerment of women suggested by participants during the discussions.

(1) Training concerning water supply services and income generating projects;

(2) Sensitizing communities on tree planting; and

(3) Development of alternative sources of energy to help to reduce working hours for women

c.3.8 Benefits expected from New Water Project

Benefits to be obtained as a result of provision of the new water system are identified as follows.

(1) To reduce incidences of diseases and improve the health of families

(2) To allow children to go to school instead of fetching water

(3) To give women more time to look after children

(4) To be able to obtain clean water

(5) To give opportunities for the villagers to become involved in other economic ventures such as irrigation and gardening.

(6) To make available water for school children.

c.3.9 Contraceptives Methods

17.6% of the interviewed women reported to use contraceptives, while the rest are using nothing. There are many factors of not adopting contraceptive methods; the main ones are low education on the benefits of family planning, reluctance of men to accept methods, and low formal education among women and men. The community has low trust in the contraceptives methods as they believe they can cause cancer. This is because some women when using contraceptives methods experience too much bleeding.

Most women use injections rather than pills. Traditional methods have been forgotten. Condoms are available in shops and are used at a low rate. Therefore, regular sensitization meetings on contraceptives methods should be carried out, and advice from health workers should be provided.

c.3.10 Measures Taken When Someone Becomes Seriously Ill or Injured

The majority of the respondents claimed to buy drugs from medical stores before reporting to the medical services when one gets sick or injured. 94.1% reported to use a dispensary or health centre in the village or nearby villages, if the case gets serious the district hospital is visited for further treatment. 29.4 % use traditional medicines and herbs. Few said they pray to God for quick recovery.

c.3.11 Preventive Health Measures Used

76.4% of interview indicated they use bed nets while 46% said they wash their hands before eating. Only 41% reported the bury rubbish. Very few people boil water for drinking. Few use toilets, condoms or wash clothes properly. Health officers carry out campaigns on malaria and HIV preventive as well as family planning and polio vaccination.

c.3.12 Health Extension Workers

Extension workers and TBAs train communities. 17.6% reported that campaigns on childcare and preventive health measures have taken place. Primary health workers rarely sensitize women on hygiene and nutrition.

c.3.13 Other Comments

Other comments expressed during the discussions include:

(1) Women lamented that it is difficult to get credit though badly needed.

(2) Women would like to develop their groups but do not have means.

(3) Would like to be trained on water facility management, use and other social aspects

(4) Would like to be supported by JICA in women's economic groups.

(5) More sensitization and education needed at village level especially on hygiene and sanitation issues

(6) Would like to request the village government to call a meeting to select the water committee.

6.3 Analysis of Socio-economic Survey

6.3.1 Water Demand of the Communities

Out of the data obtained as a result of the socio-economic survey, some indicators have been selected to indicate the water demand of the communities. Such indicators include: (i) distance to water sources from each household; and (ii) water consumption volume per household or per person per day. Water users living at remote areas from the water sources will feel an urgent need to obtain water at a shorter distance to reduce time for fetching water. Water users who can get only a small amount of water per day will also feel a stronger need for the provision of an improved supply of water.

The data of indicators for each target village is presented in Appendix 3-3, Table 1 and the data for each district is summarized below.

Table 6.3-1: Indicators for Water Demand by District in Mwanza Region

District	Geita	Sengerema	Magu	Kwimba	Misungwi	Ukerewe	Nyamagana
1. Distance to water sources by percentage of households							
Near (<20 minutes)	41%	41%	22%	23%	21%	51%	100%
Far (20 to 40 min.)	30%	30%	34%	48%	50%	40%	0%
Distant (40 to 60 min.)	21%	21%	31%	25%	21%	9%	0%
Remote (>1 hour)	8%	8%	13%	5%	8%	0%	0%
2. Water consumption (litre per day)							
Per household	150	153	139	125	144	141	205
Per person	16	16	12	13	16	15	20

Source: Socio-economic Survey, JICA, 2005

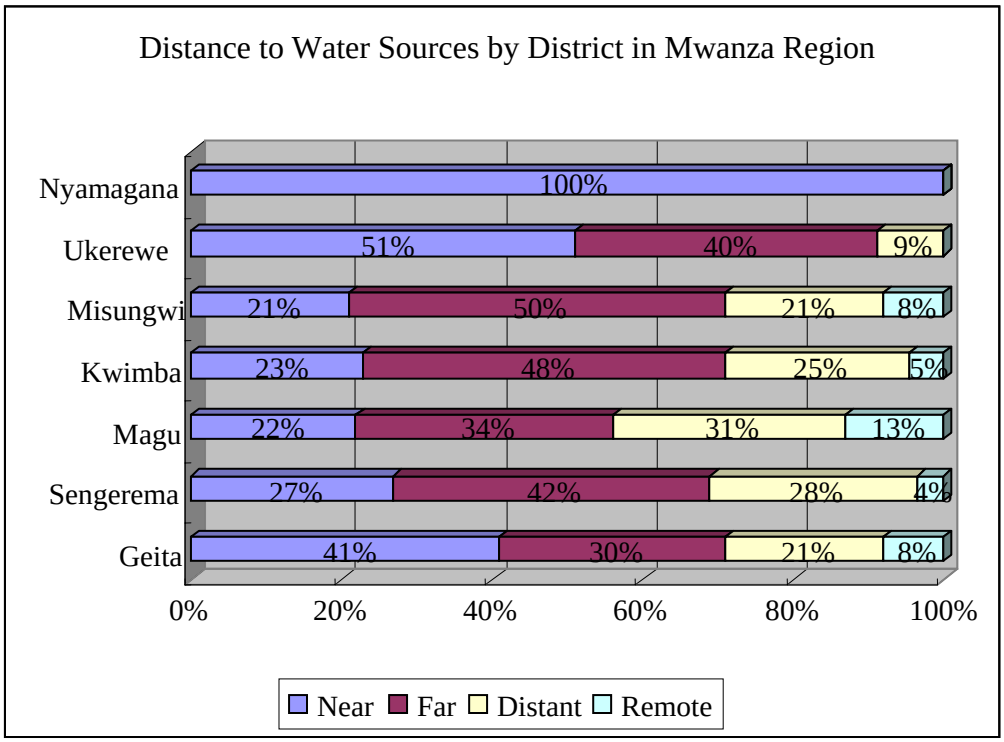

Figure 6.3-1: Distance to Water Source by District in Mwanza Region

Table 6.3-2: Indicators for Water Demand by District in Mara Region

District	Bunda	Musoma	Tarime	Serengeti
1. Distance to water sources by percentage of households				
<20 minutes	61%	56%	41%	35%
20 to 40 min.	25%	41%	36%	40%
40 to 60 min.	11%	1%	14%	20%
>1 hour	0%	0%	10%	5%
2. Water consumption (litre per day = lpd)				
Per household	142	139	167	130
Per person	16	14	17	17

Source: Socio-economic Survey, JICA, 2005

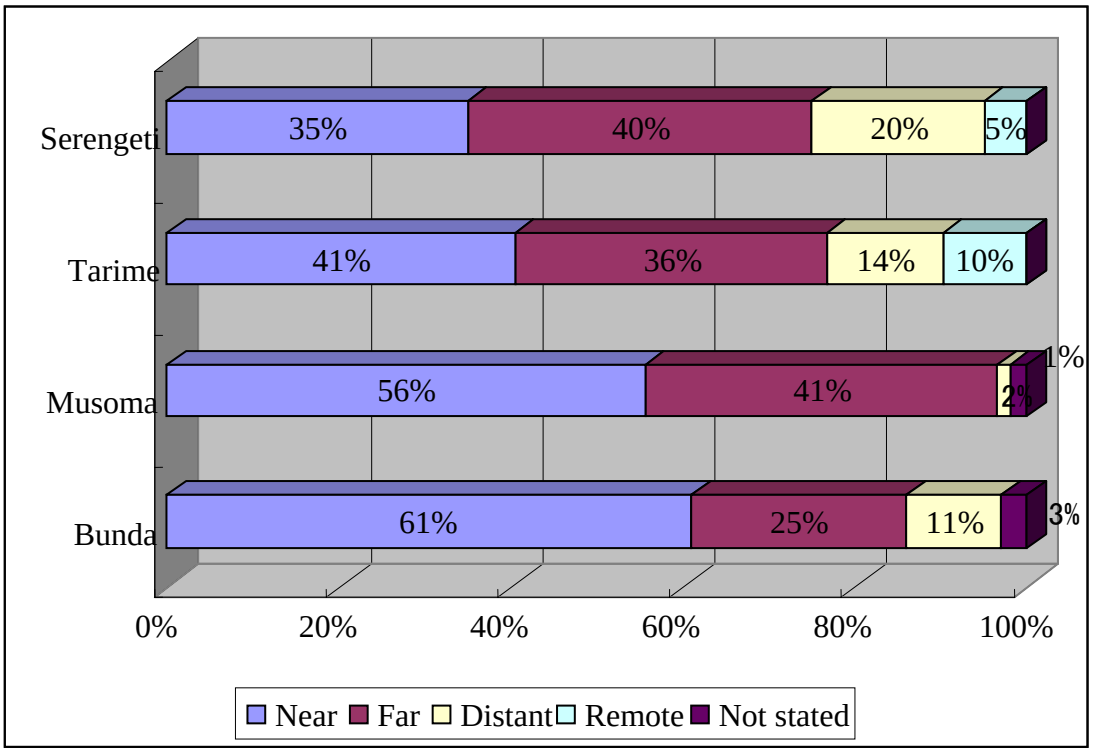

Figure 6.3-2: Distance to Water Source by District in Mara Region

6.3.2 Community Management Capacity

On the basis of the results of the socio-economic survey, some indicators have been identified for the assessment of the community management capacity for operation and maintenance activities for the future projects. Such indicators include: (i) amount of water charge and/or water fund collected by the water supply organizations; (ii) availability of O&M personnel in the community; and (iii) O&M activities conducted and some problems encountered. These indicators will show the management capacity of the water supply organizations (e.g. water committee) in the villages with the existing water supply facilities.

In the case of the villages without any water supply facilities, other indicators will be necessary to assess the management capacity. Such indicators will include: (i) project experience in the community; and (ii) community contribution to the project implementation such as provision of community fund, labour force, construction materials, etc. Project experience and community contribution will show the management capacity and the

community's strong will to implement the project.

The data for these indicators for each target village is presented in Appendix 3-3 Table 1 and the number of villages where the data was assessed is summarized below.

Table 6.3-3: Number of Villages for Assessment of Community Management Capacity in Mwanza Region

District	Geita	Sengerema	Magu	Kwimba	Misungwi	Ukerewe	Nyamagana
a. Water charge or water fund collected	7 villages	8 villages	1 village	3 villages	5 villages	1 village	0 village
b. availability of O&M personnel	8 villages	21 villages	3 village	8 villages	7 villages	6 village	1 village
c. O&M activities	Some activities in 10 villages	Some activities in 20 villages	Some activities in 3 villages	Some activities in 4 villages	Some activities in 7 villages	Some activities in 21 villages	Some activities in 2 villages
d. Project experience and community contribution	16 villages assessed	18 villages assessed	1 village assessed	3 villages assessed	0 village assessed	3 villages assessed	0 village assessed

Source: Socio-economic Survey, JICA, 2005

Table 6.3-4: Number of Villages for Assessment of Community Management Capacity in Mara Region

District	Bunda	Musoma	Tarime	Serengeti
a. Water charge or water fund collected	3 villages	6 villages	11 villages	2 villages
b. availability of O&M personnel	3 villages	12 villages	21 villages	2 villages
c. O&M activities	Some activities in 4 villages	Some activities in 11 villages	Some activities in 21 villages	Some activities in 2 villages
d. Project experience and community contribution	3 villages assessed	21 villages assessed	33 villages assessed	2 villages assessed

Source: Socio-economic Survey, JICA, 2005

6.3.3 Financial Capability of Water Users

The traditional method for assessing how much water users should pay for water has been based on their ability to pay (ATP) for water. This indicator can be estimated from the standard percentage of income assumed to be within an affordable range of the water users. The percentages of 3 to 5% of disposable income are normally used for the estimation of the APT. In this study, the percentage of 5% of monthly disposable income has been assumed to be the APT of the water users.

The monthly disposable income of the target communities has been estimated from the data from the socio-economic survey. The monthly household expenditure has been assumed to indicate the disposable income level of the households.

The data for the APT in each village is presented in Appendix 3-3 Table 1.

6.3.4 Willingness to pay (WTP) for Water

Willingness to pay (WTP) is an indicator to predict what water users (consumers) are actually going to pay for water. WTP in economic terms is the maximum value that the water users

would pay to a commodity within the prevailing conditions. In the case of a water supply project, a higher amount of WTP would indicate a stronger need of the consumers for the improved water supply system.

Two kinds of questions were made to the households members in the target villages on how much they would pay for water if the payment is made per month (monthly payment), and if payment is made per bucket (pay-for-the bucket). The category amounts for the monthly payment consists of: (i) less than 500 Tsh.; (ii) 500 to 1000 Tsh.; (iii) 1000 to 1500 Tsh.; (iv) 1500 to 2000 Tsh.; and (v) more than 2000 Tsh. The category amounts for the pay-for-the bucket consists of: (i) less than 10 Tsh.; (ii) 10 to 15 Tsh.; (iii) 15 to 20 Tsh.; and (iv) more than 20 Tsh.

The data on the WTP for each target village is presented in Appendix 3-3 Table 1 and the data for each district is summarized below.

Table 6.3-5: WTP in Household Percentage by District in Mwanza Region

District	Geita	Sengerema	Magu	Kwimba	Misungwi	Ukerewe	Nyamagana
1. Willingness to pay (households percentage based on the amount per month)							
<500 T. sh.	23%	46%	38%	30%	29%	30%	0%
500 to 1000	29%	22%	31%	30%	36%	39%	25%
1000 to 1500	9%	9%	6%	20%	14%	11%	25%
1500 to 2000	9%	11%	6%	8%	14%	7.50%	25%
>2000	31%	11%	19%	13%	7%	12.50%	25%
2. Willingness to pay (households percentage based on the amount per bucket)							
<10 T. sh.	23%	44%	25%	39%	21%	35%	0%
10 to 15	27%	20%	44%	16%	36%	22%	50%
15 to 20	24%	28%	25%	20%	32%	22%	50%
>20	26%	8%	6%	25%	11%	17%	0%

Source: Socio-economic Survey, JICA, 2005

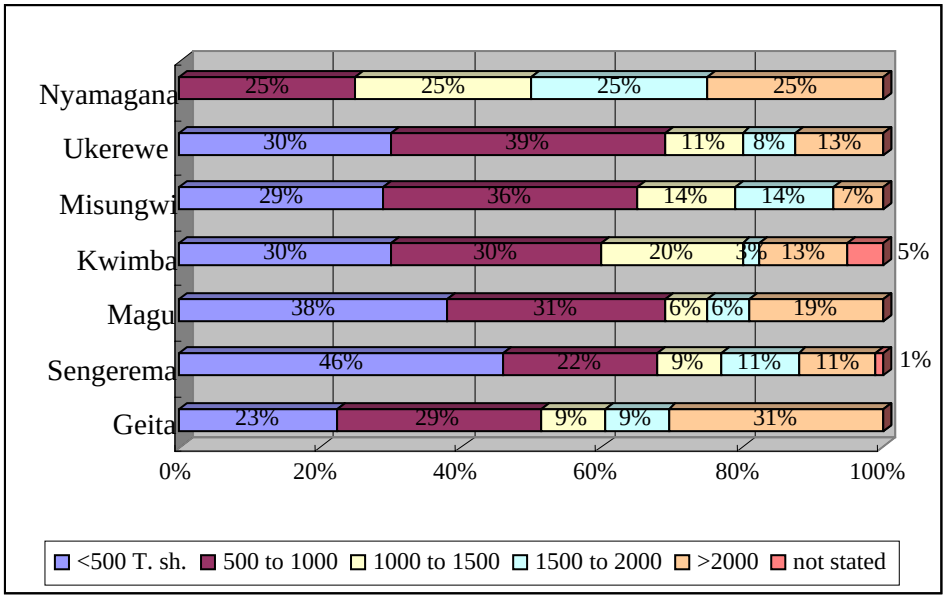

Figure 6.3-3: WTP for Monthly Payment by District in Mwanza Region

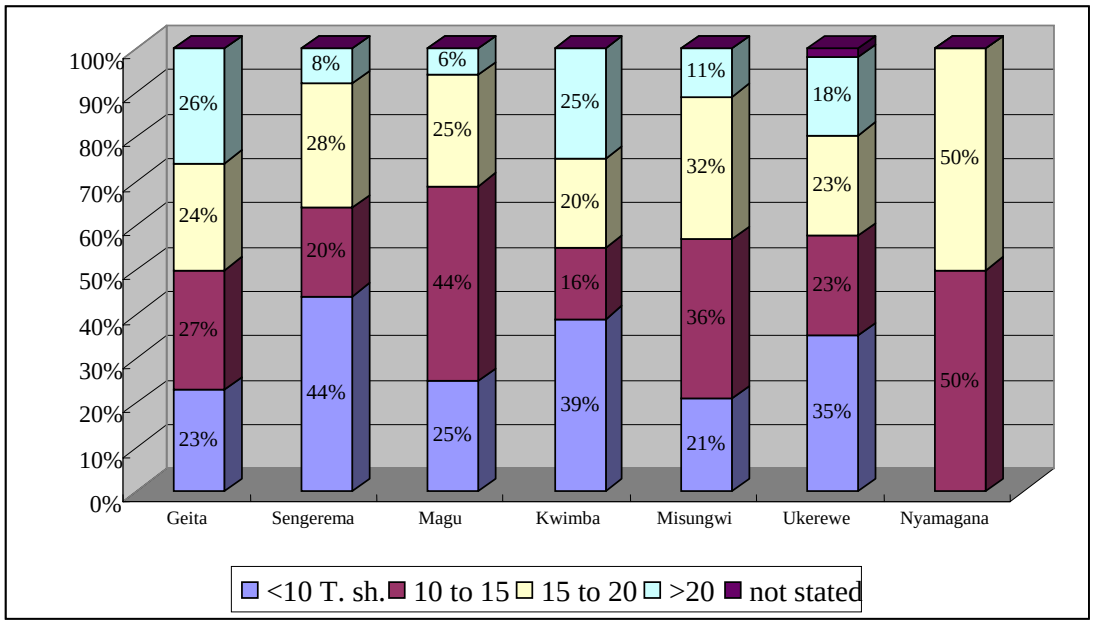

Figure 6.3-4: WTP for Pay-for-the Bucket by District in Mwanza Region

Table 6.3-6: WTP in Household Percentage by District in Mara Region

District	Bunda	Musoma	Tarime	Serengeti
1. Willingness to pay (households percentage based on the amount per month)				
<500 T. sh.	14%	20%	7%	45%
500 to 1000	50%	18%	53%	30%
1000 to 1500	21%	13%	12%	0%
1500 to 2000	7%	28%	17%	5%
>2000	7%	19%	11%	20%
2. Willingness to pay (households percentage based on the amount per bucket)				
<10 T. sh.	21%	19%	23%	45%
10 to 15	61%	23%	34%	20%
15 to 20	4%	32%	34%	30%
>20	14%	24%	8%	5%

Source: Socio-economic Survey, JICA, 2005

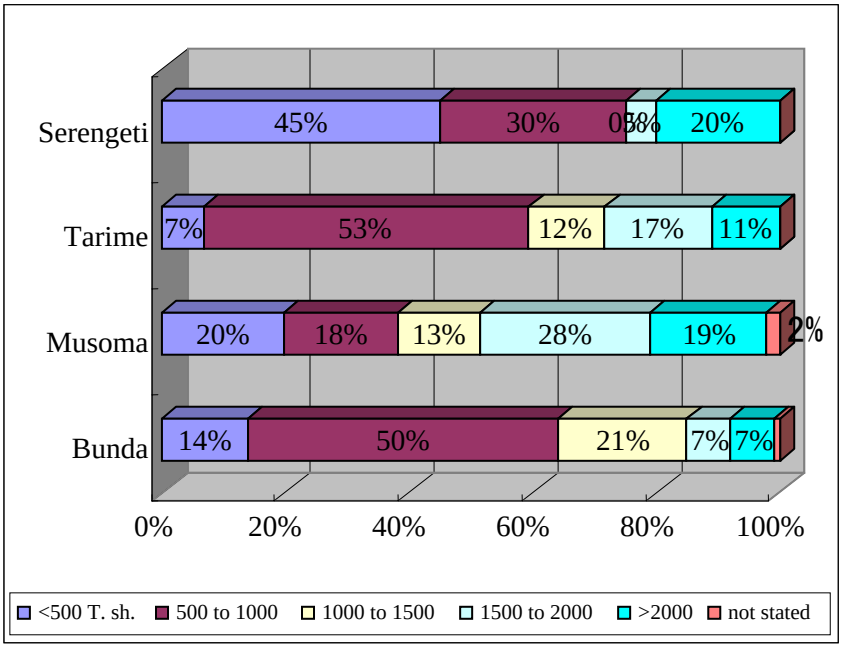

Figure 6.3-5: WTP for Monthly Payment by District in Mara Region

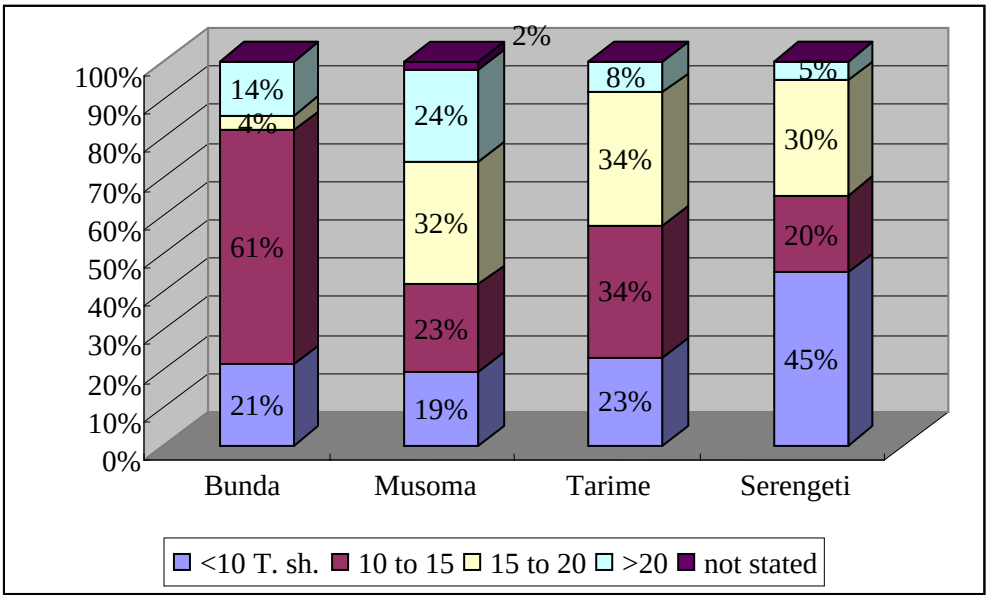

Figure 6.3-6: WTP for Pay-for-the Bucket by District in Mara Region

6.4 Supplementary Survey

Out of the 57 piped schemes selected for the water supply plan, 17 piped schemes were proposed as the candidate schemes for early implementation.

In this regard, a socio-economic supplementary survey was conducted during February and March 2006 in order to obtain basic information on the socio-economic conditions in the 77 villages covered by the 17 piped schemes.

6.4.1 Objectives

The main objectives of the socio-economic supplementary survey are: (i) to obtain the basic socio-economic data of the candidate villages for the prioritization of the schemes; (ii) to obtain basic data for the calculation of the project benefits; and (iii) to obtain data for the formulation of the O&M plan.

6.4.2 Methodologies

a. Target Villages

The survey was conducted in 77 villages distributed in 7 districts as presented in the following table.

Table 6.4-1: Target Villages for the Socio-economic Supplementary Survey

District	Name of Scheme	Villages covered by the existing facility	Villages to be coverd by the future plan
Misungwi	Usagara	Usagara	Nyang'homango, Fella
	Ukiriguru	Mwalogwabagole, Ngudama, Nyang'holongo, Buganda	Mwagala, Nyamatala
Geita	Nyakagomba	Chikobe, Kabugozo, Chigunga, Nyakagomba, Kitigiri, Chankolongo, Busaka, Bukondo	Nyamwilolelwa, Mwenegezi, Isima
	Nyang'hwale	Nyang'wale, Ibambila	Nyaruguguna, Kaseme
	Kharumwa/Msalala	Kharumwa, Nyantukuza, Kakora, Nyarubele, Kitongo, Kabiga, Izunya, Kayenze, Bukwimba, Ikangala	Nyang'holongo, Bumanda, Bukungu,
	Nzera	Nzera	Sungusira, Nyamboge
Sengerema	Sima	Sima	
	Luchili	Luchili, Nyakasingwa, Nyanzenda	Migukulama
	Nyakaliro	Nyakaliro	
Ukerewe	Gallu,	Gallu	Nakamwa, Busangu, Murutilina, Masonga
	Muriti	Bugala, Itira	Ihebo, Igongo, Muriti, Kamaya
	Kagunguli/ Bukindo	Bukindo, Kagunguli	Buguza, Muhande, Bugombe, Nansole, Bulamba
	Bukonyo	Bukonyo	Kitangaza, Namilembe
Magu	Kabila/Ndagulu	Kabila, Ndagulu	Kayenze B, Ng'washepi
Kwimba	Mantare	Mantare, Ishingisha	
Tarime	Nyamagaro	Nyang'ombe, Muharago	Manila, Rwang'enyi
	Kyangasaga	Kyangasaga	

b. Methodology and Survey Items

An interview with two kinds of questionnaires was conducted in each target village with the village leaders including, among others, a village chairperson, a village executive officer, village committee member, water committee members, school teachers and group leaders on the basic socio-economic information of the village.

Two questionnaires were prepared for each village. One questionnaire (village survey sheet) included such survey items as: (i) number of sub-villages, (ii) number of households; (iii) electrification; (iv) household income (4 samples); (v) availability and activities of water committee (WC) or water user group (WUG); (vi) experience of development projects; (vii) the water use situation; (viii) water supply facilities; (ix) willingness to pay for the water charge; and (x) average medical expenses per household.

Another questionnaire (O&M survey sheet) included such survey items as: (i) availability of organization responsible for O&M activities; (ii) O&M activities; (iii) reason for breakdown of the facility; (iv) procurement of spare parts; (v) collection of water fee; (vii) experience of repair; (viii) support from DWE; and (ix) health conditions in the village.

6.4.3 Survey Results

The survey results are summarized in the following table. The detailed data are presented in the Data Book.

Table 6.4-2: Summarized Results of the Socio-economic Supplementary Survey

1. Usagara Piped Scheme in Misungwi District

Situated in the northern part of Misungwi district, the scheme was designed for water supply for the Usagara community with the design population of 600. The construction of the facility was completed in 1961 with water source from a borehole (BH). The water supply stopped recently. DWE was responsible for O&M of the facility. Presently main water sources are hand pumps (50%) and hand dug wells (50%) in the Usagara community. In other villages, traditional water sources are extensively utilized.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Usagara	769	91,667	Ttraditional water sources (TWs) and shallow wells with hand pump (SWs)	TWs and SWs	Tsh 1500 per year	1500-2000
Nyang'homango	569	107,375	TWs (charco dam, dug wells, etc.)	TWs (charco dam), SWs	Tsh 1,000 per HH per year	500 to 1000
Fella	597	43,333	TWs, river	TWs, HP (borehole well with hand pump)	Tsh 1,000 per HH per year	500 to 1000

2. Ukiriguru Piped Scheme in Misungwi District

Situated in the northern part of Misungwi district, the scheme was designed for water supply for 4 villages with the design population of 4,000. The construction of the facility was completed in 1961 with water source from a lake. Water supply stopped in 2003. Ukiriguru Agricultural Institute was responsible for O&M of the facility. Presently main water sources are traditional water sources as hand pumps are unable to provide water during dry season.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Mwalogwabagole	545	11,173	TWs, lake Victoria	SWs, Tws	Some amount collected	Less than 500

Ngudama,	304	38,333	neighboring village	TWs	Tsh 1,000 per HH per year	Tsh 500 to 1000
N yang'holongo	664	25,083	TWs (dug wells)	TWs (dug wells)	Tsh 200 to 500 per HH per year	Tsh 1500 to 2000
Buganda	359	69,625	HP (1)	HP, river	Tsh 10,000 per HH per year (past year)	more than Tsh 2000
Mwagala	478	27,958	TWs (dug wells)	TWs (dug wells)	Tsh 200 per HH per year	Tsh 1500 to 2000
Nyamatala	355	79,708	neighboring village	TWs	Tsh 5,000 per HH per year	more than Tsh 2000

3. Sima Piped Scheme in Sengerema District

Situated in the northern part of Sengerema district, the scheme was designed for water supply for Sima village with the design population of 750. The construction of the facility was completed in 1967 with water source from a dam. Water supply stopped in 1984 due to breakdown of the facility. DWE was responsible for O&M of the facility. Presently the main water sources are traditional water sources.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Sima	800	82,633	TWs, vendors	TWs, rain water	Amount is not recorded	Tsh 500 - 1000

4. Luchili Piped Scheme in Sengerema District

Situated in the northwestern part of Sengerema town, the scheme was designed for water supply for 3 villages with the design population of 3,500. The construction of the facility was completed in 1973 with water source from lake. Water supply was stopped since 1977 due to breakdown of the facility. DWE was responsible for O&M of the facility. Presently main water sources are traditional water sources as hand pumps are unable to provide water during dry season.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Luchili	950	33,333	TWs	TWs, SWs	Tsh 500 per HH at once	Tsh 1,500 - 2000
Nyanzenda	487	143,750	Lake	TWs	No	Tsh 1,500 - 2000
Nyakasungwa	874	100,625	Lake	TWs	No	Tsh 1,500 - 2000
Migukulama	374	48,958	TWs	TWs	Tsh 300/HH/year	Tsh 1,500 - 2000

5. Lugasa Piped Scheme in Sengerema District

Situated in the northwestern part of Sengerema district, the scheme was designed for water supply for a health centre at Lugasa sub-village in Nyakarilo village with the design population of 900. The construction of the facility was completed in 1968 with water source from a lake. Water supply stopped in 1982 due to breakdown of the pump. DWE was responsible for O&M of the facility. Presently main water sources in dry season are a lake, SWs and traditional water sources.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Nyakarilo	1,086	21,854	Lake (50%), TWs (25%), SWs (25%)	TWs	No	Tsh 500 - 1000

6. Mantare Piped Scheme in Kwimba District

Situated in the northwestern part of Kwimba district, the scheme was designed for water supply for 2 villages with the design population of 1,600. The construction of the facility was completed in 1977 with water source from a lake. Water supply for Ishingisha village stopped in 1984, while that for Mantare stopped in 1998. DWE was responsible for O&M of the facility. Presently main water sources are traditional water sources.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Mantare	334	100,208	TWs, SWs	TWs, SWs	Tsh 1,000 per HH per evry	Tsh 500 to 1000

					two months (Tsh 500 per month)	
Ishingisha	630	106,042	TWs (dug wells, etc.)	TWs, SWs	Tsh 1000 to 3000 per HH	Tsh 500 to 1000

7. Kabila/Ndagalu Piped Scheme in Magu District

Situated in the southeastern part of Magu town, the scheme was designed for water supply for 2 villages with the design population of 3,150. The construction of the facility was completed in 1974 with water source from a borehole. Water supply stopped in 1992 due to breakdown of the pump. DWE was responsible for O&M of the facility. Presently main water sources are traditional water sources.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Kabila	720	57,823	HP	HP, charco dam. rain	no	Tsh 500
Ndagalu	660	30,219	HP, river	HP, TWs	Tsh 500 per penalty	Tsh 500
Kayenze B	420	113,033	River	SWs, TWs	Tsh 1,000 per HH as a revolving fund	Tsh 500 to 1000
Ng'washepi (Mwashepi)	301	103,375	SWs and TWs	SWs, TWs, rain water	Tsh 1,000 per HH as a revolving fund	Tsh 500 to 1000

8. Kharumwa/Msalala Piped Scheme in Geita District

Situated in the southeastern part of Geita district, the scheme was designed for water supply for 10 villages with the design population of 18,283. The construction of the facility was completed in 1973 with water source from a lake. Water supply stopped in 1990 due to breakdown of the facility. DWE was responsible for O&M of the facility. Presently main water sources in the villages situated in the northern part of Kharumwa village are a lake and traditional water sources. Some villages along the road can receive water from water points of Kahama goldmines. TWS are the main water sources for the villages situated southern part of the area.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Nyamtukuza	267	72,917	Kahama goldmines water points, Lake	TWs, Lake	Tsh 1,500 per HH per year	Tsh 1500 to 2000
Kakora	521	43,958	Lake	TWs, SWs (2)	Tsh 300/HH/year	Tsh 500 to 1000
Kharumwa	900	10,313	neighboring village (Kayenze)	TWs, SWs (2)	no	less than Tsh 500
Nyarubele	300	74,792	TWs (3)	TWs (3), SW	No	Tsh 500 to 1000
Ikangala	206	43,302	TWs, pipeline supply of Kahama Mining Co.	TWs, rain water, pipeline supply of Kahama Mining Co.	No	Tsh 500 to 1000
Kitongo	322	102,500	Kahama goldmines water points, Lake	TWs (6)	Tsh 54,798 per sub-village	Tsh 1000 to 1500
Kabiga	450	33,333	Lake	Lake, SWs (3)	Tsh 300/HH/year	Tsh 1000 to 1500
Izunya	329	68,438	SW (1), charco dam	TWs (12), SWs (3)	No	less than Tsh 500
Kayenze	702	100,000	TWs (2)	TWs (7)	No	Tsh 500 to 1000
Bukwimba	446	67,375	TWs (1), HP	TWs (6), HP	Tsh 50 per HH per month	Tsh 500 to 1000
Nyang'holongo	254	90,000	neighboring village	TWs (5)	Tsh 200 per HH	more than 2000

Bukungu	316	200,000	TWs (8), HP (1)	TWs (18), HP (1)	No	Tsh 1500 to 2000
Bumanda	406	251,875	Kahama goldmines water points, TWs (3)	Kahama goldmines water points, TWs (9)	Tsh 1,000 per HH	Tsh 1500 to 2000

9. Nzera Piped Scheme in Geita District

Situated in the northern part of Geita district, the scheme was designed for water supply for a health centre at Nzera village with the design population of 900. The construction of the facility was completed in 1978 with water source from a lake. Water supply stopped in 1990 due to breakdown of the facility. DWE was responsible for O&M of the facility. Presently main water sources are traditional water sources.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Nzera	1,242	34,375	TWs (4)	TWs (4), SWs (7)	Tsh 1,000 per HH	more than Tsh 2000
Sungusira	1,234	261,667	TWs (6)	TWs (15)	No	more than Tsh 2000
Nyamboge	873	118,333	Lake	TWs (6)	No	Tsh 500 to 1000

10. Nyang'hwale Piped Scheme in Geita District

Situated in the southeastern part of Geita district, the scheme was designed for water supply for 2 villages with the design population of 2,624. The construction of the facility was completed in 1980 with water source from a borehole. Water supply was made only for Ibambila village for about 2 years. DWE was responsible for O&M of the facility. Presently main water sources are traditional water sources.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Nyang'hwale	424	79,167	TWs (6)	SWs (2), TWs (6)	Tsh 500 per HH	Tsh 1500 to 2000
Ibambila	255	75,208	TWs (2)	TWs (10), SW	No	Tsh 500
Nyaruguguna	230	89,583	SW (1), TW (1)	SWs (4), TWs (9)	Tsh 200 per HH	Tsh 1500 to 2000
Kaseme	294	42,708	TWs (3)	TWs (10)	No	less than Tsh 500

11. Nyakagomba Piped Scheme in Geita District

Situated in the western part of Geita district, the scheme was designed for water supply for 8 villages with the design population of 18,369. The construction of the facility was completed in 1973 with water source from a lake. The scheme was initiated in 1975 by Tanzania Cotton Project, but water supply has never been carried out since the completion of the facility. The scheme was transferred to Tanzania government in 1984, but the operation has so far not conducted. Presently main water sources are traditional water sources.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Kabugozo	345	47,479	TWs (2), SW (1)	TWs (11), SWs	Tsh 20 per bucket	Less than Tsh 500
Chigunga	678	92,208	TWs	TWs, SWs (3)	No	Less than Tsh 500
Chikobe	594	49,208	Lake, TW	TWs, SW	Tsh 10 per bucket (HP)	Tsh 1500 to 2000
Nyakagomba	719	22,042	TWs (dug wells, etc.)	SWs (3), TWs (dug wells, etc.)	Tsh 3000 per HH per year	Tsh 500 to 1000
Kitigiri	200	50,646	TWs	TWs	No	Tsh 1500 to 2000
Chankolongo	490	50,000	TWS (3)	TWs (9)	No	Tsh 1500 to 2000
Busaka	243	18,542	TWs (2)	TWs (11)	No	Less than Tsh 500
Bukondo	840	132,396	TWs (4), lake	TWs (7), lake	No	Tsh 500
Nyamwilolelwa	840	71,458	TWs (3)	TWs (6)	Income generating activities	Tsh 500 to 1000

Mwenegeza	427	29,500	TWs (4)	TWs (34)	No	Tsh 1500 to 2000
Isima	516	259,812	Nyambyambo Stream	TWs	No	Tsh 500 to 1000

12. Gallu Piped Scheme in Ukerewe District

Situated in the northwestern part of Ukerewe district, the scheme was designed for water supply for Gallu village with the design population of 2,429. The construction of the facility was completed in 1971 with water source from a lake. Water supply stopped in 1990 due to breakdown of the pump. DWE was responsible for O&M of the facility. Presently main water sources are traditional water sources.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Gallu	718	249,792	Lake	TW, SW, hand dug well	Tsh 200 per HH when necessary	Tsh 500 to 1000
Nakamwa	481	101,042	TW	TW, SW, hand dug well	Tsh 1000 per HH	Tsh 500 to 1000
Busangu	531	44,583	Lake, TWs	TWs, SWs	Tsh 100 to 1,000 per HH per year	Tsh 500 to 1010
Murutilima	840	24,596	TW, Lake	TWs	No	Less than Tsh 500
Masonga	793	50,750	Lake	Lake	Tsh 150 per HH per month	Tsh 200

13. Muriti Piped Scheme in Ukerewe District

Situated in the western part of Ukerewe district, the scheme was designed for water supply for 3 villages with the design population of 6,853. The construction of the facility was completed in 1976 with water source from a lake. Water supply stopped in 1989 due to lack of budget for the operation. DWE was responsible for O&M of the facility. Presently main water sources are traditional water sources and lake water.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Muriti	1,250	129,167	TWs	SWs, TWs	Tsh 500 to 2000 per HH	Tsh 500 to 1000
Itira	440	15,896	TWs	Lake, TWs	No	Tsh 200
Bugula	955	45,625	SWs and TWs	Lake	Tsh 1,000 per HH per year	Tsh 500
Igongo	360	85,625	TWs	TWs	No	Tsh 500 to 1000
Kameya	975	28,115	Lake, TWs	SWs, TWs	No	Less than Tsh 500
Ihebo	422	38,458	Lake	SWs, TWs	Tsh 6,000 per HH per year	Tsh 200

14. Kagunguli/Bukindo Piped Scheme in Ukerewe District

Situated in the eastern part of Ukerewe district, the scheme was designed for water supply for 2 villages with the design population of 5,470. The construction of the facility was completed in 1968 with water source from a lake. Water supply stopped in 2000. The operation of the scheme was transferred from DWE to a local NGO but was not successful. Presently main water sources are traditional water sources and lake water.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Bukindo	235	96,875	Lake	Lake, TW	No	Tsh 500 to 1000
Kagunguli	1,500	71,875	SW (25%), TW (75%)	SW (75%), TW (25%)	No	na
Buguza	685	79,708	Lake	Lake, TW	No	Tsh 500 to 1000
Muhande	400	156,458	Lake	TW	No	Tsh 1000

Nansole	315	31,458	Lake	TW, SW	Tsh 500 per HH	Tsh 500 to 1000
Bulamba	615	89,583	Lake, spring	Spring, SWs, hand dug well, rain water	exact amount not remembered	Tsh 500 to 1000

15. Bukonyo Piped Scheme in Ukerewe District

Situated in the western part of Ukerewe district, the scheme was designed for water supply for Bukonyo village with the design population of 1,257. The construction of the facility was completed in 1973 with water source from a lake. Water supply stopped in 1978 due to the breakdown of the pump. DWE was responsible for O&M of the facility. Presently main water sources are traditional water sources and lake water.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Bukonyo	247	133,750	Lake	TW, SW, hand dug well	Tsh 100 per HH	Tsh 500 to 1000
Namilembe	455	112,500	Lake, SWs, ring wells	TW, SW, hand dug well	Tsh 500 per HH	Tsh 500 to 1000

16. Nyamagaro Piped Scheme in Tarime District

Situated in the northwestern part of Tarime district, the scheme was designed for water supply for 2 villages with the design population of 4,000. The construction of the facility was completed in 1971 with water source from a borehole. Water supply stopped in 2005 due to the breakdown of the pump. DWE was responsible for O&M of the facility. Presently main water sources are traditional water sources and lake water.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Nyang'ombe	600	137,292	TWs, Lake	TW, lake, rain water	No	Tsh 500 to 1000
Muharango	604	104,792	Lake	TWs	Tsh 2,500 per HH per year (for charco dam)	Tsh 500 to 1000
Manila	385	123,083	Lake	TWs	No	Tsh 500 to 1000
Rwang'enyi	755	65,167	Lake	Springs	No	Tsh 500 to 1000

17. Kyangasaga Piped Scheme in Tarime District

Situated in the northwestern part of Tarime district, the scheme was designed for water supply for Kyangasaga village with the design population of about 2,000. The construction of the facility was completed in 1972 with water source from a lake. Water supply stopped in 1988 due to the breakdown of the pump. DWE was responsible for O&M of the facility. Presently main water sources are traditional water sources and lake water.

Village	Household (HH)	Monthly income (average)	Water sources in dry season	Water sources in rainy season	Water fee or fund collection	Willingness to pay (WTP) per month
Kyangasaga	877	37,917	Lake, SWs	TW, Lake, river	No	Tsh 1000 to 1500

Chapter 7

Investigation for Operation and Maintenance Plans

7 Investigation for Operation and Maintenance Plans

7.1 Introduction

This chapter addresses issues concerning the operation and maintenance (O&M) of the water supply facilities. In order to explore these issues, first, the ideas on operation and maintenance in national water policies and guidelines are examined as a basis for further analysis. Then HESAWA experiences in the Study Area are reviewed since the programme has formulated the main framework of water supply facilities and the management structure that is currently practiced. The results of the socio-economic surveys are analyzed in order to draw implications for O&M.

7.1.1 General issues

General issues on O&M at the regional, district and community levels are identified based on facts found through interviews and questionnaire surveys carried out by the JICA Study Team member (in charge of O&M planning) and counterparts. In particular, for the purpose of looking at issues of "sustainability", the following four issues are examined:

1) Current situation of institutional/organizational arrangement,
2) Human resources deployment and training,
3) Users' organizations, and
4) Repair and spare-parts delivery system

Based on the situation analysis and problem identification, plans for improvement are suggested after section 7.9. The plans are composed of:

1) Operation and Maintenance Plan
2) Water Supply Services Delivery Improvement Plan, and
3) Community Empowerment Plan on O&M (including hygiene/sanitation improvement)

Besides those plans, a broad outline of the 'Manual for Community Empowerment' is also introduced. At the end of the chapter, some notes for further steps are addressed.

The currency exchange rate in the chapter is based on the rate of November 1st, 2005 (1USD= Tsh 1,144.36, 1USD=JY 115.74).

7.1.2 Objectives and Methodologies

The main objectives of collecting information and analyzing the information collected on the O&M issues concerning water supply development and facility management are the following four:

1) To understand and examine the current needs and usage of water and water supply facilities
2) To understand problems and the magnitude of the problems, the reasons causing the problems and the consequences of the problems
3) To identify the gaps between concepts/guidelines and real practices being carried out on the ground
4) To reflect insights obtained through analysis of the above issues on water use, water supply and management of water facilities to formulate the O&M plans for improving the management of water supply facilities and hygiene and sanitation improvement

In order to attain the aforementioned objectives, mixed methodologies, both qualitative and

quantitative, are adopted in the Study as follows:

1) Review of available reports, literature and data
2) Interviews with relevant key institutions, personnel and professionals
3) Field visits and observation
4) Consultation/discussions with designated counterparts and water development related offices, and
5) Socio-economic Survey sub-contracted to the Tanzanian Consultants

In particular, different methodologies, such as Village Profiles, Household Interviews, Focus Group Discussions and Rapid Rural Appraisal, are deliberately mixed in the Socio-economic Survey so as not to be biased to emphasizing only qualitative results but also qualitative examination in order to get an appropriate picture of the current situation and the relationship between needs, water use and management of water supply facilities.

7.2 National Policies on O&M

As the 2002 National Water Policy (NAWAPO) reaffirms, communities are currently expected to "initiate, own, manage, operate and maintain their water schemes, including the responsibility of paying for operation and maintenance costs, so as to improve the sustainability of rural water supply schemes." [1] Along with the Local Government Reform Program (LGRP), which was started in 1997 in order to improve the delivery of services by making local authorities more autonomous, the mandate to provide basic services was transferred to "the lowest governmental administrative level" and thus the community and the district council have became two major players in the sector of rural water supply. The first question here is whether a community has enough information and capacity to have a sense of ownership of the improved water facilities and the second is whether the district council/water office has sufficient capacity to empower the community in order to ensure sustainability of the rural water facilities.

7.2.1 1991 National Water Policy

As it is widely known, before the 1991 National Water Policy (NAWAPO) was announced, the government had been taking "the supply driven implementation approach" in which the government was the "initiator, planner and provider of water services intervention in the centralized decision making system on water service allocations." [2] Thus, before the 1991 NAWAPO, water users did not pay fees and the cost for operation and management (O&M) of the water schemes.

Having realized limited impacts and unachievable targets by "the supply driven approach" of the water projects during the 1970s and 1980s, the Government of Tanzania (GOT) introduced the 1991 NAWAPO, with a new concept of "active community participation in all stages of the water projects and cost sharing." [3] In other words, the idea of a "water fee for all" was adopted with the 1991 NAWAPO. The key concepts on O&M in the 1991 NAWAPO are as follows:

[1] Vice President's Office, United Republic of Tanzania, "National Strategy for Growth and Reduction Poverty (NSGRP)" (Final Draft), 15th January 2005
[2] Tom van Miert and Deo Binamungu, Swiss Centre for Development Cooperation, "The Shinyanga Experience: Water User Group Concept as a Sustainable Management System for Hand Pump Wells", 2001
[3] ditto

＜Points of the 1991 NAWAPO regarding O&M＞

- Government and donors as the provider through project approach
- Participation of community in the entire water project cycle
- Cost sharing by the community (cash, in kind, labor)
- Water facility management through the Village Water Committee under the village governments
- Community is responsible for O&M costs
- District Water Department is responsible for rehabilitation, new construction having consultation with communities
- Protection of water sources

7.2.2 2002 National Water Policy

The revised National Water Policy was introduced in 2002, and this version incorporated various targets on water supply development in Tanzania, such as the "Development Vision 2025 for Tanzania", the "Poverty Reduction Strategy", the "Millennium Development Goals (MDGs)" [4], "Public Service Reform" and the "Local Government Reform Programme (LGRP)", which have been concurrently on-going.

The 2002 NAWAPO also reaffirms the principle that development and O&M of the rural water supply facilities are the community's responsibility, and roles of other key players in water supply services, which were not clear in the previous version of the NAWAPO, were also defined as shown in the following.

Table 7.2-1: Roles of Key Players in Water Supply Services in the 2002 NAWAPO

Key Players		Positions	Major responsibilities/ roles expected
1	Communities	• Users of improve water facilities	• Identification of water and sanitation needs • Application for assistance (based on Demand Responsive Approach) • Participation in implementation • Operation and maintenance of the improved facilities
2	Districts/Town Councils (DCs)/ District Water Sanitation Team: (DWST) [5] District Water Department	• The overall planning authority • Technical and financial support	• Preparation of investment planning and budget for the water and sanitation sector • Management of the contracting process • Provision of quality assurance and technical support • Review of the village sub-projects

[4] MDGs' targets on "water and sanitation" are; by 2015
1) to halve the proportion without sustainable water access to safe drinking water
2) to halve the proportion without the improved sanitation, and
3) to reduce by 2/3 the infant mortality rate.
As for the water access of the rural area in Tanzania, it is expected to increase the coverage of safe and clean water from 47% (2004) to 70.5% while in the urban and peri-urban areas 27% to 86.5%.

[5] DWST under the District Executive Director Office is composed of officers from various water and health related sectors such as water, health, community development, and education in a multi disciplinary way to support and empower community.

			• Coordination of players at the district level
3	Facilitation Services Providers (FSP)	• Contracted by the DCs	• To conduct the soft-component tasks such as community capacity building in planning and management of their facilities
4	Technical Service Providers (TSPs)	• Private sector to deliver services such as local private artisans	• Supply of construction materials, equipment and spare parts. • Provision of technical services including surveys, design, construction and technical supervision
5	Regional Administrative Secretariats (RAS)	• The integral role providing technical assistance to the DCs	• Provision of technical assistance to the DCs in terms of planning and budgeting
6	Regional Administration and Local Government Office (PO-RALG) [6]	• Integrated roles to provide technical assistance to DCs	• Responsible for DCs administration and human resource allocation/mobilization • Formulation and issue of planning and budget guidelines • Review and monitoring of local council expenditures
7	Ministry of Finance (MOF)	• Provision of financial transfer (conditional grants) to District Councils • Monitoring on records keeping and reporting on transfer and expenditure of DCs	
8	Ministry of Water & Livestock Dev. (MoWLD)	• The overall programme implementer	• Formulation of the sector policies • Support for capacity building • Monitoring and quality assurance • Regulating entities
9	External Support Agencies (ESAs)	• Donors, NGOs	• Provision of financial support and technical assistance, in particular, on capacity building

Sources: Ministry of Water and Livestock Development, United Republic of Tanzania, "National Water Policy 2002", July 2002, Ministry of Water and Livestock Development, United Republic of Tanzania, "National Rural Water Supply and Sanitation Programme: NRWSSP" (Draft) Vol.1, Main Report, September, 2004

[6] PO-RALG: The President's Office-Regional Administration and Local Government

7.2.3 National Rural Water Supply and Sanitation Programme (NRWSSP)

a. Approaches of NRWSSP

The 'National Rural Water Supply and Sanitation Programme (NRWSSP)' is a national programme that is coordinated and implemented by the Ministry of Water and Livestock Development (MoWLD). With a 4-year credit from the World Bank (through the International Development Association: IDB), the national programme started in order to put the new 2002 NAWAPO into practice in 2002. The specific objective of the NRWSSP is for "74% of the rural population to have sustained and equitable access to safe water and sanitation by mid-2015". To meet the objective, the project takes an approach promoting "a decentralized and demand responsive delivery mechanism" and building "the institutional foundation needed to implement the NRWSSP". [7]

The three detailed development objectives of the NRWSSP are:

1) Decentralized Demand Responsive Approach (DRA) based district implementation model

2) Physical improvement of RWSS: Improvement of water supply and sanitation condition

3) Institutional strengthening and development of NRWSSP: Stakeholder agreement and endorsement of NRWSSP and the strategy

This programme was started in three pilot districts, namely Kilosa, Mpwapwa and Rufiji, in financial year 2003/2004, and according to the plan in 2004, it was expected to expand to 103 identified rural districts of mainland Tanzania by June 2006. However, by the beginning of 2005, only 12 districts have in fact been intervened due to changes of approaches (stated later).

As indicated in Figure 7.2-1, the NRWSSP emphases the three-tier structure and players for Rural Water Supply Development at the district, in between district and village (community), and village levels. The different levels of implementers in the NRWSSP, their roles and relations are summarized in the table below.

Table 7.2-2: Different Levels of Players of the NRWSSP, Their Roles and Relations

Level	Implementers		Roles/Notes
National	1	Rural Water Supply Dept: Project Coordinating Unit	1) Coordinating and monitoring the activities 2) Orientation of technical and procurement issues 3) Channeling funds to the **districts** 4) Providing support to the **DWST**
(Region)	(2)	(Regional Consultancy Unit)	**1) Formal Structure at the regional level has not been identified yet while the need of assisting/coordinating districts is recognized.** 2) (The Former RCU will not be used any more and resources are directly allocated to the DWST (DC) for RSSP implementation) **3) Basin Water Offices and Regional Secretariats** are expected to provide support to

[7] MoWLD, National Rural Water Supply and Sanitation Programme: NWSSP (Draft) Vol. 1, Main Report, September 2004, Executive Summary p. iii

			districts
District	3	**District Councilor**	As community leaders in the area and as policy maker in the council: 1) Farming policies and by-laws (=local rules) on water and sanitation 2) Approval of district water and sanitation plans 3) Monitor progress at the community level
	4	**District Council leaders:** Executive Director (DED)/ District Commissioner (DC)/ Council chairperson	Responsible for coordinating and directing the District Council's business: 1) Provision of leadership on discussion in the Council 2) Management of planning and administrative machinery implementing decisions 3) Leading the District Management Team monitoring/overseeing the work of the DWST (DED as chairperson of the DWST) 4) Supervision of district level procurement 5) Signing of contract with the Service Providers
	5	**Education/Health/Water Committee**	The sub-committee of the District Council deals with social sector issues: 1) Approval and discussion on water and sanitation plans 2) Sponsor promotion and support for community managed water and sanitation facilities 3) Decision on council budgets for water and sanitation development 4) Approval of short listed service providers
	6	**District Water Sanitation Team (DWST)**	DC/DED assigns members of DWST: **1) Providing day to day leadership and coordination of water and sanitation activities in the district** 2) Planning and managing the Council's water and sanitation activities **3) Providing continuous back-up support to communities** **4) Organizing monitoring and evaluation of water and sanitation activities in the district** 5) Carrying out planning and administrative tasks to support the NRWSSP 6) Supervision of the work of DED and Water Technicians 7) Serving as communication links with all the stakeholders in the district **8) Supervision and support to service providers (ESPs and TSPs).**
	7	**Water Department**	**Serve as a focal point for rural water sanitation development in the district:**

			DWE: as secretary of the DWST 1) Leading coordination of the DWST activities 2) Supervision of and quality control for water and sanitation projects in the district 3) Leading in mobilizing partnership with private service providers and building their capacities **Water Technicians: based in the field** 1) Regular visits to the communities to monitor the work of the service providers 2) Regular visits to the communities to advise communities on O&M activities to improve water and sanitation issues ** Detailed Tasks: 1) Collecting baseline data on water and sanitation levels, water points and needs 2) Keeping records and developing data/inventory on all the water facilities 3) Assisting communities to apply for NRWSSP 4) Monitoring of the work of private service providers 5) Supervision and verification of the construction work and technical designs 6) Assisting preparation of the district water and sanitation plan and preparing reports on the field activities to the district Education/Health/Water Committee
	8	District Tender Board	1) Preparation for tenders (TORs, documents, registration, short-listing, invitation, etc.) 2) Review of tenders 3) Evaluation and approval for the award of tenders 4) Monitoring implementation of the contracts
Between District and Communities	9	Extension Workers	Field workers of Community Development, Health, and Water Dept of the District Council: 1) Leading roles during the promotion phases before the FSPs are contracted. 2) Promotion of community participation in the NRWSSP and water and sanitation through information provision/delivery 3) Monitor and back/support service providers in communities 4) Monitory and support communities, in particular at the post-implementation phase after the FSPs' contract of the work 5) Collecting baseline data on communities on

			water and sanitation 6) Producing a monthly report on the field work on water and sanitation and report to the DWST
	10	Facilitation Service Providers (FSPs)	Companies or NGOs delivering goods or services to communities to support community managed water and sanitation: "software services" 1) Mobilization, training and supporting of communities to plan, construct, finance and manage water and sanitation facilities 2) Facilitation of communities to increase awareness and take actions for hygiene, sanitation and HIV/AIDS
	11	Technical Service Providers (TSPs)	Private consultants, contractors, suppliers and NGOs operating at the district, region or national level to deliver goods and services to communities to support mainly the development of new facilities: 1) Design, planning and surveying of water supply and sanitation facilities 2) Construction 3) Supply of pumps, engines, equipment, spare-parts 4) Training of community based caretakers 5) Maintenance and repair for major faults
Ward-Village	12	Users-Community	**I) Ward Development Committee (WDC)** : composed of representatives of Ward and Village Governments: 1) Link between the District Council and Village on information delivery and distribution and compilation of applications for the NRWSSP 2) As for **Piped Schemes** encompassing more than 1 village, WDC roles are 1) Facilitation of agreement between participating villages, 2) Formulation of the management committee. 3) Monitoring of the scheme for ensuring sustainability **II) Village Government:** overall development authority and overseeing planning, coordinating and monitoring of all development activities at the village level 1) Assisting the Village Water and Sanitation Committee (VWSC) 2) Fostering and informing community participation and mobilization

			III) Village Water and Health Committees within the Village Government 1) Promotion of water and health issues 2) Making and enforcing by-laws on water and sanitation 3) Planning and lobbying for improvements for water and health in the village. **IV) Village Water and Sanitation Committee (VWSC):** formed by users to plan and manage water and sanitation facilities on behalf of the 'user community', either based on - single water source or - piped scheme covering multiple villages. 1) Leading community in the planning and building of new water and sanitation facilities through conducting meetings 2) Taking responsibility for O&M of the facilities 3) For O&M, raising funds from the user community and managing it 4) Keeping finance and meeting records 5) Facilitation of hygiene, sanitation and HIV/AIDS education and planning **NOTE**: 'Water and Sanitation (WATSAN) Committee' in the NRWSSP concept is **not the same** basis of the formation as the VWC or VHC, as it is formed in the Study region. **V) Users (Household level): the primary client** 2) Making demand for new water facilities by participating in planning, developing and managing the facilities 3) Preparation of a proposal for community water with a facility management plan 4) Choosing types of water technology for the new facilities 5) Contribute labor and materials for construction 6) Selecting caretakers for the facilities 7) Monitoring the work of the service providers 8) Monitoring and evaluation of the O&M activities

Source: MoWLD, "Mid-Term Review Report on the Rural Water Supply and Sanitation Programme (RWSSP)", January 2005, MoWLD, "District Operational Manual" NRWSSP.

In the structure of the NRWSSP, the position of the District Council, through DWST as managers of the NRWSSP, came to be very significant. On the other hand, the standpoints and roles of the Regional Secretariats or Basin Water Offices are not clearly stipulated in the guideline.

When considering the context of Mwanza and Mara regions, the capabilities of some districts, in terms of technical service provision and financial foundation, are still not strong enough while these districts are expected to be autonomous to manage all the required services within the districts by themselves.

The total investment requirement of the RWSP, to achieve the 74% of safe water coverage by mid-2015, was estimated at a cost of USD533 million (equivalent to JY61.34 million).

b. The NRWSSP in the Study areas: Changes from the Initial Plan

In the initial plan, the districts of Mwanza and Mara regions were included as the 103 identified target districts where the programme was to intervene by June 2006. However, according to the programme coordinator of the NRWSSP based in Dar as Salaam, it was decided that the modality of intervention/support by the World Bank (WB) on the rural water supply sector was shifted from project intervention to support through the Sector Wide Approach (SWAPs), in which the WB pursues multi-donor financing to the NRWSSP and the pooled sector budget. As a consequence of the change in the support modality and approach, the plans to construct and rehabilitate the improved water facilities and capacity development associated with the physical development in the Study area were cancelled.

For example, in Musoma rural district in Mara region, the district council has formed the District Water Sanitation Team (DWST: Refer to the figure of the intended structure for the NRWSSP) in 2004 in responding to the instruction of the NRWSSP program.[8] The DWST of Musoma District is composed of the District Executive Director (DED) as chair person, District Planning Officer (DPLO) as vice chair person, District Water Engineer (DWE) as secretary and District Treasurer, District Education Officer (DEO), District Community Development Officer (DCDO) and District Health Officer (DHO) as members complying with the instruction in the “District Operational Manual (DOM)” of NRWSSP.

The Musoma DWST has held two meetings so far, and one District Education/Health/Water Committee (= the steering committee at the district level which is reporting to District Councils) meeting was also held in order to select 10 candidate villages for the NRWSSP in 2004. However, due to the change of the support approach for the RWSSSP in the beginning of 2005, the Musoma DWST has not been active, and the DWST is not certain what it should do at this moment.

[8] Information was obtained from the Musoma DWE through interview.

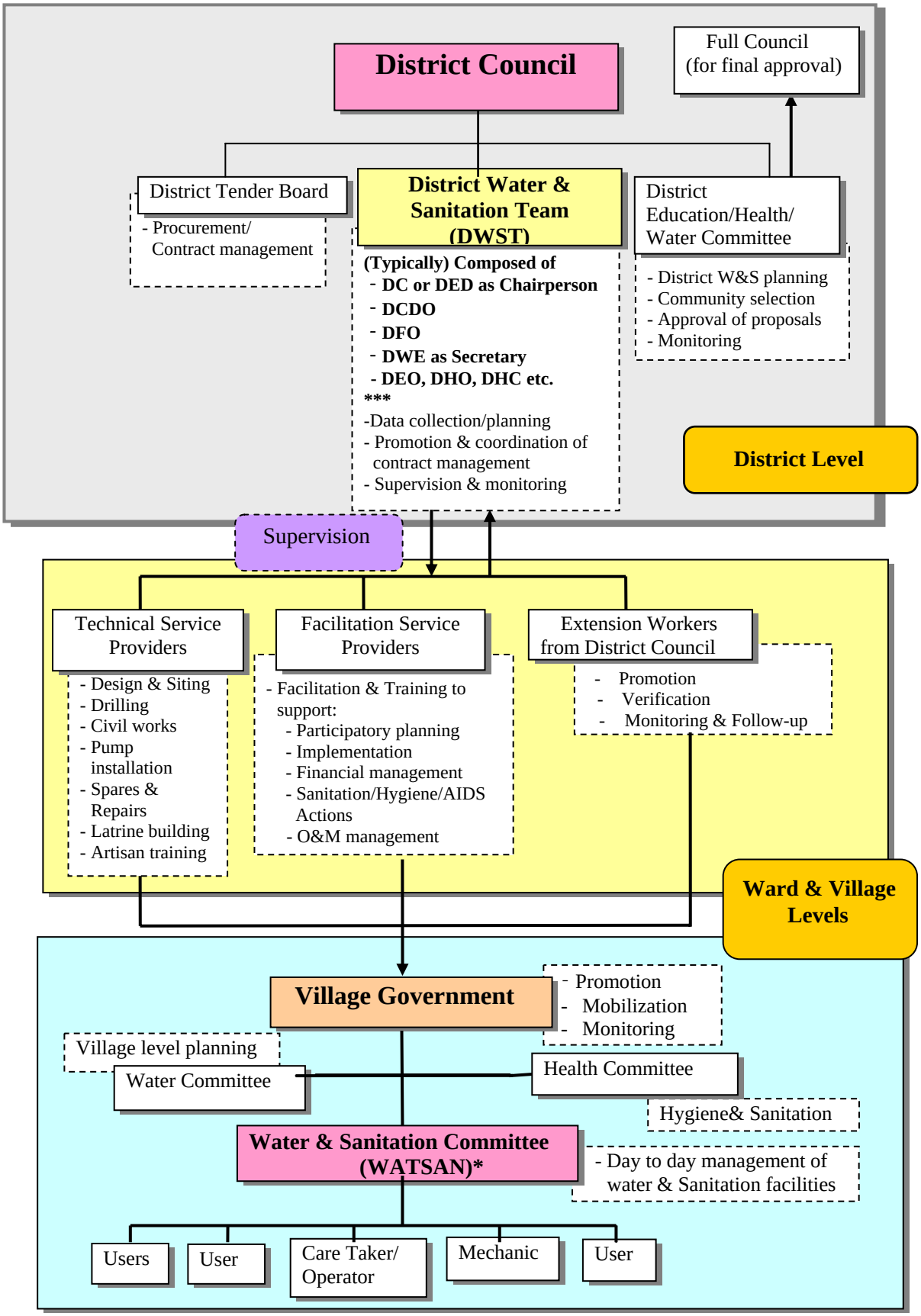

Figure 7.2-1: Intended Implementation Structure by NRWSSP at District

Note: * WATSAN in the NRWSSP is based on single water pipe scheme covering 1 or more than 1 village while VWC/VHC in the Mwanza and Mara region context are based on a single village to oversee and manage water supply and sanitation activities within the village.

c. Mid-term Review of the NRWSSP, 2005

The MoWLD had undertaken the mid-term evaluation of the NRWSSP from August 2004 to January 2005 in order to review the design, objectives, expenditure, and achievements of the program. [9] According to the report, the 'Decentralized DRA Model', which is the 1st objective of the RWWSP, has been operational in the 12 districts [10]. The progress of 'improved water supply and sanitation', the 2nd objective of the NRWSSP which 75% of the total budget is spent for, is as shown in the following table:

Table 7.2-3: Progress of 'Improved Water Supply and Sanitation' in NRWSSP

SUB-project Completion Status	No of sub-projects		No of District
	Planned	Actual	
Completed sub-projects	30	17	3
Sub-project preparation done but construction not started	105	105	12
Small town sub-project under preparation	6	4	6

Source: MoWLD, "Mid-Term Review Report on the Rural Water Supply and Sanitation Programme (RWSSP)", January 2005.

The review report says that the RWWSP project would likely achieve only 50% of the original target of 250 communities by June 2006. It also states that sanitation improvement is not significant compared with the progress of water supply improvement. As for the 3rd objective, that is 'institutional strengthening and development of NRWSSP' through 'stakeholder agreement and endorsement of NRWSSP and the strategy', the draft of the NRWSSP was prepared in 2004, and the concept document and an operational manual would be available in 2005. The lessons learned are summarized by looking at four different categories of actors in the NRWSSP in Table 7.2-4 (refer to the intended project implementation structure mentioned previously as well as Figure 7.2-1).

Table 7.2-4: Lessons on Organizational Arrangement at Four Different Categories

Categories of Actors		Lessons
1	RWSD-PCU	• Much time spent assisting the DWST in planning, designing, tendering and contracting sib-projects
2	DWST	• Lack of capacity to monitor and support community water and sanitation committee, in particular in the post-construction period while post-construction monitoring is critical to enhance sustainability of the facilities

[9] MoWLD, "Mid-Term Review Report on the Rural Water Supply and Sanitation Programme (RWSSP)", January 2005.

[10] The three Districts are: Rufiji (Coast Region), Kilosa (Morogoro region) and Mpwapwa (Dodoma Region).
The Twelve Distircts are: Morogoro(R), Handeni, Kiteto, Kondoa, Kongwa, Manyoni, Singida (R), Iramba, Igunga and the three mentioned above.
The six Small Towns are: Igunga, Kiomboi, Manyoni, Kondoa, Kongwa and Kibaya.
No district in Mwanza and Mara has been involved in the RWSS so far.

		• DWST needs to measure the effectiveness of implementation (having evaluation indicators) • While DWST is composed of multi-sectoral representation, DWE plays an overwhelmingly major role. Roles and responsibility need to be shared among the DWST members. • Need of functional and reliable information system for the existing water resources, water supply, and sanitation conditions in the district. • Need of facilitation of information sharing within relevant offices in regions and districts, and within communities
3	ESPs and TSPs	• Private sector needs capacity building not only for material support and credit facilities, but in training of participatory methods, facilitation and community based management skills.
4	Uses-community	• Need of ensuring that communities are making informed choices • Need of ensuring that the community water and sanitation committees are legally registered and have a right to operate water facilities, draw water and own communal land • Need of training for caretakers and operators at the community water facilities on comprehensive operation and maintenance • Need of ensuring the availability of spare parts, in particular for the piped system. District-based repair artisan/technicians are also necessary. • Need of Village Operations Manual including O&M guidelines and equipment manuals • Need of early establishment of hygiene and sanitation promotion in the project preparation activities. • Need of water supply and sanitation to be integrated in planning and implementation activities of village and districts

Source: MoWLD, "Mid-Term Review Report on the Rural Water Supply and Sanitation Programme (RWSSP)", January 2005.

It is observed that some lessons described in the NRWSSP are also relevant to the issues and problems concerning O&M, particularly in the user-community, in the Study area. On the other hand, some points, such as the participation of FSPs and TSPs to work for community mobilization and construction, seem to be not relevant and too early to discuss within the context of the Study area since not many service providers (i.e. FSPs and TSPs) exist. It is

observed that the District Councils and District Water Departments of the target districts do not share a clear vision on entrusting the technical services to private contractors, and the capability of the District Water Department does not seem to be good enough yet to manage and control the private service providers in the Study area.

7.2.4 Millennium Development Goals (MDGs)

According to the plan as of 2002 by the Tanzania Government, achievement of the MDGs will be carried out in the following three phases. In this plan, operationalization of the SWAPs is anticipated in 2006. In the event that the SWAPs is stated to work out, it is assumed that budget allocation to the Study area will change and a standardized monitoring and evaluation system will be introduced.

Phase		Duration	Implementation (Plan)	Relations with NRWSSP (Plan)
1	Transition	January 2004-June 2006	- Expansion of 2002 NAWAPO - Completion of National Water Sector Development Strategy (NWSDS) - Preparation of investment plan & the water laws - Restructuring of MoWLD	- 38 districts involved in the preparatory work and will be included in the programme in July 2005 - The programme will be expanded to cover all 103 districts by July 2006.
2	Scaling up	June 2006-2010	- Start of the Water Sector Support Programme I - Operationalization of SWAP framework	
3	Consolidation	July 2010- June 2015	- Implementation of Water Sector Support Programme II, focusing on Institutional and investment sustainability	

Sources: MoWLD, National Rural Water Supply and Sanitation Programme: NWSSP (Draft) Vol. 1, Main Report, September 2004, Executive Summary p. iii

7.3 HESAWA Experience in the Study Area

7.3.1 General

The Health through Sanitation and Water (HESAWA) Program had been operated by the GOT, in particular through the Ministry of Community Development, Women Affairs and Children, for fifteen years from 1985 to 2002 in both the Mwanza and Mara regions with financial and technical support by the Swedish International Development Agency (SIDA). As for the Mwanza region, the HESAWA Programme has been continued by the “Regional

Project Implementation and Supervision Committee" (RPISC) using central government funding and the district budget after SIDA's financial assistance ceased in 2002[11]. On the other hand, there is currently no organization, at either the regional and district level, to support the HESAWA initiative in Mara region.

Owing to the 15 years implementation and high coverage of the HESAWA Programme, which aimed at the improvement of "integrated rural water, health education and environmental sanitation," during the site visits it was observed that awareness for clean and safe water among the villagers has been maintained. Owing to the extensive coverage and long time support through HESAWA, the concept of HESAWA has penetrated most villagers in both regions, and the majority of rural water supply facilities existing in the two regions are by the programme.

However, how much the sustainability of the water supply facilities has been assured by the district water departments, villages and users seems to be questionable. The impacts and challenges left in the regions through the HESAWA experience are discussed later.

7.3.2 Objective, Approaches and Implementation of the HESAWA Programme

The ultimate objective was "to raise the quality of health of the rural population through improved health education, environmental sanitation, the provision of clean safe water as well as capacity building at the village, ward and district levels." In order to meet the objective, the following three pillars of approaches were adopted:

1) Building capacities/capabilities at the district, village and user level is needed to establish and sustain the provided services

2) Physical improvement of water and sanitation facilities (construction, rehabilitation and rectification)

3) Promotion of private sector involvement in water provision services

As seen in Table 7.3-1, at the district level, a District HESAWA Coordinator was assigned, mostly from the Community Development Office, and a District Action Team (DAT), which is a multidisciplinary team composed of field workers/staff from Community Development, Water Education and Health, was set up in each district to coordinate and monitor the activities within the district.

Table 7.3-1: HESAWA Interventions and Impacts Remaining in the Study Areas

Major interventions		Major Activities	Impacts Left in the Study Areas
1	Management Capacity building at district and village/user levels	1) Capacity building at grass root level for coordination of the activities and sustainability of the installation - Assignment of District HESAWA coordinator (mostly from Community Department)	- Existence of District ESAWA Coordinator (at Community Development Dept, Water Department or Health Department) - Existence of DAT (some

[11] Coverage of the villages by the HESAWA was higher in Mwanza region (70%). While coverage of villages in Mara could not be identified, numbers of constructed wells were 2,173 in Mwanza while 818 in Mara regions. In Mara, programme activities were not expanded to all the districts.
"Mwanza Region, Final HESAWA Programme Report (FY1985-2002)," 2002, "Mara Region: Final Report for Hesawa Programme 1985-2002"

[12] According to the "Mwanza Region, Final HESAWA Programme Report (FY1985-2002)," the vision, skills of leadership and participatory monitoring were not implemented in some villages, such as Kwimba and Ukerewe, and this affected the performance of the achievement.

		- Establishment of District Action Team (DAT) - Establishment of Village HESAWA Committee (VHC): Coordination body to supervise and monitor HESAWA Activities in the village - Establishment of Water User Group (WUG) system: to maintain their installations - Training of village leaders on leadership skills, HESAWA vision, monitoring and WUG concepts [12] - Training of WUG management - Training of human resources at grass root level to promote quality health/hygiene: • WUG Committee Members • Village Health Worker (VHW) • Traditional Birth Attendant (TBA) • Village Animator (VA) • Village Fundis (VF: Artisan) • Study Tour (only in Kwimba)	functioning) - Existence of VHC - Existence of WUG system & fee collection system - Existence of trained personnel for health/hygiene promotion in villages -
2	Provision of safe and clean water	1) Construction - Shallow wells, - Boreholes - Rehabilitation of non-HESAWA wells - Water domestic points - Institutional & Household rain water harvesting tank 2) Improvement of: - Traditional water source - Rehabilitation of piped scheme (4)	- Water installations
3	Provision of health education and sanitary facilities	1) Health/hygiene Education - Community health - School health 2) Construction and rectification/rehabilitation - Institutional latrine - Household latrine 3) Promotion of construction of sanitary facilities (by own efforts) - bathroom, garbage pits, dish lack etc.	- Latrines at Health centers and Schools
4	Promotion of gender equality & Private Sector Participation	1) Promotion of gender representation 2) Private sector participation in provision of water and sanitary facilities	- Concepts on equal gender representation to key positions of district councils, VHC, WUG and various committees.

Sources: Mwanza Regional HESAWA Monitoring Office, "Mwanza Region Final HESAWA Programme Progress Report: FY1985/86-2001/02", August 2002, Mara Region, "Mara Region Final Report for HESAWA Programme 1985-2002"

The main approach of the HEWASA programme was "community participation during all stages of the project cycle" from decision making to planning, implementation, monitoring and evaluation. In particular, special attention was paid to meet the needs of women and children throughout the 15 year period of implementation and gender promotion was one of the key approaches. [13]

During the 15 years implementation, the actives were divided into four phases as shown in the following:

<Four Phases in HESAWA implementation in Mwanza Region>

Phase I (1985-1990): Experimental, inputs from external consultants

Phase II (1991-1994): More involvement of district authorities in implementation and activities while consultants take more advisory roles

Phase III (1995-1997): Expansion of the program activities to the entire district. Introduction of a PRA (participatory rural appraisal) approach in order to identify community's own needs and priority projects

Phase IV (1998-2002): Focus on consolidation and ensuring sustainability of the HESAWA principle and services

In the beginning, it was expected that activities were coordinated through the Village HESAWA Committees as mentioned in Table 7.3-8 HESAWA Interventions and Impacts Remaining in the Study Areas. However, after the WUG system of maintaining the water installation by user groups of single facilities was introduced in Phase IV in 1998, the roles of the VHCs became weak in most of the villages. This will be further explained below in "Formulation of WUGs".

7.3.3 Coverage of the HESAWA Programme:

Coverage of the HESAWA Programme was very extensive. For example, more than 2,300 wells in Mwanza region and 940 wells in Mara region were constructed and rehabilitated besides the implementation of improvement of other types of water facilities, latrine construction and sanitation/hygiene education. Establishment of the Water User Groups was promoted and they were trained for respective water points. Table 7.3-2 to Table 7.3-5 summarizes details of the HESAWA Programme coverage by types of interventions.

[13] As for the HESAWA experiences in Mara region, additional information collection and further analysis are required. It seems that differentiation in the HESAWA impacts as Mwanza larger compared with limitation of the HESAWA impact in Mara were observed by the Study Team. The factors and reasons behind of this will be examined later.

Table 7.3-2: HESAWA Coverage Summary in Mwanza, Mara and Kagera Region (as of 2002)

District	Program Coverage Area	Non Program Area	Total of the Region	% of Coverage
Mwanza region				
Districts*	7	0	7	100%
Divisions	33	0	33	100%
Villages	489	206	695	70%
Population	**1,606,546**	**206**	**2,813,884**	**57%**
Mara region				
Districts	4	0	4	100%
Divisions				No information
Villages				No information
Population				No information
Kagera region				
Districts	5	0	5	100%
Villages	309	295	604	51%
Population	**902,099**	**820,689**	**1,722,788**	**52%**

Sources: Mwanza Regional HESAWA Monitoring Office, "Mwanza Region Final HESAWA Programme Progress Report: FY1985/86-2001/02", August 2002, Mara Region, "Mara Region Final Report for HESAWA Programme 1985-2002", Kagera Regional HESAWA Monitoring Office, "The HESAWA Programme Final Progress Report July 1985 to June 2002"

*: Mwanza: includes Mwanza City

Table 7.3-3: HESAWA Coverage in Mwanza Region (as of 2002)

District	Program Coverage Area	Non Program Area	Total of Mwanza region	% of Coverage
Districts*	7	0	7	100%
Divisions	33	0	33	100%
Villages	489	206	695	70%
Population	**1,606,546**	**1,207,338**	**2,813,884**	**57%**

Source: Mwanza Regional HESAWA Office, "Mwanza Region Final HESAWA Programme Progress Report: FY1985/86-2001/02", August 2002

*: includes Mwanza City

Table 7.3-4: HESAWA Coverage and Achievement in Respective Districts in Mwanza Region (as of 2002)

District	Physical Structure (Construction/Rehabilitation)										Capacity Building (Training of User Groups/Community Members)							
	Water Supply Facility								Sanitary Facility									
	SWs	BHs	RWs	ITWs	IRWHTs	HRWHTs	Gravity Scheme Drafting Points	Pumped Scheme Drafting Points	ILs	HHLs	VHWs	TBAs	VAs	VFs	PAs	Scheme Attendant	TWUGs	Village WUG Facilitators
Musoma (R)	123	13	34	73	13	5	5	5	47	2,372	102	66	55	72	400	0	222	24
Bunda	266	11	35	184	20	0	10	10	51	9,285	178	289	20	154	488	8	227	24
Serengeti	248	9	29	124	34	15	11	11	72	2,012	76	192	62	102	1,004	8	411	36
Tarime	140	11	25	78	3	12	26	114	69	2,760	110	80	72	65	580	14	349	30
Total	**777**	**44**	**123**	**459**	**70**	**32**	**52**	**140**	**239**	**16,429**	**466**	**627**	**209**	**393**	**2,472**	**30**	**1,209**	**114**

Source: Computed by JICA Study Team referring "Mara Region Final Report for HESAWA Programme 1985-2002"

Abbreviation:

SWs: Shallow wells
BHs: Bore holes
RWs: Rehabilitated wells
DPs: Domestic points
ITWs: Improved Traditional Water Sources
IRWHTs: Institutional Rain Water Harvesting Tanks
HHRWHTs: Household Rain Water Harvesting Tanks
ILs: Institutional Latrines
HHLs: Household Latrines
VHWs: Village Health Workers
TBAs: Traditional Birth Attendant
VAs: Village Aniamators
VFs: Villgae Fundis
PAs: Pump Attendants
TWUGs: Trained Water User Groups

Table 7.3-5: HESAWA Coverage and Achievement in Respective Districts in Mara Region (as of 2002)

District	Physical Structure (Construction/Rehabilitation)										Capacity Building (Training of User Groups/Community Members)							
	Water Supply Facility								Sanitary Facility									
	SWs	BHs	RWs	ITWs	IRWHTs	HRWHTs	Gravity Scheme Drafting Points	Pumped Scheme Drafting Points	ILs	HHLs	VHWs	TBAs	VAs	VFs	PAs	Scheme Attendant	TWUGs	Village WUG Facilitators
Musoma (R)	123	13	34	73	13	5	5	5	47	2,372	102	66	55	72	400	0	222	24
Bunda	266	11	35	184	20	0	10	10	51	9,285	178	289	20	154	488	8	227	24
Serengeti	248	9	29	124	34	15	11	11	72	2,012	76	192	62	102	1,004	8	411	36
Tarime	140	11	25	78	3	12	26	114	69	2,760	110	80	72	65	580	14	349	30
Total	**777**	**44**	**123**	**459**	**70**	**32**	**52**	**140**	**239**	**16,429**	**466**	**627**	**209**	**393**	**2,472**	**30**	**1,209**	**114**

Source: Computed by JICA Study Team referring "Mara Region Final Report for HESAWA Programme 1985-2002"

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SWs: Shallow wells
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7.3.4 Impacts of HESAWA

a. Formulation of WUGs

During Phase I to III from 1985 to 1997, the HESAWA Programme had emphasized forming and strengthening the Village HESAWA Committees (VHCs) as the coordinating, supervising and monitoring bodies to promote the HESAWA activities at the village level. However, when the concept of the "Water User Group (WUG) System"[14] was introduced from the beginning of Phase IV, the role of the VHCs became weaker, although the programme did not intend it that way. In the following, the attributes of WUGs and the organizational structure are explained:

<WUGs Concept and Advantages>

1. Concept:

1) Voluntary membership to share a water point (maximum of 250 people) *
2) Members preferably living within a walking distance of not more than 400 m from the improved water point.
3) Members demonstrate their willingness and capacity to undertake the joint decisions and actions on improvement and up-keeping of their water facilities.
4) Members democratically elect gender-balanced leadership **
5) Members of established WUGs register themselves to District Councils as "a legal entity" according to law
6) Members operate their activities on principles agreed on in a Memorandum of Understanding (MOU) stating their rights and obligations.
7) Members have a clear basis for legal ownership of a water point and right of occupancy
8) A WUG must obtain a water right for point sources yielding more than 22,700 litres of water a day.

2. WUGs Advantages

1) Assurance of easy access to adequate and safe water for users
2) WUG as a manageable unit in which every member can participate in fulfilling their responsibility
3) Creation of a sense of ownership and control of water facilities
4) Binding WUG members legally to manage the improved facilities
5) Ensuring long-term sustainability by creating social cohesion among members

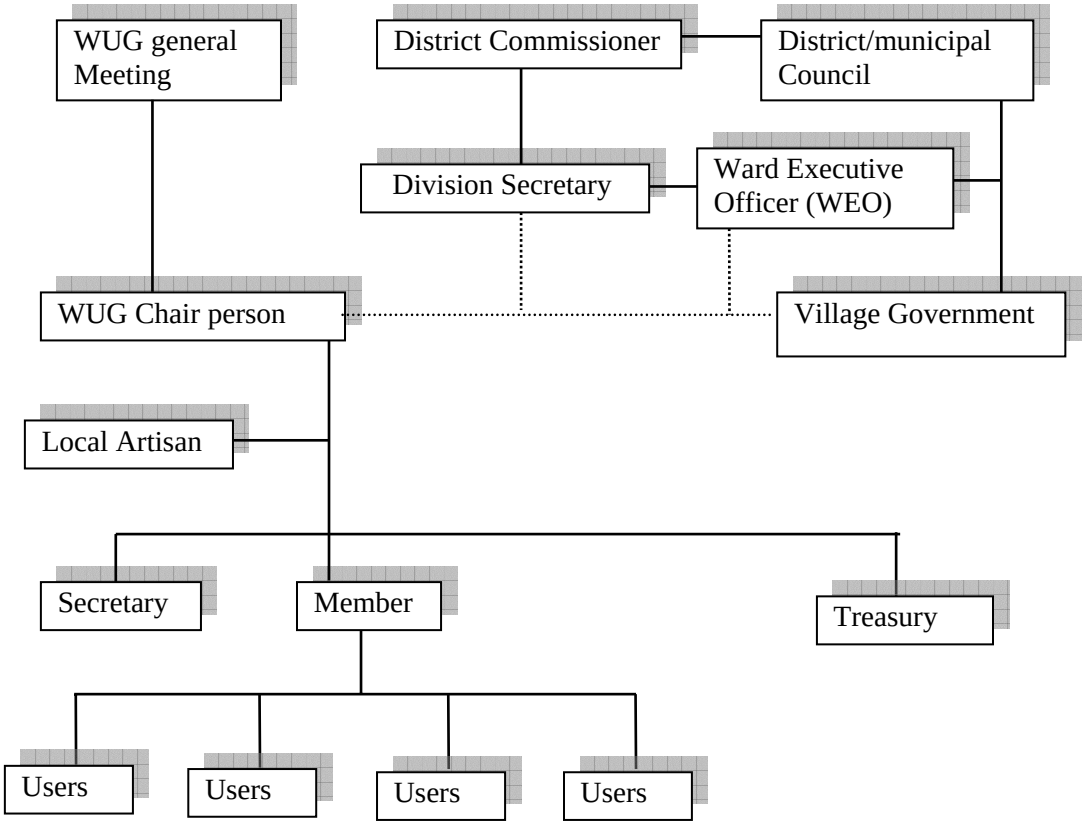
Note: * In reality, it is found that most of water points are shared by far more than 250 people in Mwanza and Mara regions comprising four members each. The three key leaders are: the chairperson, the secretary and the treasurer.

As indicated in Figure 7.3-1, a WUG is an organization formed by users of a single water facility and is independent from the village government; the linkage between village

[14] WUG System: The concept of WUG emerged from the practical deficits of the village government leaderships, which tends to be occupied with various issues, and an unclear sense of community as a unit of water facility management although the VWCs were identified as the major responsible body for the rural water in the 1991 NAWAPO. In Tanzania, the idea of a WUG was introduced in Shinyanga Region (support by Netherlands) in 1996 before the HESAWA started to adopt the concept. The concept of WUGs is not unique to Tanzania while development and implementation of the concepts varies place to place.
Tom van Miert and Deo Binamungu, Swiss Centre for Development Cooperation, "The Shinyanga Experience: Water User Group Concept as a Sustainable Management System for Hand Pump Wells", 2001

government and divisions are indicated by dotted lines. In the case of the HESAWA Programme, a WUG committee, a representative of the users, is composed of 12 members divided into three sub-committees, namely finance, security and technical, and the roles of the sub-committees are explained in Table 7.3-2.

After the WUG system was introduced in Mwanza and Mara regions, it became that WUG is theoretically supposed to be formed for each water installation; even if the water installation was a non-HESAWA facility. After 2002, some non-HESAWA WUG, in particular those which are based on water installations constructed by NGOs and UNICEF, were trained by following the same training program as HESAWA did. On the other hand, it is observed and was heard from DWEOs and HESAWA coordinators that training was rarely conducted for the beneficiaries of the Government financed wells, and for those well, users were simply instructed to form WUGs from the staff of the District Office without significant follow-up.



Source: Drawing by the JICA Study Team by referring Tom van Miert and Deo Binamungu, Swiss Centre for Development Cooperation, "The Shinyanga Experience: Water User Group Concept as a Sustainable Management System for Hand Pump Wells", 2001

Figure 7.3-1: WUG Organization and its Linkage with District Council/Water Department

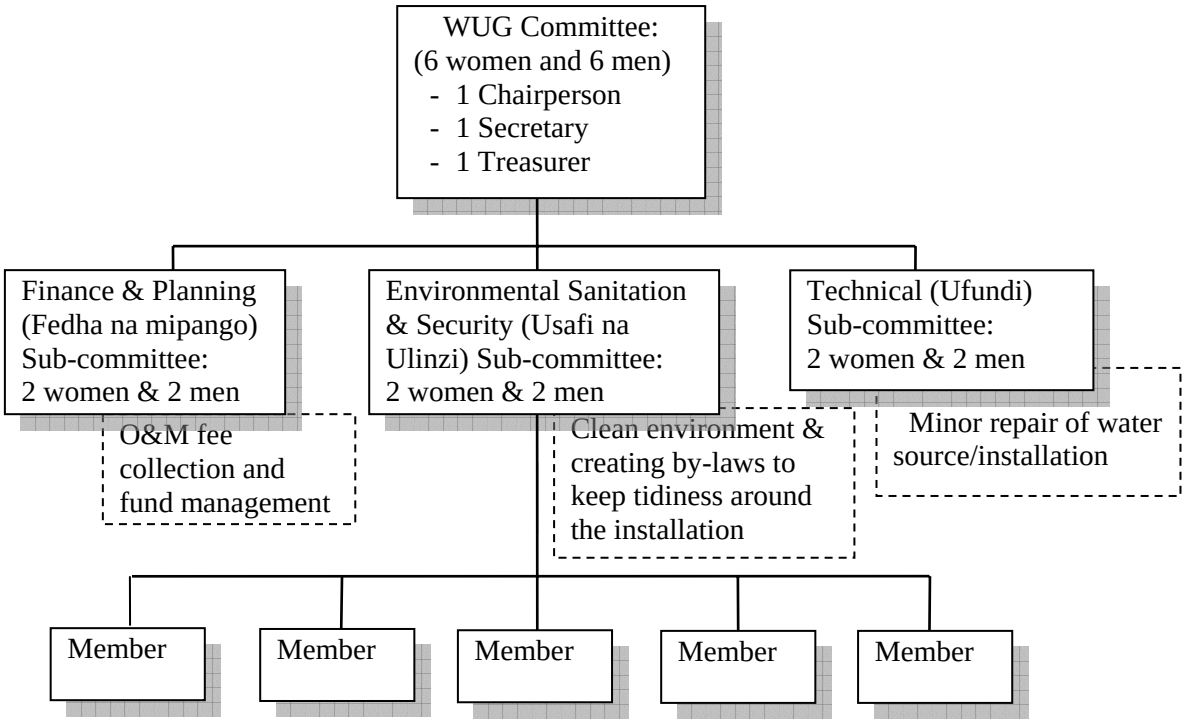


Figure 7.3-2: WUG Committee Organization and Functions of Each Sub-committee

b. District Action Team (DAT)

As explained in Table 7.3-1, District Action Team (DAT), a multi-disciplinary team comprised of a Community Development Officer, Water Department Staff, Education Officer and Health officer, to facilitate the HESAWA Activities within a district, was formed prior to 2002. However, after 2002, the DAT team, in general, has become inactive due resource allocation constraints.

In the NRWSSP, as explained before, the DWST, as focal and coordination machinery to promote the NRWSSP in the district, has a similar function which has been experienced through the HESAWA Programme in Mwanza and Mara region. This could be an advantage for the Study area in case experiences and lessons from the DAT could be utilized in effective ways.

For example, Magu district, Mwanza region conducted an assessment survey of the Village HESAWA Committees in 2004 with the initiative of District Council (DED) as preparation for the NRWSSP, and the former DAT members, which were converted to staff/field workers under the DWST members, were involved in the exercise and hav continuous activities to re-promote the Village Water Sanitation Committees (VWSCs), which is a revising organization from the Village HESAWA Committees (VHCs).

c. "Regional Project Implementation and Supervision Committee" (RPISC) for HESAWA in Mwanza Region

In Mwanza region, there is a unit referred to as a "Regional Project Implementation and Supervision Committee" (RPISC)" that serves to coordinate and supervise 'continuation' of the HESAWA activities in the region. The organizational structure of the RPISC is described as Figure 7.3-3 and the budget/expenditure of the RPISC for FY 2003/04 and FY 2004/05 and shown in Table 7.3-6 and Table 7.3-7 respectively.

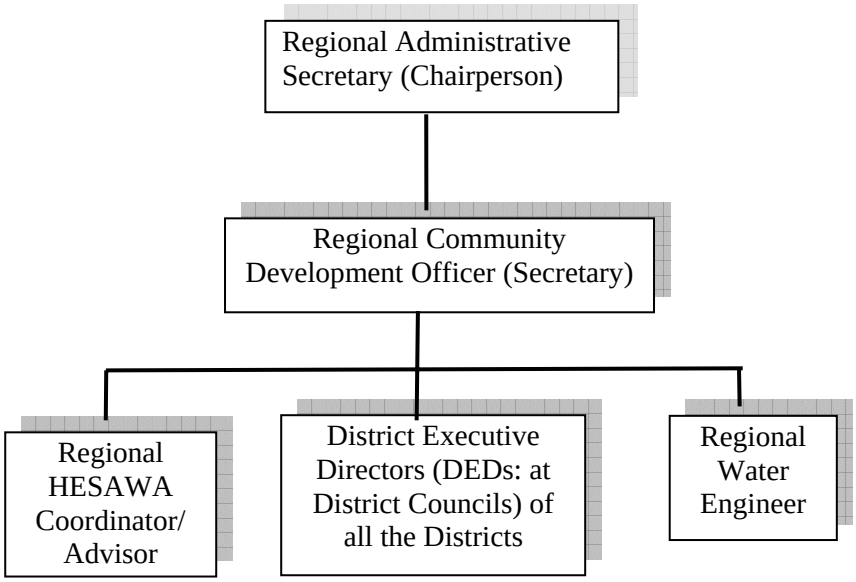
Originally, the RPISC in Mwanza region was established by SIDA for monitoring/supervision. After 2002, it has been established by Mwanza Regional Administrative Secretariats (RAS) according to the decision to continue the HESAWA concepts and activities in the region at the end of SIDA funding in 2002. Both Mwanza and Mara regions decided to continue the HESAW programme and activities by their own resources at that time, but it was not realized in Mara region.

In Mwanza, as seen in Figure 7.3-3, the Committee members are composed of a Regional Administrative Secretary as Chairperson, a Regional Community Development Officer as Secretary, District Executive Directors (DEDs: at District Councils) of all the Districts, a Regional Water Engineer (RWE) attached to RAS, and a HESAWA advisor and coordinator. Having the office in RAS, which is financially supported by RAS within the general administration budget, the office functions as a focal point to coordinate and oversee district activities to keep the HESAWA ideologies and impacts in Mwanza region.

Specific activities carried out under the RPISC are support and coordination to the district on:

1) (Post construction) Follows-up
2) Evaluation and monitoring activities according to objectives and indicators
3) Repair of vehicles distributed through HESAWA
4) Repair of office equipment
5) Formulation of management and implementation

Table 7.3-8 indicates HESAWA's follow-up activities and monitoring indicators for the activities. It is generally assumed that the activities seem to be non-standardized and rather sporadic (may be carried out when special funds are available or there is a special initiative/promotion), and supervision and monitoring activities to villages have not been carried out closely or on a regular-basis.



Source: Regional Planning Officer and Regional HESAWA Advisor, Mwanza region

Figure 7.3-3: Organization of "Regional Project Implementation and Supervision Committee" (RPISC) for HESAWA in Mwanza Region

Table 7.3-6: Mwanza Annual HESAWA Activities Budget (FY2003/2004)

District	Funds Released (Tsh)			Funds Utilized (Tsh)							Utilization rate
	Central Governemnt (to District) (Grant)	District Council (Own revenue*)	Total	Central to Distirct (Grant)			District Council (Own revenue*)			Total	
				Amount Utilized	Share in the Actual Expense	Utilization % from Release	Amount Utilized	Share in the Actual Expense	Utilization % from Release		
Kwimba	-	-	-	-	-	-	-	-	-	-	-
Ukerewe	4,563,400	300,000	4,863,400	2,783,330	90%	61%	300,000	10%	100%	3,083,333	63%
Geita	10,000,000	1,200,000	11,200,000	10,000,000	89%	100%	1,200,000	11%	100%	11,200,000	100%
Mwanza City	5,000,000	3,765,250	8,765,250	5,000,000	57%	100%	3,765,250	43%	100%	8,765,250	100%
Sengerema	6,373,400	1,932,000	8,305,400	3,186,700	62%	50%	1,932,000	38%	100%	5,118,700	62%
Misungwi	12,033,400	-	12,033,400	9,060,000	100%	75%	-	-	-	9,060,000	75%
Magu	10,000,500	3,159,336	13,159,836	10,000,500	76%	100%	3,159,336	24%	100%	13,159,836	100%
Regional HQ	15,000,000	-	15,000,000	15,000,000	100%	100%	-	-	-	15,000,000	100%
Total	62,970,700	10,356,586	73,327,286	55,030,530			10,356,586			65,387,119	89%

Source: Mwanza Region Administration Community Development (HESAWA) Office and computation made by the JICA Study Team
Note: For FY2003/2004, beneficiaries' contribution is not included in the budget.

Table 7.3-7: Mwanza Annual HESAWA Activities Budget (FY2004/2005: July2004-June 2005)

District	Funds Released (Tsh)				Funds Utilized (Tsh)										Utilization rate
	Central Government (to District) (Grant)	District Council (Own revenue*)	Beneficiaries **	Total	Central to District (Grant)			District Council (Own revenue*)			Beneficiaries**			Total	
					Amount Utilized	Share in the Actual Expense	Utilization % from Release	Amount Utilized	Share in the Actual Expense	Utilization % from Release	Amount Utilized	Share in the Actual Expense	Utilization % from Release		
Kwimba	7,370,000	2,300,000	294,000	9,964,000	1,470,000	36%	20%	2,300,000	57%	41%	294,000	7%	100%	4,064,000	41%
Ukerewe	4,563,400	-	-	4,563,400	3,886,900	100%	100%	-		-	-		0%	3,886,900	85%
Geita	10,000,000	1,229,000	1,170,000	12,399,000	8,260,700	83%	77%	1,229,000	12%	100%	1,170,000	11%	11%	10,659,700	86%
Mwanza City	9,968,600	4,998,480	1,190,000	16,157,080	9,968,600	100%	62%	4,997,480	31%	100%	1,190,000	7%	7%	16,156,080	100%
Sengerema	19,100,000	2,600,000	1,680,000	23,380,000	18,661,000	98%	81%	2,600,000	64%	100%	1,680,000	41%	7%	22,941,000	98%
Misungwi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magu	10,000,000	1,000,000	2,500,000	13,500,000	8,850,000	89%	72%	1,000,000	8%	100%	2,500,000	20%	20%	12,350,000	91%
Regional HQ	15,000,000	-	-	15,000,000	15,000,000	100%	100%	-	-	-	-	-	-	15,000,000	100%
Total	76,002,000	12,127,480	6,834,000	94,963,480	66,097,200			12,126,480			6,834,000			85,057,680	90%
			USD	83,083									=	USD 74,416	
			JY	9,554,506										JY 8,557,859	

Source: Mwanza Region Administration Community Development (HESAWA) Office and computation made by the JICA study team
Note: * District revenue such as taxes, fine from local by-laws.
** Beneficiaries' contribution is not necessary in cash. Most of the amount shown here is in the form of cost for labour and food preparation which are accounted in the cash value.

As Table 7.3-6 and Table 7.3-7 show, budget to sustain and continue the HESAWA activities comprises national subsidies to districts, the districts' own budget and contributions from beneficiaries at the village level. The contributions from beneficiaries are mostly not in cash, and in the figures, costs for labor and food preparation are counted as cash value. In FY2003/04, Tsh 65,387,119 (USD57,157= JY6,573,006) was spent and Tsh 8,557,859 (USD74,416 =JY8,557,859) was spent in FY2004/05. While the ratio of central subsidies accounts for a large portion (57%-100%) of the total budget and expenses, it is noted that the allocation of their own resources differs between districts. While Sengerema allocates a relatively stable amount of budget, Misungwi and Ukerewe seem to be having difficulties allocating their own resources for the continuation of the HESAWA activities.

Table 7.3-8: Annual Implementation Report/Monitoring Indicators of HESAWA Follow-up in Mwanza Region (FY2003/04)

Objectives/Outputs		Kwimba		Ukerewe		Geita		Mwanza City		Misungwi		Magu		Sengerema		Total	
		Plan	Actual implementation	Plan	Actual implementation	Plan	Actual implementation	Plan	Actual implementation	Plan	Actual implementation	Plan	Actual implementation	Plan	Actual implementation	Plan	Actual implementation
Objective 1: Strengthening villages and users																	
1.1	Training of WUG	-	-	-	-	10	10	-	100	56	-	-	-	-	-	66	110
1.2	Monitoring & Supervision of WUG	100	0	120	44	90	68	100	100	100	18	80	625	100	53	690	908 (among them 625 at Magu)
1.3	Strengthening "Village Water Sanitation Committee" (VWSC)	-	-	-	-	-	-	-	6	78	-	-	125	-	-	78	131 (among them 125 at Magu)
Objective 2: Increase in Water Services																	
2.1	Construction of new shallow wells & bore holes	-	-	3	5	-	10	-	1	-	-	-	-	-	-	3	16 (among them 10 at Mwanza city)
2.2	Establishing legal status of water installation (WUG)	✓	✓	✓	-	✓	✓	✓	✓	✓	-	✓	-	✓	-		
2.3	Training of pump attendant	-	-	-	-	-	40	-	-	-	-	-	-	-	-	-	40 (all at Magu)
2.4	Water quality control (treatment)	-	3	-	-	-	150	199	25	-	73	100	-	-	-	299	250 (among them 150 at Geita)
2.5	Improvement of water source environment (e.g., protection, tidiness, cleanness)	-	-	-	-	-	-	-	-	10	-	-	-	-	-	10	-
Objective 3: Strengthening sanitation facility & hygiene education																	
3.1	School latrine construction	-	-	4	4	5	1	-	-	2	1	-	-	2	40%	13	6
3.2	Household latrine construction	-	-	-	-	-	-	-	-	-	-	-	-	50	50	50	50 (all at Sengerema)
3.3	Training of school committee	60	44	40	-	80	20	40	-	50	-	75	-	70	-	415	64 (44 at Kwimba)
Objective 4: Rehabilitation and rectification of improved water facilities																	
4.1	Replacement of pump	-	-	-	-	-	-	-	1	-	-	5	1	-	-	5	2
4.2	Rehabilitation of well with pump (e.g., shifting, re-development)	-	-	17	1	-	2	4	-	-	-	10	20	-	-	31	23 (out of them 20 at Magu)
Objective 5: Promotion of private sector and private groups to carry out water sector developmemt (e.g., women groups,		✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-		
Objective 6: Capacity building of District Office/Water Department (e.g., training, provision of tools)																	
6.1	Training	✓	✓	✓	-	✓	✓	✓	✓	✓	-	✓	-	✓	✓		
6.2	Equipment provision	✓	-	✓	-	✓	-	✓	-	✓	-	✓	-	✓	-		
Objective 7: Strengthening of management programme																	
7.1	Holding meeting of District Action Team	4	-	4	-	4	4	4	-	4	-	4	-	4	1	28	5
7.2	Vehicle replacement & repair or new	✓	-	✓	-	✓	-	✓	-	✓	-	✓	-	✓	-		
7.3	General service & repair	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
7.4	Purchase of stationeries & necessary goods	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		

Source: HESARA Regional Office (Regional Project Implementation and Supervision Committee:RPISC), Mwanza Region

d. Assessment: Advantages and Challenges Left in the Regions through the HESAWA Experience

As suggested previously, there were great advantages from experiencing 15 years of the HESAWA Programme in both regions. For example, not only were WUG members and village leaders trained on water facilities and point management, but also many district officers were also trained on methods of community empowerment and participatory approaches by the programme. On the other hand, some confusion concerning water facilities and point management exists between the villages without HESAWA intervention and those that benefited from HESAWA training and support.

As previously pointed out, most of the VHC/VWC, regardless of whether trained by HESAWA or not, have become "empty shells" which are not functioning. It was also discovered that there are many WUGs, which were fully trained by HESAWA, in which a regular collection of water fee is rarely seen after three years of SIDA financial support. In addition, the Bank Account, which was one of the pre-requisites for the request of HESAWA water facility construction, was not utilized much due to the long distance from the bank, unfamiliarity of using the bank, and charges for bank transactions is seen expensive for the villagers. The Summary of the positive impact, current status and issues presently arising are summarized in Table 7.3-9.

Another confusion caused by slightly different concepts between the HWSAWA and the NRWSSP is the name 'village water committee'. While VHC in HESAWA is a single village base, the Village Water and Sanitation (WATSAN) Committee in the RWWS is referring to 'users of a single water source' or 'a group of people sharing a single piped scheme'. In the case of HESAWA, user groups at a single water point are called Water User Group (WUG) while users sharing one scheme are referred as Board member in urban/town member of Water User Associating (WUA).

Table 7.3-9: Positive Impact, Current Status and Issues Presently Arising

Major interventions		Positive Impacts Left in the Regions	Current Status As of 2005 (General)	Current Issues/Problems
1	Management Capacity building at district and village/user levels	- Existence of District HESAWA Coordinator (at Community Development Dept, Water Department or Health Department) - Existence of DAT (some functioning) - Existence of VHCs - Existence of WUG system & fee collection system - Existence of trained personnel for health/hygiene promotion in villages	- Existence of HESAWA. In Mwanza region, there have been follow-up activities while there is no substantial activity in Mara region. - Most DATs are not active currently. - "Fade out" of VHCs - Existence of	- Mara: Regional level coordination body on water promotion - Capacity building of the DWST - Capacity building of District Water Department staff - Re-promotion of WHC and WUG through education on the concept, institution and financial management - Moving of the trained members

			WUGs while there are not many WUGs continuously collecting community contribution Moving of the trained VHC and WUG key members	-
2	Provision of safe and clean water			- Capacity building of District Water Department staff - Malfunction of water facilities (out of order, stolen pumps, dried-up, etc.) - Management of the water facilities - Mixed use with unprotected water
3	Provision of health education and sanitary facilities			- Awareness of sanitation/hygiene - Moving of trained personnel
4	Promotion of Private sector participation to the water and sanitation sectors		- There are cases (2 seen in the 2 regions) entrusted to a private agent to run schemes (relatively smaller scale) in Sengerema and Magu. - Private business person to carry spare parts are limited.	- Private service providers, who have good skill, are scarce - Management of private service providers - Availability of spare parts

Assessment by the JICA Study Team based on observation, various survey exercises, interviews to relevant personnel.

7.4 Results of Socio-economic Surveys and Implications for O&M

Reflecting on the results of the Socio-economic Survey, this chapter particularly examines some of the implications drawn from the results of the Focus Group Discussions (FGDs) and Rapid Rural Appraisal (RRA) on issues concerning operation and maintenance.

The methodology and objectives for the Focus Group Discussions were explained in the previous chapter. The Rapid Rural Appraisal was carried out at the five selected villages in the districts of Kwimba, Sengerema, Ukerewe, Bunda and Tarime. The criteria for selection of those sites were the difference in geographical location and the availability of the existing water facility based on the results of the reconnaissance surveys by the Study Team.

1) Kwimba: A village along a major road.
2) Sengerema: No protected water sources and it is assumed that water from Lake Victoria is used in the dry season.
3) Ukerewe: The main water sources are unprotected springs.
4) Bunda: No protected water source exists. The main water source is assumed to be Lake Victoria since the village is located along the lake.
5) Tarime: No protected water sources while it is assumed that there are many sources because the village is located in the watershed area.

The main objectives of implementing the RRA were three fold:

1) To learn the real situation of rural village life
2) To learn the water use, perceived needs and priority of water of the villagers for O&M planning
3) To get an idea of the gender issues determining the way of living in the village and water use/needs

As previously mentioned, through the process of preparation and implementation of the RRA exercises, technical transfer to the counterpart personnel was carried out on the RRA survey methodologies.

7.4.1 Development and History of Communities

The start of settlement in the five villages, where the RRA was conducted, differs. For example, Nyakunguru Village, Tarime started in the early 1800s by transmigrants from the present Kenya for cattle raising and farming, to 1951 (Bitoto village, Sengerema) when exploration of the virgin land started for farming by people who came from the then Kwimba. In Haluwego village of Ukerewe, the influence of colonialism was significant compared with other villages as villagers mentioned the German rule during the late 1800s, the British rule which started from 1918, the introduction of taxation in 1913 and the money economy in 1920. This appears to be because of the natural resources (woods) available on the island. On the other hand, most of the other settlements were governed through the local chieftaincy until the chieftaincy system was abolished in 1962.

The common experiences shared among the villages in the Study area are as follows:

- The introduction of primary schools during the late 1940s to 1960s.
- The first water facility construction: dams in Buzimbwe, Bunda in1954 onward
- The nationalist movement: the early 1950s to 1958 through the establishment of TANU (Tanganyika National Union) in the villages
- Independence (Uhuru) in 1961
- The formal start of villages (Vijiji) through ‘Ujamaa’: the ‘socialist village campaign’

in 1974. People gathered in the village centre for communal farming. All commercial activity was socialized.

- Along with the resolve of Ujamaa village, villagers went back to their original land from 1976 to 1987
- The start of a multi party system in 1992
- The start of the HESAWA Programme in 1985
- The start of CSPD (Child Survival Protection and Development Program supported by UNICEF) from 1996 to 2001
- The start of PEDP (Primary Education Development Program) from 2000 to 2002
- The start of MMEM (Secondary Education Development Program supported by World Bank) in 2004

During the RRA exercises, many elder villagers mentioned that farmers were not satisfied with the Ujamaa movement, because it was not convenient for farmers to work communally and to go to their own land due to the far distance. They also stated that security conditions during the Ujamaa movement became worse because there were many attempts to steal pooled cash and goods, which were kept in the village centre.

It was discovered that development programs through community participation and contribution are relatively new to the villagers, with the HESAWA Programme being the first program to intervene through community contribution in 1985. To most villages where the program was applied, they experienced the HESAWA Programme around 2000. Lately, there are many programs where villagers are requested to contribute their resources, such as DEDP and MMEM.

7.4.2 Ethnicity

As a result of the RRA, it is observed that the composition of ethnic groups in the villages also varies from village to village, while the Sukuma group is pre-dominant in the mainland districts of Mwanza region.

The composition of ethnic groups in each village is as follows:

Mwanza region:

- Ilula Village, Kwimba: The major ethnic group is Sukuma.
- Bitoto Village, Sengerema: The major ethnic group is Sukuma (98%).
- Haluwego village, Ukerewe: The major ethnic groups are Kerewe (50%), Kara (25%) and Jita (15%).

It is generally said that the Sukuma people are cooperative in mutual works.

Mara region:

- Buzimbwe Village, Bunda: The major ethnic groups are Kurya and Jita and a minor portion of Sukuma.
- Nyakunguru Village, Tarime: The major ethnic group is Kurya (100%).

It is observed that women's participation and decision-making with regard to water issues and family resources seem to be better in Ukerewe compared to other villages. In Mara region, the prevalence of polygamy is very high with 70 % of the total households in Buzimbwe, Bunda and 80% of the total households in Nyakunguru, Tarime being polygamy families. Christianity is the primary religion in the five villages.

7.4.3 Traditional Land and Water Entitlement

From the result of the FGDs, it is observed that ownership of land is traditionally controlled by the clan, which is the extended family group. While there are villages where the transaction of land is practiced through economic terms, the clan head still has a strong influence in determining the allocation of land. The study result on customary leaders also shows that customary organization based on the clan system is still relevant and functioning parallel with village government leadership, although it is not very significant in water development activities. When the candidate villages and the sites for water facilities are selected for the future expected intervention, it is necessary to be aware of the practices following this morale to avoid unnecessary conflicts and disputes.

7.4.4 Traditional Water Resource Management

During the FGDs, it was found that water resource management, mobilization and conflict solution for water supply development and the use of the improved water facilities are primarily matters that are controlled by the village government. In view of this, using the village government as a channel to communicate and intervene, following the HESAWA experiences, seems to be appropriate, and does not have any conflicting points with the local practices.

7.4.5 Present Water Sources and Coping Strategies for Water Shortage

Fifty two percent (52 %) of the respondents of the Household Survey answered that hand dug wells are the main water source followed by springs and streams (21%). When the water source dries up, villagers dig alternative sources or dig the existing one deeper communally under the leadership of the village chairperson and VEO (Village Executive Director). This implies the importance of leadership for problem solving and finding coping strategies and it could be assumed that the sustainability of water facilities may depend on the leadership of communities.

Through the village resource mapping exercises and physical water source observation in the RRA, it was revealed that the majority of villagers in the five villages do not use a single water source but rely on multiple water sources, such as shallow wells constructed by the HESAWA Programme, if available, and unprotected water sources (i.e. hand dug wells, streams, lakes and ponds), depending on the availability within the communities in order to cope with seasonal water shortages or to save money paying for water. [15] For example, water from traditional unprotected water sources is used for laundry and bathing while water from the protected sources is used only for drinking and cooking purposes. This implies that if the protected water is not adequate in volume, and safe water from protected sources is expensive for villagers, villagers will probably continue to take water from the unprotected water sources even if the water supply facilities are newly constructed. From this finding, it is indispensable to include a sanitary/hygiene education component in the water supply improvement projects. It could be assumed that if the hygiene practices of villagers do not change, the impact of the water supply improvement would remain limited.

In the case of Buzimbwe Village, Bunda, where a protected water source is not available, people need to travel 5 to 7 km to fetch water from Lake Victoria spending nearly an hour one way during the dry season. During the rainy season, due to the long distance to Lake

[15] In general water users pay for water fee 1) household contribution by monthly flat rate (500 Tsh per family seems to be common), 2) irregular basis (when necessary arise) or 3) using the traditional revolving funds called " Ifoghongo". In the case of a small scheme in Sengerema, there is only case that a private agent is constructed for full O&M, and water is charged per bucket (20Tsh/20L).

Victoria, the villagers use ponds and hand dug wells nearby their houses. It was observed from interviews on women's time allocation that the long distances to fetch water affects the amount of time that women can spend on farming and other household duties as seen in the Buzimbwe case.

7.4.6 Relationship with the District Office

As a result of the FGDs, it is observed that most of the villages do not have a significant relationship with or experience receiving support from the District Water Engineer Office, and villagers complain about the bureaucracy and inefficiency of the services provided. As explained later in this chapter, supervision and monitoring by the District Water Engineer Office has not been carried out sufficiently in the Study area. The supervision by the District Council and Water Department needs to be promoted in order to ensure the sustainability of the water supply facilities in communities.

7.4.7 Gender Division of Work and Control of Resources

a. Gender Division of Work (DOW)

The result of RRA shows that fetching water is traditionally and predominantly a women's responsibility, as in many African countries. However, when the distance to water sources is far, and if men have bicycles to carry water, men help to fetch water although men said they never want to fetch water without carrying it by bicycle. This is because fetching water is traditionally a women's chore as part of domestic work, and men feel embarrassed when other community members see them carrying water on their heads. It was observed that women's workload is much heavier that that of men; women even do most of the agricultural work while men's involvement in the agricultural work is specific and rather limited. Many villagers point out the practice of "dowry" as the reason for women's heavier workload. [16] It is mentioned that because of the dowry, men tend to see women as one of their belongings and claim that women need to work harder for men.

As for other domestic work, it is commonly found that bathing and feeding children, cooking, cleaning inside the house, washing and collecting fire wood are primarily the duties of adult women and girls while men do the ironing[17], clean outside the house, collect firewood and make decisions within the household. Many women also mentioned that decisions on children's education and other household expenses are jointly decided by both the wife and husband. Decision-making in public spheres is traditionally done by men while women are expected to participate equally. In view of the result of the RRA and the traditional practices, it is suggested that communities need to be repeatedly reminded of gender integration when decisions on the technology of rural water supply facilities, community contribution and the training of VWSC and WUG/WUA are considered.

b. Control of Resources

According to the result of the RRA, the selling of cash crops, such as cotton, maize, cassava and bean, to markets is predominantly done by men except for the sale of sweet potatoes and other vegetables such as tomatoes. As for products that women decide on for disposal, men do not assist with the work much, and thus women can decide on this.

[16] In Tanzania, giving a dowry is a very common practice associated with marriage. The groom's parents/family prepares some money and numbers of cattle and gives it to the bride's parents when the couple marries.
[17] It is heard from men that in general women are not good at ironing.

7.4.8 Workload by Seasons

The start of the rainy season slightly differs from village to village. During the exercise of 'Seasonal Calendar' in the RRA, the duration of the rainy season answered by the villagers are as follows:

- Ilula Village, Kwimba: November to May
- Bitoto Village, Sengerema: October to April
- Haluwego Village, Ukerewe: The middle of October to February and April (in March, not much rain experienced)
- Buzimbwe Village, Bunda: October to December and the end of February and May (in between not much rain experienced)
- Nyakunguru Village, Tarime: September to December and the middle of March and May (in between not much rain experienced)

It is found that the busiest seasons for villagers are one to three months after the start of the rainy season (November to March) when weeding for most of the crops needs to be done, and then the harvest season for cash crops such as cotton and rice (April to August). This implies that when intervention is considered, it is suggested to avoid the busiest seasons for farmers to request labor contribution for construction and to hold meetings on significant decisions on O&M issues.

7.5 Current Conditions at District Level for O&M

7.5.1 Progress of Decentralization Process and Capacity of District

With the 2002 NAWAPO and the NRWSSP, the District Council became "the manager" to implement water supply and sanitation activities. In this section, the capacity of the District Council including the Water Department is looked at. As seen in Table 7.5-1, the conditions of progress of decentralization in each district and the preparation for the NRWSSP are summarized in order to evaluate their institutional capacities and preparedness for rural water supply development.

As described in Figure 7.5-1, there are in fact two major lines for rural water supply development. One is the technical line from the MoWLD and the other is the institutional and budgetary arrangement along with the decentralization policies following the Local Government Reform (LGRP). As for the technical matters, command comes down from the MoWLD, through the Basin Water Office to the District Water Engineer Office. The 'Lake Victoria Basin Water Office' covers Mwanza, Mara and Kagera regions, and is mostly concerned with environmental and management matters such as water rights applications from user groups, as a representative of the MoWLD. The Basin Water Office was established four years ago, but it does not have a substantial system to oversee the activities of the covered regions or bilateral systems with the regions and the District Water Engineer Office (DWEO) such as baseline data compilation and a regular reporting system.

The DWEO mainly works only on technical matters. When the O&M of rural water supply is referred to in the context of the DWEO, it means the 'repair' of facilities in practice and does not mean 'preventive maintenance' and community involvement. 'Soft issues' such as community mobilization for the sustainability of water supply facilities are mostly done through the District Action Team (DAT), which was established by the HESAWA Programme or with the collaboration of the Community Development Officer/Assistant under

the instruction of DED. Thus, as explained later, due to a limitation of budget, supervision activities of rural water facilities and consultation of user groups are rarely done by staff of DWEO's and other departments at present.

As for the capacity of District Councils, among the 10 districts that were interviewed and surveyed, Magu is the only district expressing confidence on the progress of decentralization. On the other hand, many districts said their slow progress is due to limited funds. The DWST has been formed in more than 50% of the districts, but in most of the districts, the DWST has not yet met, and substantial activities of the Team have not been started. Some districts state that after the instruction given to form the DWST, there has been no information provided by the NRWSSP. All districts met replied that the re-promotion of rural water facility management is critically necessary and measured on water issues need to be taken at the district level. However, except for Magu, as stated previously there is almost no regular supervision or monitoring activities of VWC/VHC and WUG since the districts (in particular, the DWEO) do not have the budget to carry out regular monitoring. While there are points to be clarified and collected further, it could be said that in general decentralization has not progressed well, except for the case of Magu, and the possibility of the re-promotion of water supply facilities and user groups/communities seems to depend on the budget preparation and initiatives of the District Council leaders.

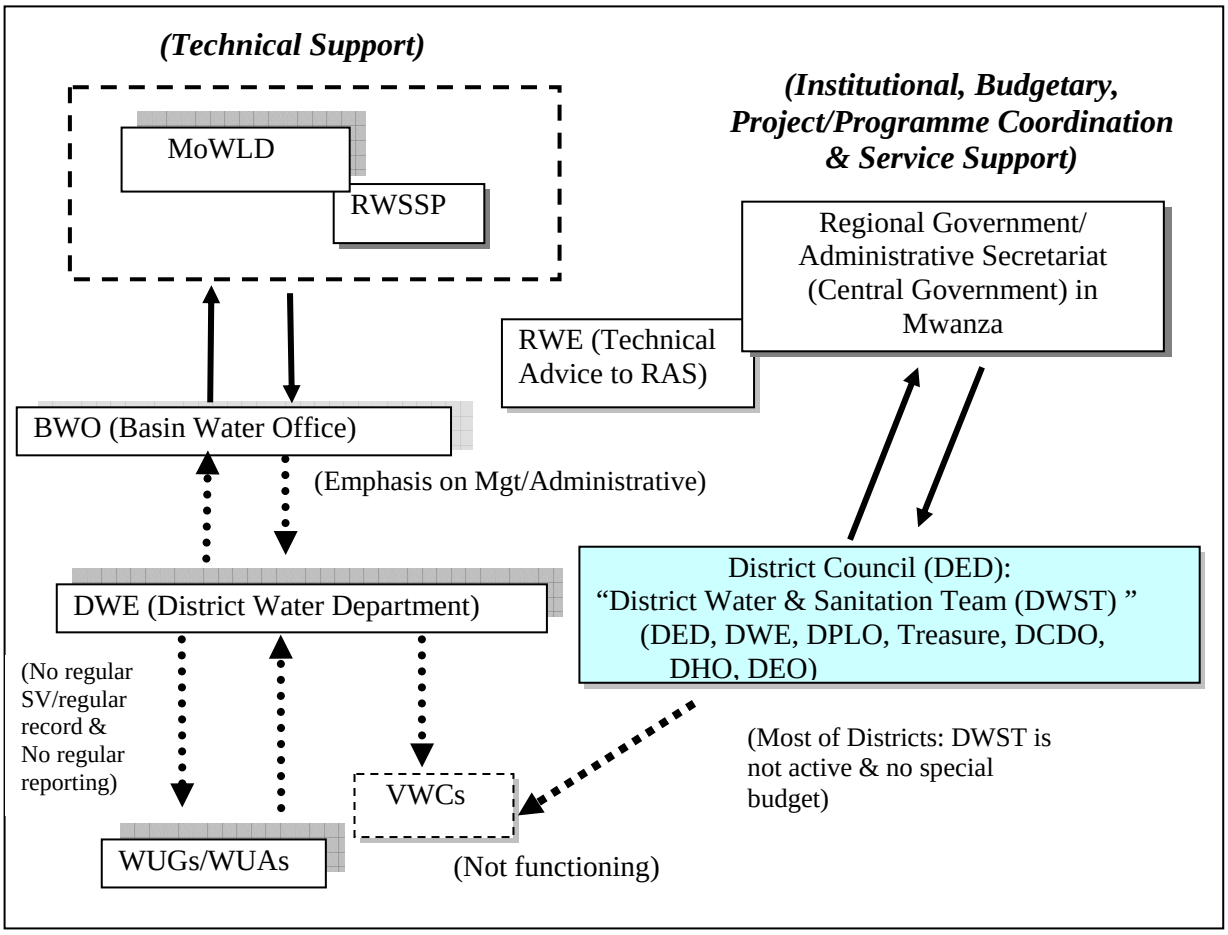


Figure 7.5-1: Relations between MoWLD, Basin Water Office, District Council, District Water Department, VWC and WUGs/WUAs

Table 7.5-1: Progress of Decentralization (local government reform), Capacity of District and Water Re-promotion in Mwanza Region

District	Progress of Decentralization Process/reasons	Progress of Restructuring/ institutional set-up	Formation/ function of the DWST/DAT	Awareness/ willingness for Water-re-promotion & comments on promotion of community	Rapid Assessment by the JICA Team Member on Capacity of District
Mwanza region					
Magu	○ Relatively faster	- There is an agreed future organizational chart & restructuring of District Council is on-going. - According to the plan, water department will merge with works dept in the near future.	○ DWST is formed. Budget for fuel is allocated to the DAT by District Council to visit communities.	○Surveys for revising VWC/VHC have been carried out by visiting all the VWC/VHC in 2004. District could allocate own revenue, and district started re-promotion of VWC/VHCs.	○High: visions for both decentralization and water re-promotion are clear. As district, it has a good team.
Misungwi	×Behind	- No clear vision on re-structuring plan	○ The DWST was formed in 2004 while it is inactive.	×Due to budget limitations, decentralization reform is not going well. It is not easy to allocate extra-budget for water re-promotion	×Low: No clear vision on reform presented on decentralization。
Kwimba	△On track	○Re-organization of District Council was just done.	○ The DWST is formed but not yet met. DAT is not active.	△	△Medium: It is observed that DC has potentiality.
Sengerema	No information (to be collected)		×DAT meets irregular basis.	No information (to be collected)	No information (to be collected)
Geita	No information (to be collected)		○ The DWST is formed but not yet met. DAT rarely meets.	No information (to be collected)	No information (to be collected)
Ukerewe	No information (to be collected)		×DAT exists but not active.	No information (to be collected)	No information (to be collected)

Source: The JICA Study Team. Interview made to District Planning Officer (in case, the DPLO was not present, to Acting DPLO) and District Executive Director (when DED was available).

Table 7.5-2: Progress of Decentralization (local government reform), Capacity of District and Water Re-promotion in Mara Region

District	Progress of Decentralization Process/reasons	Progress of Re-structuring/ institutional set-up	Formation/ function of the DWST/DAT	Awareness/ willingness for Water-re-promotion & comments on promotion of community	Rapid Assessment by the JICA Team Member on Capacity of District
Mara region					
Bunda	△Medium (on-track)	△ No clear plan on re-structuring of DC	○ The DWST was formed in August, 2005 but not met.	△There is awareness of need for water-repromotion, but district budget, in particular from own revenue, is quite limited to allocation for water related programs.	△-○Medium
Musoma (Rural)	No information (to be collected)	No information (to be collected)	○ The DWST formed in 2004 as preparation of the NRWSSP.	No information (to be collected)	No information (to be collected)
Tarime	×Slow	No information obtained.	×	No information obtained.	× Quite low: Responses from the district are in general very slow.
Serengeti	No information (to be collected)	No information (to be collected)	× The DWST is not inaugurated.	No information (to be collected)	No information (to be collected)

Source: The JICA Study Team. Interview made to District Planning Officer (in case, the DPLO was not present, to Acting DPLO) and District Executive Director (when DED was available).

7.6 Capacity of District Water Departments

7.6.1 Organization

It is observed that there is no standardized structure of the District Water Department. As seen in the typical organization charts shown in Figure 7.6-1 and Figure 7.6-2, there are two to three patterns of the organizational chart. In general, some are divided by function while some are divided by area in charge such as urban-rural sectors. However, it is observed that there is no clear division of works in the Water Department, no clear mandate of each staff, and no basis of performance or evaluation system.

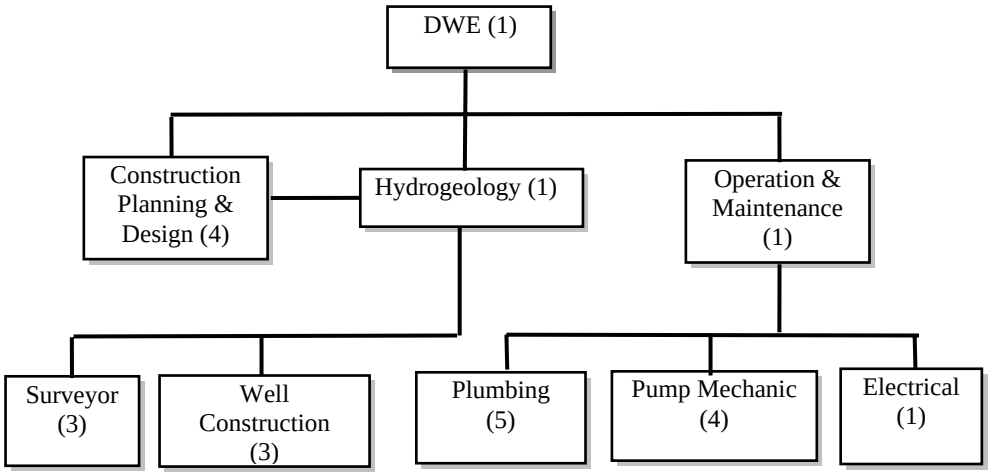


Figure 7.6-1: Organization Chart of Bunda District Water Engineer Office in Mara Region (by Function)

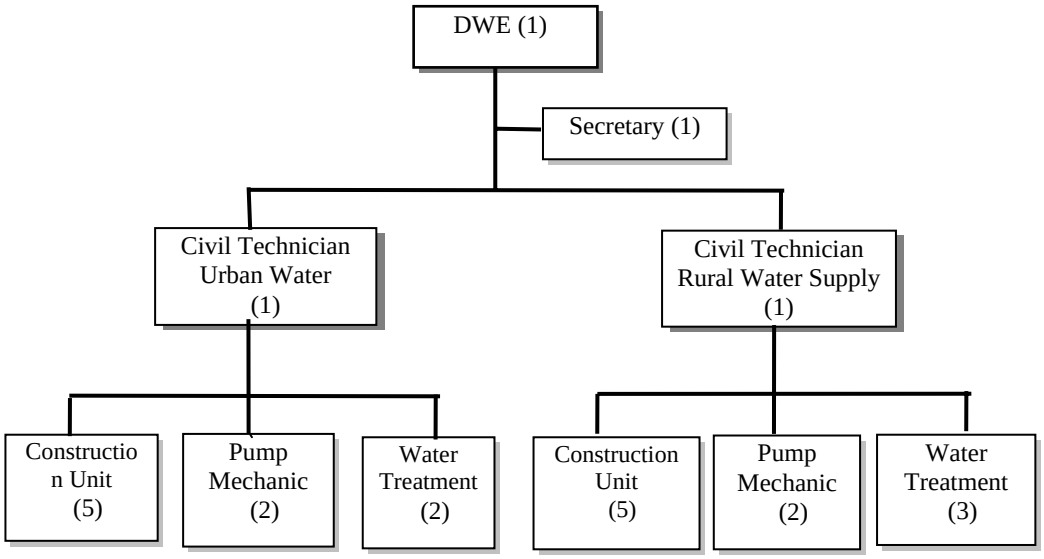


Figure 7.6-2: Organization Chart of Magu District Water Engineer Office in Mwanza Region (by Area: Urban and Rural)

7.6.2 Human Resource Deployment and Training Record

The number of staff at the District Water Department ranges from 11 to 34. For example, as for Musoma Rural in Mara region where there are only 11 staff members, the number of staff decreased after HESAWA and private contractors that worked for HESAWA went back to the private sector. Some DWE mentioned that the number of staff is, in fact, less than half of what is needed, considering the work load the District Water Departments is currently fulfilling. In general, the cadre of engineers and full technicians is not large, while the number of Trade Tests technician is the majority.

From Table 7.6-3 to Table 7.6-5, it is found that training opportunities depend on the availability of funds and vacancies in training institutes, and there is no regular follow-up training. Most of the training courses are one year long and on civil engineering, and are implemented at the Water Resource Institute in Dar es Salaam. It is also found that the technicians of the District Water Department have not undergone training in community mobilization skills, such as participatory planning.

Table 7.6-1: Human Resource Deployment of District Water Departments in Mwanza Region (As of November, 2005)

Qualification / Distirct	Engineer with Univ./College Degree	Full Technician***	Trade Test Technician***		Assistant Technician (Untrained Techinical Auxilliary)	Clerical Staff	Scheme pump/water installation attendant*****	Total
			I	II				
Magu	1	1	23		0	4	5	34
Misungwi	1 (with Advanced diploma**)	2	10	3	0	8	No info.	24
Kwimba	0	2	3	5	2	2	9 (some: trained techinician and some not trained)	23
Semgerema	1	2	5	10	1	0	3	22
Geita	1	1	2	0	14 (Trade Test III)	0	No info.	18
Ukerewe	0	1	2	3	0	3	2	11
Total	4	9	66		17	17	19	132

Source: Interview to Distict Water Depts (DWEs or acting DWEs)

* Advance diploma: equivalent to univ. dgree

** Full Techiniain: 7+4+ 3Years Training at Water Resource Institute of MOWLD (DSM)

*** Trade Test Technitian: In general, devided into I & II category. 7+4+2 years for Trade Test I, 7+4+1 years for Trde Test II

***** Pump Attendant: some are permanently contracted while some are not.

Table 7.6-2: Human Resource Deployment of District Water Departments in Mara Region (As of November, 2005)

Qualification / Distirct	Engineer with Univ./College Degree	Full Technician***	Trade Test Technician***		Assistant Technician (Untrained Techinical Auxilliary)	Clerical Staff	Scheme pump/water installation attendant*****	Total
			I	II				
Musoma (Rural)	1	3	0	2	0	3	8	17
Bunda	0	4	6	1	8 (Trade Test III)	1	3 (+7 Temporary contratced)	30
Serengati	0	4	5	6	6	2	8	31
Tarime	0	2	3 (1 Year course)	1 (3 Month course)	0	0	21 (Temporary, Untrained)	27
Total	1	13	14	10	14	6	47	105

Source: Interview to Distict Water Depts (DWEs or acting DWEs)

* Advance diploma: equivalent to univ. dgree

** Full Techiniain: 7+4+ 3Years Training at Water Resource Institute of MOWLD (DSM)

*** Trade Test Technitian: In genral devided into I & II category. 7+4+2 years for Trade Test I, 7+4+1 years for Trde Test II

**** Trade Test III: 7 + 1 year techinical training

***** Pump Attendant: some are permanently contracted while some are not.

Table 7.6-3: Training Records of District Water Department Staff (the last 5 years) in Mwanza Regions (1/2)

1) **Magu**

	Types of Training	Place of Training	Length of Training	No of Staff Trained
FY1999/2000	-	-	-	0
FY2000/2001	-	-	-	0
FY2001/2002	-	-	-	0
FY2002/2003	-	-	-	0
FY2003/2004	Full Technician Certificate	Water Resource Institute (DSM)	3 Years (still in the course)	1 Trade Test Technician
FY2004/2005	-	-	-	0

2) **Misungwi**

	Types of Training	Place of Training	Length of Training	No of Staff Trained
FY1999/2000	Pump technique	Water Resource Institute (DSM)	1 year (3 month lecture + 9month OJT)	1 Trade Test Technician
	Shallow well technique	Water Resource Institute (DSM)	Ditto	1 Trade Test Technician
FY2000/2001	-	-	-	0
FY2001/2002	Pump technique	Water Resource Institute (DSM)	1 year (3 month lecture + 9month OJT)	5 Trade Test Technicians
	Masonry	Water Resource Institute (DSM)	Ditto	1 Trade Test Technician
FY2002/2003	-	-	-	0
FY2003/2004	Plumping	Water Resource Institute (DSM)	1 year (3 month lecture + 9month OJT)	1 Trade Test Technician
	Mechanic	Water Resource Institute (DSM)	Ditto	2 Trade Test Technicians
FY2004/2005	Masonry	Water Resource Institute (DSM)	Ditto	1 Trade Test Technician
	Carpentry	Water Resource Institute (DSM)	Ditto	1 Trade Test Technician

* all staff trained during the last 5 years still remain at the DWD.

3) Kwimba

	Types of Training	Place of Training	Length of Training	No of Staff Trained
FY1999/2000	Shallow well technology	OJT	OJT	1 Trade Test Technician
FY2000/2001	-	-	-	0
FY2001/2002	-	-	-	0
FY2002/2003	Supervision technique	Water Resource Institute (DSM)	1 year	1 Trade Test Technician
FY2003/2004	Water laboratory technology	Water Resource Institute (DSM)	1 year	1 Trade Test Technician
FY2004/2005	Water quality analysis	OJT	OJT	1 Trade Test Technician
	Plumbing	OJT	OJT	1 Trade Test Technician
	Electricity	OJT	OJT	1 Trade Test Technician

Source: District Water Engineer Office

Table 7.6-4: Training Records of District Water Department Staff (the last 5 years) in Mwanza Regions (2/2)

4) Sengerema

	Types of Training	Place of Training	Length of Training	No of Staff Trained
FY1999/2000	-	-	-	0
FY2000/2001	-	-	-	0
FY2001/2002	Supervision technique	Water Resource Institute (DSM)	1 month	1
FY2002/2003	-	-	-	0
FY2003/2004	Plumbing Grade II	Water Resource Institute (DSM)	1 year	8
	Water Treatment Grade II			
	Shallow Well Technology Grade II			
FY2004/2005	Plumbing Grade I	Water Resource Institute (DSM)	1 year	3
	Shallow Well Technology Grade I			

5) Geita

	Types of Training	Place of Training	Length of Training	No of Staff Trained
FY1999/2000	-	-	-	0
FY2000/2001	-	-	-	0
FY2001/2002	-	-	-	0
FY2002/2003	-	-	-	0
FY2003/2004	Shallow Well Construction Grade I	No info.	No info.	2
	Water Analysis Garade I	No info.	No info.	1
FY2004/2005	Plumbing/Meter Reader	No info.	No info.	3
	Shallow Well	No info.	No info.	1
	Water Analysis	No info.	No info.	1

6) Ukerewe

	Types of Training	Place of Training	Length of Training	No of Staff Trained
FY1999/2000	-	-	-	0
FY2000/2001	Database on Water	Mwanza	1 Week	1
FY2001/2002	-	-	-	0
FY2002/2003	Supervision Technique	Water Resource Institute (DSM)	3 Weeks	1
FY2003/2004	-	-	-	0
FY2004/2005	Design and Estimation of Water Pipe Scheme Distribution Costs	Water Resource Institute (DSM)	1 Month	2

Source: District Water Engineer Office

Table 7.6-5: Training Records of District Water Department Staff (the last 5 years) in Mara Regions

1) Musoma

	Types of Training	Place of Training	Length of Training	No of Staff Trained
FY1999/2000	Water Quality Testing	Mwaza Training Institute (HESAWA Activity Training)	5 Days	1
FY2000/2001	Participatory and Monitoring	Mwaza Training Institute (HESAWA Activity Training)	5 Days	1
FY2001/2002	-	-	-	0
FY2002/2003	Rain Water Harvesting Tank	Water Resource Institute (DSM): lecture + OJT	1 Year	1
FY2003/2004	-	-	-	0
FY2004/2005	-	-	-	0

2) Bunda

	Types of Training	Place of Training	Length of Training	No of Staff Trained
FY1999/2000	-	-	-	0
FY2000/2001	-	-	-	0
FY2001/2002	-	-	-	0
FY2002/2003	-	-	-	0
FY2003/2004	-	-	-	0
FY2004/2005	Plumbing	Water Resource Institute (DSM	1 Year	1 Trade Test I Technician
	Pump mechanic			1 Trade Test I Technician
	Foundation Course (for Business Administration course)	Open University	1 Year	1 Full Technician (DWE)

3) Tarima

According to Tarime District Water Department, no training attended in the last 5 years. (No informatio

4) Serengeti

	Types of Training	Place of Training	Length of Training	No of Staff Trained
FY1999/2000	-	-	-	0
FY2000/2001	Pump mechanic	Water Resource Institute (DSM)	1 Year	1 Trade Test Technician
	Construction			1 Trade Test Technician
FY2001/2002	-	-	-	0
FY2002/2003	-	-	-	0
FY2003/2004	Pump mechanic	Water Resource Institute (DSM)	1 Year	3 Trade Test Technician
	Masonry			2 Trade Test Technician
	Plumbing			1 Trade Test Technician
	Survey			1 Trade Test I Technician
FY2004/2005	Pump mechanic	Water Resource Institute (DSM	1 Year	2 Trade Test I Technician

Source: District Water Engineer Office

7.6.3 Budget of District Water Department

As shown in Table 7.6-6 and Table 7.6-7, the amount of budget allocated to the district water sector is in general very limited. It is also noted that some districts do not have any development costs for new facility construction activities. It is observed that the limitation of budget and other necessary resources resulted in inactiveness of regular supervision and monitoring of village level O&M activities, which are major responsibilities for water technicians. As explained in Table 7.6-10, in practice water technicians visit communities only if they are requested by villagers to assist repair or check-up, and currently no preventive maintenance activities are done by the District Water Department.

Table 7.6-6: Budget of District Water Department (the last 5 years) in Mwanza Regions (Tsh 000)

District	2001/02		2002/03		2003/04		2004/05		2005/06	
	Development	Recurrent	Development	Recurrent	Development	Recurrent	Development	Recurrent	Development	Recurrent
Sengerem	84,920	417,690	92,980	61,540	101,040	72,498	117,220	104,500	133,400	154,365
Kwimba	99,728	72,463	22,482	81,786	27,400	107,165	83,085	84,539	143,259	105,888
Geita	8,000	34,612	8,000	37,719	15,000	39,533	30,000	54,562	39,000	57,183
Magu	161,200	36,083	238,299	42,643	95,440	49,815	191,742	69,252	3,614,760	67,415
Misungwi	6,000	18,000	8,500	20,000	12,000	33,600	16,000	50,000	9,000	70,000
Ukerewe	7,014	24,385	-	26,636	4,563	28,360	4,563	38,457	-	-

Note: Data collected from each District Water Office
Recurrent Budget: Salaries, utilities, minor maintenance
- : No budget

Table 7.6-7: Budget of District Water Department (the last 5 years) in Mara Regions (Tsh 000)

District	2001/02		2002/03		2003/04		2004/05		2005/06	
	Development	Recurrent	Development	Recurrent	Development	Recurrent	Development	Recurrent	Development	Recurrent
Musoma (rural)	51,370	71,200	-	48,835	-	78,268	13,000	103,767	12,306	126,990
Bunda	4,000	192,539	7,000	199,175	8,000	215,872	8,000	264,476	8,000	317,599
Serengeti	-	124,500	-	49,959	-	53,680	-	81,133	-	84,500
Tarime	Information was not obtained from the District Water Dept./Planning Office									

Note: Data collected from each District Water Office through the Planning Office of Regional Administration Secretariat.
Recurrent Budget: Salaries, utilities, minor maintenance
- : No budget

Table 7.6-8: Expenditure of District Councils and Water Department in Mwanza Region (FY2004/2005) (Tsh 000)

District	Total Expenditure of the District Council		Water Sector			Education			Health		
	Develop-ment	Recurrent	Develop-ment	Recurrent	% of recurrent in DC	Develop-ment	Recurrent	% of recurrent in DC	Develop-ment	Recurrent	% of recurrent in DC
Magu	2,946,272	4,890,742	340,572	104,967	2%	1,534,000	2,780,000	57%	450,000	740,000	15%
Missungwi*	No info.	No info.	16,000	50,000		3,000	2,186,539		4,500	462,531	
Kwimba	No info.	No info.	32,833	77,704		1,148,002	839,994		223,424	147,285	
Sengerema	No info.	4,883,111	18,800	104,500	2%	No info.	2,232,046	46%	No info.	324,587	7%
Geita	29,465,532	1,538,494	58,000	52,457	3%	28,638,117	359,878	23%	442,114	895,601	58%
Ukerewe	644,592	4,652,458	3,912	50,130	1%	3,981	3,172,397	68%	0	432,791	9%

Sources: District Water Engineer Office, District Financial Offices, District Planning Offices
* As for Missungwi: Salaries are exclusive and information is incomplete. It is possible to be not reflecting actual figures.

Table 7.6-9: Expenditure of District Councils and Water Department in Mara Region (FY2004/2005) (Tsh 000)

District	Total Expenditure of the District Council		Water Sector			Education			Health		
	Develop-ment	Recurrent	Develop-ment	Recurrent	% of recurrent in DC	Develop-ment	Recurrent	% of recurrent in DC	Develop-ment	Recurrent	% of recurrent in DC
Musoma (R)	2,091,768	3,689,527	13,000	99,367	3%	172,603	580,747	16%	1,502,037	2,459,352	67%
Bunda	5,462,027*	4,680,114	8,000	265,476	6%	533,813	2,963,636	63%	103,404	412,355	9%
Serengeti	1,639,350	2,500,456	29,173	112,609	5%	890,507	1,645,778	66%	164,509	287,480	11%
Tarime**	438,821	3,119,784	0	214,869	7%	114,063	2,470,796	79%	119,649	312,701	10%

Sources: District Water Sector., District Financial Offices, District Planning Offices
* Only includes Grant+Own Source Revenue
** As for Tarime District, information is incomplete and it is possible to be not reflecting actual

7.6.4 Supervision and Monitoring Activities on O&M and Record Keeping on WUG/WUA

The conditions of supervision and monitoring activities for water facilities, Water User Groups and Water User Associations were surveyed through interviews and questionnaires to the District Water Department, in order to know the magnitude of preventive activities and repair activities in the Study area. In addition, the situation of record keeping of WUG/WUA was also inquired about to see how much the district water departments support and manage the water supply services to communities.

Except for Bunda district in Mara region, which regularly carries out scheduled activities assigning technicians to supervision and monitoring, regular supervision and monitoring is not common. In most of the districts, when requests from communities are made to the water department, the technician goes to the villages for repairs and to deal with the problems. One DWE mentioned that before 2002, when HESAWA was financially supported by SIDA, there was a budget and scheduled activities for the monitoring of communities.

Records on WUG and WUA are currently not regularly updated in the District Water Department, and villages are not reporting to the District Water Department regularly on the status of their water facilities and the account.

Table 7.6-10: Monitoring, Supervision Activities and Recording Keeping of WUGs & WUAs at District Water Department in Mwanza Region

District	Monitoring/ Supervision of Facility Conditions Piped Schemes	Monitoring/ Supervision of Facility Conditions Wells	WUG Record ○ Updated regularly × Not updated	WUA Record ○ Updated regularly × Not updated	Regular Report from WUG to Water Dept.
Mwanza region					
Magu	△3 operational schemes are checked regularly.	× No preventive. After deficiency occurs, technicians go to the site by responding to request from communities.	△ 40% of WUG report to District Water Department regularly (annually).	×	△ 40% of WUG report to District Water Department regularly (annually).
Misungwi	×	×No preventive. After deficiency occurs, technicians go to the site by responding request from communities.	×	×	×
Kwimba	△	×No preventive. After deficiency occurs, technicians go to the site by responding request from communities.	×	×	×Some WUGs report to District Water Dept. Before 2002, the records were updated better.
Sengerema	○	○	×	×	×

Geita	○	△	×	No Association	×
Ukerewe	○	○	×	×	×

Source: The JICA Study Team. Interview or questionnaire to District Water Offices

Table 7.6-11: Monitoring, Supervision Activities and Recording Keeping of WUGs & WUAs at District Water Department in Mara Region

District	**Monitoring/ Supervision of Facility Conditions** **Piped Schemes**	**Monitoring/ Supervision of Facility Conditions** **Wells**	**WUG Record** ○ **Updated regularly** × **Not updated**	**WUA Record** ○ **Updated regularly** × **Not updated**	**Regular Report from WUG to Water Dept.**
Mara region					
Bunda	○Pump technician or pump attendant keep watching at sites.	○ Visited once a year.	×	×	×WUG report shows only the status of water installation.
Musoma (Rural)	×Before 2002, monitoring was done because of budget availability.	× No preventive. After deficiency occurs, technicians go to the site by responding to request from communities. Before 2002, monitoring was done because of budget availability.	×	○	× In 2004, it was tried to collected updated information on VWCs/VHCs, but only 44% of the VWCs replied.
Tarime	×	×	×	×	×
Serengeti	× No preventive. After deficiency occurs, technicians go to the site by responding to request from communities.	×	×	○	×

Source: The JICA Study Team. Interview or questionnaire to District Water Offices

7.7 Institutional Arrangement for O&M and Current Practices at Community

7.7.1 Village Water Committee

Similar to the Village HESAWA Committee, the Village Water Committee is organized at the village level to "coordinate, supervise and monitor" activities of water supply and sanitation within a single village. As shown in Figure 7.7-1, in principle, the members of the VHC consist of a Chairperson, Secretary and Treasurer as the key leaders of the committee, and two representatives (1 male & 1 female) from each sub-village

As shown in Figure 7.7-1, in principle, the VHC consists of a Chairperson, Secretary and Treasurer as the key leaders, and two representatives (1 male & 1 female) from each sub-village. In the case of the Village HESWA Committee, trained village Health Volunteers are members of the Committee while the VWC, which are not trained, does not have such trained volunteers.

As stated previously, it is found that the concept of the 'Water and Sanitation (WATSAN) Committee' in the NRWSSP is not the same as the VWC or VHC as it is formed and understood in the Study region.

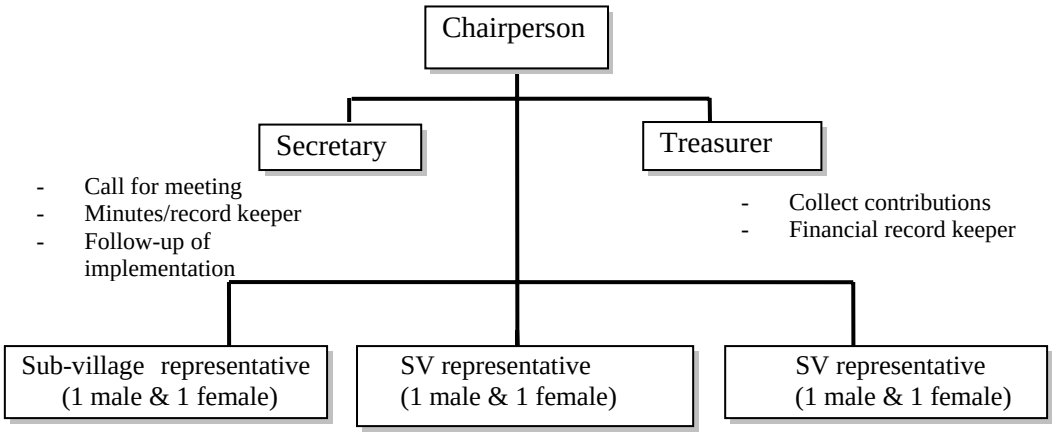


Figure 7.7-1: Organization of Village Water Committee in Mwanza and Mara Regions

The VWC/VHC system deteriorated when the WUG system was introduced in Mwanza and Mara region in 1998. Most of the villages interviewed answered that there are VWCs/VHCs in the villages since all villages are encouraged to form VWCs, and because they need to exist in the villages theoretically. However, in reality, as previously explained, the majority of VWCs/VHCs are currently not functioning. In Magu district of Mwanza region, the revival of VWCs/VHCs has been sought after finding that the District Council is not able to directly supervise a large number of WUGs (858 WUGs in Magu). Instead, the district of Magu thinks that the VHC/VWC could be an organization to supervise and monitor WUG activities within the village in Magu. Assessment of all the VWC/VHC was completed in 2005. Based on the results and recommendation of the survey, the District has a plan to intervene for the improvement of existing facilities.

In Magu district of Mwanza region, a revival of VWCs/VHCs has been sought after, as it was found that the District Council is not able to directly supervise a large number of WUGs spread out in the large rural areas (in the case of Magu district, there are 858 WUGs). The re-promotion of VWCs/VHCs and the limitation of community funds available in and VWCs/VHCs WUGs for O&M were raised as issues at the District Sector Head meeting

when the NRWSSP preparation was discussed. Then, with the initiative of the DED, the District conducted an assessment study for revising the VWCs/VHCs in 2004 by mobilizing the Assessment Team in 2004. The Assessment Team comprised of a District Water Engineer as secretary, District Health Officer, District Community Development Officer and District HESAWA coordinator, and the budget for the vehicle mobilization was allocated from the district budget. During the visit to all the villages in Magu districts, the Team instructed the villages to reorganize the VWCs/VHCs as the Village Water and Sanitation Committees (VWSCs), which emphasize not only water but also latrine construction at the household level following the HESAWA sanitation component, with 12 newly selected members with an equal number of women and men. [18] The members are composed of the following:

- 1 animator (promoter)
- 2 Village Health Workers (trained by HESAWA or other donor supported projects)
- 9 Village Government Members, who are "not" executives of the village government [19]

As seen in Figure 7.7-2, the district of Magu would like the VWSCs to be an organization to supervise and monitor WUGs and sanitation activities within the village. In reviving the VWSCs, it is expected that the VWSCs will reorganize the 'Village Water and Sanitation Fund' which consists of joint contributions by WUGs and individual households for latrine construction in a single village, and the fund will be purely used for the O&M of water supply facilities and latrine construction.

In sum, expected improvements of the VWSCs at Magu are as follows:

- Close monitoring of the WUG by VWSCs at the village level since the District Council has difficulties monitoring each WUG directly
- The "Village Water and Sanitation Funds" will be kept in the bank and used purely for the purposes of water and sanitation. This is because the WUG accounts are mostly kept in cash in their own ways, such as treasure rues' houses or in the form of 'Ifoghongo' (an informal revolving fund for the Sukuma people), and the fund tends to be used not for water improvement but for other purposes as a "communal fund".

According to the DED of Magu, based on the result and recommendation from the survey, the District has a plan to intervene for the improvement of existing facilities by allocating the district's own budget.

7.7.2 Water User Group (WUG)

As stated previously, a WUG is formed by voluntary membership in order to share a single water point. According to guidance, the number of members is within 250 people. However, in reality, it exceeds more than 250 people. The methods for payment of water fees are in general, as follows:

1) Users *contributing* (paying)* fees for operation & maintenance by month: 100Tsh-500Tsh for members + usually more for non-members **
2) Users *contributing* (paying)* fees for operation & maintenance per bucket/container

[18] According to the Magu HESAWA coordinator, 124 villages already submitted the form of new selection of the 12 VWSC member out of

[19] Conventionally, village chair is one of the 12 VWC members. However, in the new arrangement of Magu, it is guided that the village chair person could not be a member of the Committee. Rather, the chairperson is expected act for the monitoring the activities of the Committee.

(20L): for members 20Tsh while for non-members -50Tsh is common **

3) Users are not *contributing* (paying)* fees either monthly or per bucket/container, but using "traditional revolving funds" to cover the cost for O&M (i.e., "Ifogongho" as the Sukuma tradition)

Currently, the number of WUGs is 858 in Magu, 670 (517) in Kwimba, 311 in Misungwi, 236 (194) in Sengerema, 285 (236) in Geita, and 291 (267) in Ukerewe in Mwanza region, while in Mara region there are 222 in Musoma Rural, 381 (227) in Bunda, and (411) in Serengeti. As for Tarime, there is no compiled information found at the DWEO. The setting up of WUGs is a "must" for all water installations according to the National Water Policy: However, for some of the points, WUGs have not yet been formed, particularly wells constructed with the support of private investors in the area in the tourism and mining industries. [20]

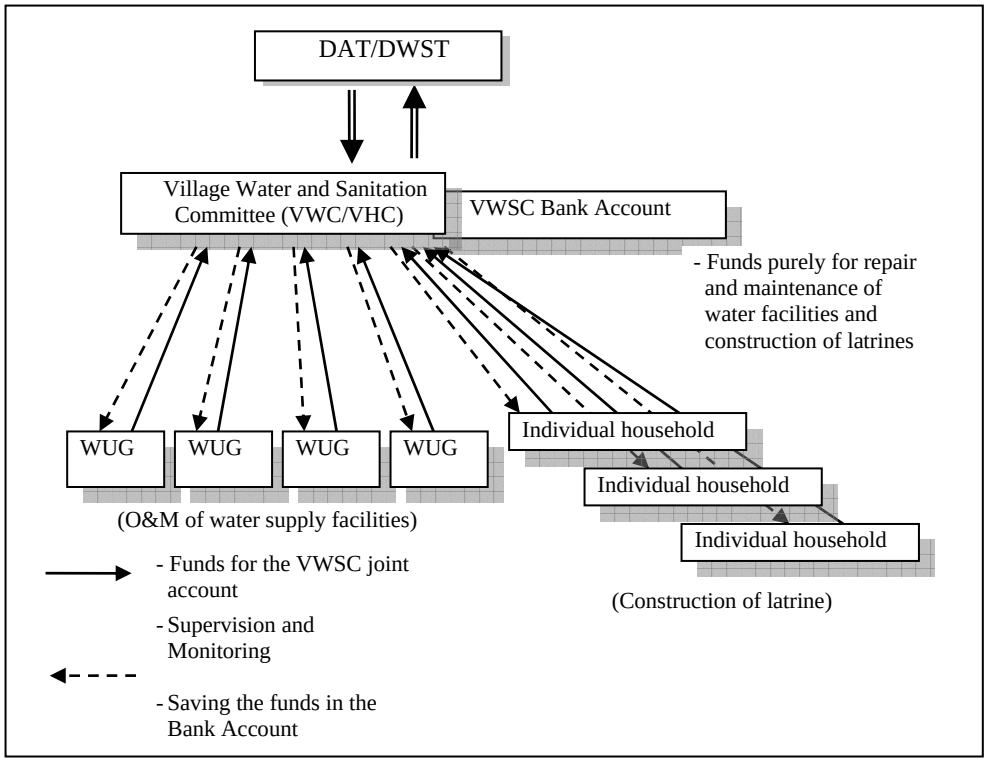


Figure 7.7-2: VHCs/WSC and WUGs Reviving Pursued in Magu (Plan)

a. WUG Committee and Three Sub-Committees

As seen in Figure 7.3-2, there are three sub-committees in the WUG Committee and the major responsibilities of the committee members are:

- To prepare and hold regular meetings with the committee, the sub-committees and the entire user group, and to keep the minutes of the meetings
- To evaluate the responsibilities and works of the three sub-committees
- To discuss the use of the group's by-laws/rules and penalty fees

[20] In Serengeti, Bunda & Tarime district in Mara region, surrounded by the Serengeti National, there are some villages which are receiving regular and stable revenue from those foreign capital inventors. The investor constructed Schools, water facilities and other income generation factories in the villages besides paying for land rent for village owned land to the Village government. As for those water facilities, WUGs are not formed since the village fund covers for O&M.

Each sub-committee is supposed to be composed of an equal number of women and men, and the members are to receive three days training on specific subjects by the sub-committees.

b. Financial Management

The O&M fund of the WUG is supposed to be kept in the bank to ensure long-tem sustainability (security of the water supply and the village's future survival and development). In Phase III of the HESAWA Programme, WUGs started to be requested to open a bank account, and in order to withdraw money from the account, the WUGs needed to get approval from the DWEs. During Phase IV, the requirement to get approval for withdrawal from the DWEs was removed in principle because it was found that the rural banking system was deteriorated and not adequate and to have approval for the withdrawal from the DWEs was not practical. However, like in Kwimba, approval from DWE for withdrawal has been practiced.

It was observed that the most difficult point for the WUGs was financial management, and the success of fund collection and management depends on the reliability of treasurers to keep their funds. It is stated that women are generally more dependable for keeping money than men. According to the WUG status study in 2001 by SIDA, the average amount of funds saved was Tsh 127,000 per groups. The modes of contribution were as follows:

- 55% of contributions were through household contributions
- 44% of contributions were through monthly fee (50-600Tsh),
- 4% of contributions were per bucket (10-50 Ths),
- 7% of contributions were once a year (100-3000 Tsh)
- 22% of contributions were through Ifogongho (informal revolving fund by the Sukuma people)
- Others: penalties, selling water or maize

c. Meetings

According to the Study on WUGs conducted by a HESAWA consultant in 2001[21], meetings of WUGs were not held regularly. For example, only 46% of the sampled WUGs had regular meetings while 35% of them never had any meetings. Written records were taken by 68% of the WUGs, although records were actually seen in only eight of the 100 WUGs visited.

The consultant found that if yielding is yearly and adequate, there was more possibility to keep the installation clean, and if regular meetings are held by the WUGs, the possibility of collecting monthly fees was higher. In addition, if the number of single WUG members is too big, such as 100 households, meetings are held less regularly. When the study was carried out, WUG generally consisted of 10 to 250 households, while one WUG had more than 400 registered households.

7.7.3 Water User Association (WUA)

While responsibility for the cost of O&M was transferred from government to the users after the 2002 NAWAPO, the piped schemes which are functioning, even partially, have been practically run and operated by District Councils through the District Water Departments with the technical support of Water Technicians for major repairs and budgetary support by national subsidy (Refer to the cases in Bunda in the following section).

There are three types of WUAs used in the Study area:

1) A group of WUGs

[21] Maria Cedmert and Malin Dahlberg,"A Study of Water User Groups in Mara and Mwanza Regions." 2001

2) A piped scheme based association sharing the same piped scheme water; in this sense, this has the same function as the WATSAN of the NRWSSP, while the other type of WATSAN is similar to a WUGS in the HESAWA concept.

3) WUAs similar to WUGs; In Mara region there are 47 WUAs with water rights and legal ownership which are approved by MoWLD. [22]

Table 7.7-4 and Table 7.7-7 summarize the conditions of the piped scheme based Water User Associations/Boards visited and studied in Mwanza and Mara regions. As described in the Tables, the formation of WUAs for the schemes is not complete, and of the committees that have been formed, most are not functioning well. The reasons behind the slow progress of forming the WUAs are:

- The majority of the schemes are not functioning.
- Supervision of communities for O&M support from the District Water Department is not regular; thus, information on institutional set-up is not delivered to communities well.
- Villagers' willingness to pay is low. Even if a WUA already exists, there is a shortage of funds to purchase fuel for running the scheme.
- On the other hand, there are WUAs which are already established to cover the entire scheme before rehabilitation pushing politicians to pledge to rehabilitate the piped schemes although there is no plan for rehabilitation. It is thus found that the improvement of water facilities tends to be used as a 'political tool' to manipulate constituencies.

7.7.4 Water Board (Urban Water Authority's Board approved by MoWLD)

The Water Board is a management body under authority for urban and town water supply through piped schemes. All members of the Board are appointed by the Ministry of Water and Livestock Development (MoWLD). In the Study area, water fee collection for urban water supplies is done by the District Water Office, and in general the collection is still very low to cover the running costs. In the case of the Bunda Water Supply Scheme shown in Table 7.7-1, it is estimated that 76 % of the estimated running costs [23] are covered by a national subsidy allocated every quarter.

Table 7.7-2 also shows the financial status of Kibara Water Supply through the piped scheme in Bunda district, Mara region. The Kibara Water Supply originally covered two villages, namely Kibara and Busanmbara, and after rehabilitation of the part covering Kibara with 22 domestic points in 2003, villagers of Kibara formed the WUA and decided to charge 500Ths in principle as the monthly household contribution. In Kibara village, there are about 1,165 households with a total population of 7500, but only 300 households are currently registered and pay monthly contributions. As seen in Table 7.7-3, it is observed that about 90 % of the total running cost has been subsidized by the central government while the villagers'

[22] Establishment of legal status for WUG (=WUAs in the 3rd sense) are promoted through HESAWA. In Mwanza there is no legally approved WUA yet. According to the DWEs, it takes about one year to go through the processes of formalities (application, approval etc.). Having the legal status, the WUA (=WUG) has 'communal' ownership of the land and approval of water drawing while sustaining the water installation becomes full responsibility of the group.

[23] There is no data found for the total running costs (capital cost) compiled for water supply through the pipes scheme in the Water Engineer Office. The total running cost is assumed from collection from users and the central subsidy since according to the DWEO, the two sources are all sources for operation.

contribution accounts for 9% on average. [24] According to the WUA committee members of the Kibara Water Supply, the Association is supposed to collect 500,000Ths/month from all households, but in practice only 300 households regularly pay and about 150,000Tsh/month is collected. The reasons for the low collection are:

- The water supply scheme had not been functioning and operating for long; therefore, villagers do not trust that the water supply scheme works properly
- There are some villagers who have private hand dug wells in their yards/on their premises
- Availability of alternative water sources:
  - The village is located along Lake Victoria and villagers tend to take water from there, although the village government has instructed people not to take baths in the lake for hygiene reasons.
  - Six (6) shallow wells constructed by HESAWA are available, although they dry up in the dry season.

Reviewing the financial management of the WUAs and Board in Bunda district, Mara region, it is found that the O&M of pipes schemes is hardly sustained by community contribution alone at present, and it is necessary to have government subsidies for a while until the collection rate from users is raised and stabilized. Besides the issue of low collection for O&M, the behavioral changes of villagers for sanitary/hygiene needs to be strongly emphasized to enable villagers to see the importance of using safe water and its consequences.

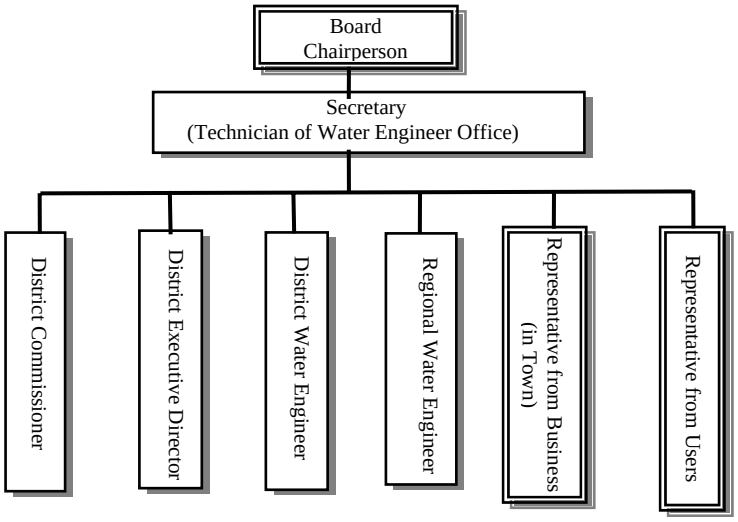


Figure 7.7-3: Organization of Bunda Water Supply Board

[24] In reality, there are some additional costs for management costs such as allowances for domestic point care takers and purchase of collection books.

Table 7.7-1: Bunda Water Supply Scheme: Revenue & Subsidy

	Collection from Users (Tsh)	Total Collection of Quarter (Tsh)	% of total subsidy+revenue	Subsidy from the Central Government (Tsh)	% of total subsidy+revenue	Total (Tsh)
October-04	1,057,830	3,522,355	16%	18,000,000	84%	21,522,355
November-04	No info.(estimeted 1,057,830)					
December-04	1,406,695					
January-05	1,625,665	4,845,830	18%	22,000,000	82%	26,845,830
February-05	1,836,395					
March-05	1,383,770					
April-05	1,648,300	5,812,895	28%	15,000,000	72%	20,812,895
May-05	1,600,300					
June-05	2,564,295					
July-05	1,749,715	(Estimate from July to Sep., 2005) 5,343,185	35%	10,000,000 (for July-Sep., 2005)	65%	15,343,185
August-05	1,796,735					
Total	**17,727,530**	**Average quarter: 4,881,066**	**24%**	**Average quarter: 16,250,000**	**76%**	**Assumed Monthly Running Cost (capital only)/7,684,024 Tsh**
Average/Month	**1,477,294**					

Source: Bunda Water Engineer Office, Mara region

Table 7.7-2: Revenue and Subsidies for Kibara Scheme, Bunda

	Collection from Users (Tsh)	Total Collection of Quarter (Tsh)	% of total subsidy+revenue	Subsidy from the Central Government (Tsh)	% of total subsidy+revenue	Total (Tsh)
September-04	153,000	345,000	10%	3,000,000	90%	3,345,000
October-04	77,000					
November-04	115,000					
December-04	95,500	290,500	9%	3,000,000	91%	3,290,500
January-05	93,500					
February-05	101,500					
March-05	101,500	115,000	4%	3,000,000	96%	3,115,000
2005/4/1*	9,000					
2005/5/1*	4,500					
June-05	82,000	395,000	12%	No info. (Assume 3,000,000)	88%	3,395,000
July-05	178,000					
August-05	135,000					
Total						
Average/Month	**95,458**	**1,145,500**	**9%**	**12,000,000**	**91%**	**Assumed Monthly Running Cost (capital only)/1,095,458 Tsh**

Source: Bunda Water Engineer Office, Mara region

Note: * From April to May 2005: Due to breakdown of pipelines, collection from the users was low.

Table 7.7-3: Piped Scheme Based Water User Associations/Boards Visited in Mwanza & Mara Regions

Region	District	Name of WUA	Name of Scheme	Distance from the District Centre	Villages Information			No of Water Point Pperational	Organization & Management of WUA/Board							Financila Status/Collection of the Water Fee				Maintenance and Repairs			HESAWA Intervention/ Alternative Water Sources	Monitoring and Supervision by DWE	Notes
					Livelihood of Villagers	No of Villages Covered by the Scheme (supposed to)	No of Villages Where the Scheme is Operational		Year of Establishment of WUA/ Board	Villages/sub-villages Participating WUA	VWC Base or Not?	Ways of Committee Member Selection	Ways of Selection for WUA/Board Executive Members	Rules/Regulation Registered to DWE	Regular Meeting	Collection of the Water Fee	Fund in the Bank Account (Tsh)	Fee: Household by Month	Fee: Per Bucket	Are Pump Attendants Paid/hired by WUA/Board?	Experience of Repairs	Knowledge of Costs for Spare-parts & Where to Get Spare-parts			
Mwanza	Magu	Kalemela Board	Kalemera/Mkula	70 KM	Fishing is main source of income⇒ relatively better off	9	2 (the other 7 villages have problems of pipes)	12	2002	9	VWC base: each VWC select 4 member to the Board	36 members (1/2 Male: 1/2 Female)	From a village water is not currently served	Rules/regulations are not registered to District Water Dept.	No	In the served villages, only 25% of the total HHs are paying monthly fee. ⇒not enough for fuel to run the scheme. The other 75% of HHs take water from the Lake (2km) or TWSs (hand dug wells).	Tsh 600,000 (as an initial cost, each HH contributed 1000Tsh.)	○ Tsh 400/HH (only 25% of the total HHs in the served villages pay)		No. Pump attendants are paid by the District Water Dept.	October 2005: replacement of damaged pipe. Cost Tsh 15,000. Money is not used from the bank account, and contributed from the users for that purpose.		No (application was not made from the area). Villages mostly take water from the Lake (2km) or TWSs (hand dug wells) in rainy season.	No (the last visit by Water Dept. was August 2004)	While only 2 villages get water, they are told by politicians that scheme will be repaired.
		Kiloleli Water Board	Kiloleli	15 KM	Fishing is main source of income(not farmers)⇒ relatively better off and villagers say that they could pay even 3,000 Tsh/month for water.	2	2 (In Ihale village for 1 sub-villages, In Yitwimila B village for 3 sub-villages)	0 (while the schemes was rehabilitated by Unicef support in 2004, the schemes is not used dues to a technical problem of the engine. There are 7 drawing points after rehabilitation)	2004	5	No. The committee member of the board are not related to VWCs.	Member from 5 villages: while the scheme is to serve to 2 villages currently, politicians told to villages about a plan of extension to 5 villages.	The ward nominated the WUA's Committee members.	No rule formulated.	No	No (the scheme is not operational)	Tsh 30,000			No.	No	It is not clear for the cost for spare-parts, therefore they consult to Water Department when a problem occurs. In general, spare-parts could be procured in Mwanza city.	5 shallow wells in the 2 villages constructed by HESAWA (not adequate in dry season). Villages use water from the Lake (0-2.5 km) or HESAWA shallow wells. Villagers also buy water from the vendors (Tsh100/20L) in dry season.	District Water Dept. visited once in 2004 from Water Dept. Villagers complain that they are only told they need to form the board without any follow-up by the Water Dept..	Partially rehabilitated by the UNICEF support in 2004, but still not in operation due to the engine problem. Management of the scheme is to be contracted to a private agent (a business man).
	Misungwi	Kasololo WUA	Kasololo/ Igongwa	Less than 40KM	Agriculture	6	0	0	2003 after rehabilitation	6	No	After 2003 rehabilitation, villagers were instructed to form the WUA by the District Water Dept.	Female Chairperson who are a community leader	Rules/regulations are not registered to Water Dept.	No	No (Amount of the fee collection is not decided by the WUA.)	0 (Ths 200,000 was contributed to rehabilitate)			No	No (2003: rehabilitation by district)	No	22 HESAWA shallow wells in the 6 villages and TWSs (hand dugged wells)	No visit & follow-up by the Water Dept in 2004 & 2005.	According to District Water Dept., after the 2003 rehabilitation, 500L diesel was given to WUA to run the schems, but due to no fee contribution by villagers, operation has been stopped.
	Kwimba	Kadashi WUA	Kadashi	40 KM	Agriculture	2 (Kadashi, Nyashana)	1 (Kadashi: out of 12 sub-villages, 7 sub-villages are covered by the sheme⇒most of sub-villagers uses alternative sources)	1 (the other 2 points are out of order): In rain season, the scheme is closed (not pumping from the borehole) since villagers take water from shallow wells or TWSs. In dry season, for only 3 days/week pumping is done.	2004	1 (Among 12 SVs, only 2 SVs habitants join the WUAs since they do not have alternative source)	No	District Water Dept instructed the VEO to form the WUA in 2004.	55 HHs in Kadashi villages registered as the WUAs members and the executive members are selected from the HHs.	Rules/regulations are not registered to Water Dept.	No	For non-member of WUAs: Tsh 50 /20L while Tsh 20/20L for the WUA members (Fee is not always collected).	Ths 11,900		For non-member of WUAs: Ths 50 /20L while Tsh 20/20L for the WUA members (Fee is not always collected)	Yes (Tsh 1,000/day, when pumping is done: 3 days/week in dry season)	2005: Spare-parts for the repair was contributed by the MP (politician) elected from the constituency.	No. Villagers think that all information for repair is delivered by the Water Department.	2 HESAWA shallow wells in Kadashi village (not adequate in dry season)	No. In 2004, one visit from the Water dept.	Borehole is an water source of the scheme. In rainy season, the scheme is not used since villagers have many alternative sources, and only in dry season villagers depend on the scheme (pumping schedule: 3 days/week).
Mara	Bunda	Kibara WUA	Kibara	52 KM	Fishing, agriculture and commercial are main sources of income	2 (Kibara, Busambara)	1 (Kibara: rehabilitated in 2003)	21 (total 22 points: 1 out of order)	2003	1 (Kibara: 5 sub-villages): 1,165HHs	No.	10 members were selected by the village assembly (members are not the village government members). Representatives of each sub-villages are selected but some members already dropped.	Member selected in the village assembly, then executive members are selected among them.	Rules/regulations are not registered to District Water Dept.	Quarterly	Collection of fee (500 Ths/month /HH) was decided by the Village Assembly, but about less than 300HHs (30% of the total HHs) pay the fee at maximum (the low registration rate for the shame users). Th other who don't pay take water from the Lake (0-200M)	Tsh 1,600,000	○ 500 Tsh/hh (there is a plan to increase to 1,000 Ths/month/ HH)		No.	Pipe broken in May 2005. Cost Tsh 200,000 and subsidized by the District budget. Pump Technician (technical supervisor of the shame) is posted from District Water Dept. The technician takes care of repair fully.	The technician knows where to get the spare-parts Bunda, Musoma City or Mwanza City).	HESAWA wells (no collection any fee currently), the Lake and the private wells (hand dug wells).	Technician (= assigned as a technical supervisor of the scheme from the District Water Dept.) It is observed that the technician does not keep good records to account for the running cost and expenses.	According to the plan by the District Water Dept., it is supposed to be collected Tsh 500,000/month to run the scheme, but only Tsh 77,000-178,000/month (in dry season) is collected since only 30% of the total HHs use the scheme (Over 70% of villagers do

Table 7.7-4: Conditions of Piped Scheme Based Water User Associations/Boards (Selected) in Mwanza Region

District		Name of Piped Scheme	Water Supply Status: **Functioning ○ or Not functioning × ***	Existence of WUA or Board: Yes ○ or No ×
Magu	1	Kabila-Ndagalu	× There is a rehabilitation plan	×
	2	Magu	△ Partially functioning, non-function due to water level	○
	3	Kalemela/Mkula	△ Among 9 villages, only two villages (Chamgasa, Bushigwamhala) are supplied.	○
	4	Kisesa	×	×
	5	Ilumya	× Not functioning at all	×
	6	Nassa	× There is a rehabilitation plan	×
	7	Kililoleli	○ Partially rehabilitated in 2004, but it is not operational yet	○ Management is contacted to a private agent
Kwimba	1	Ngudu	△	○ Board (township)
	2	Mantare	×	×
	3	Ilula	×	△ VWC works as WUA
	4	Kadashi	× (2 villages are served in October, 2005)	○ Only members from 2 sub-villages of Kadashi village are joining the WUA.
	5	Ilumba	× Not functioning at all	×
Misungwi	1	Kasololo	○Rehabilitated in 2003	○ But the water fee is not collected, and due to shortage of the running cot, it is not operational
Geita	1	Karumwa/Msalala (= Geita Urban Water	×	○ Board of Geita Urban Water Authority
	2	Nzera	×	×
	3	Nyang'wale	×	×
	4	Nyakagomba	×	×
Ukrewe	1	Nansio (=Town Water Supply)	△	×Board (for Authority) has not formed yet. It is expected to increase after installation of electric pumps. The Water Supply at Nansio and neighboring villages is managed by District Water Department with subsidy for fuel, repair and other costs. There are few users paying 'flat rate.'
	2	Other piped schemes	-	× No WUA has not formed because water yield is currently minimal.
Sengerema	1	Myamazugo (=Sengerema Urban Water Supply and Sanitation Authority)	○ Covering 7 villages (Population 31,500)	○ Board (for Authority) was formed, and 3 years later, the Chairperson was, in fact, nominated by DED through DWE advice, and already approved by MOWLD. Other 9 Board members are composed of the government offices staff. Collection of fee is done based on mixtures of 'flat rate', 'metered' and per bucket' through public domestic points (PDP) agents. Government subsidy is for electric bills only, and the rest of the costs are met by the fee collection, but not enough to improve the scheme and to replace to upgraded machines, which are required.
	2	Other piped schemes	-	× No WUA has formed

Source: Interview to WUAs, interview or questionnaire to District Water Engineer Office
Note: * Function or not-functioning primary mean that conditions on '**hard wear**' based on the survey done by JICA Study Team member in charge of Facility Design.

Table 7.7-5: Conditions of Piped Scheme Based Water User Associations/Board (surveyed) in Musoma (Rural) District in Mara Region

Name of Piped Scheme		Currently Served Villages	Water Supply/ Scheme Status		Organization & Management of WUA/Board					Financial Status/Collection of Water Fee					Note
			Water Supply Status: Functioning ○ or Not functioning ×	Reasons for Non functioning	Existence of WUA/Board : Yes ○ or Not ×	Year of Establishment	No of HHs in the WUA	WUA or Board just by Name? (=No substantial activity done)	Rules/Regulations of WUA/Board are Registered to District Water Dept. or Not: Yes ○ or Not ×	Fund of WUA/Board in the Bank Account: Yes ○ or No ×	In case of Yes for the Fund, How much kept currently ? (Tsh)	Collection of Water Fee: Yes ○ or No×	In case Yes for the fee collection, how much ? (Tsh)	Monthly HH contributions (Tsh)	Per Bucket (Tsh)	
1)	**Masrura**	**Msurura**	○	-	× (The VWC functions for the management)	-	No info.	-	-	× (There are 3 WUGs in the VWC, but all WUGs are not functioning and not collecting fees cuurently)	-	×	-	-	-	There is no WUA for the scheme while the VWC, which is not functioning well, exits. The District Water Dept. has a plan to make the WUA to be Board and Authority.
2)	**Itaro**	**Etaro**	○	-	× (The VWC functions for the management)	-	No info.	-	-	No WUG under the WVC.	-	×	-	-	-	
3)	**Murangi**	**Murangi**	○	-	× (The VWC functions for the management)	-	No info.	-	-	Ditto	-	×	-	-	-	
4)	**Kyankoma**	**Kursaro**	×	Stolen	×	-	No info.	-	-	There are 7 WUGs and 3 WUGs are somehow functiong while all are not collecting fees cuurently.	-	-	-	-	-	
		Kyallowa														
		Kalugeneli														
		Buowahile														
5)	**Murango/ Butiama**	**Murango**	○		○ But not functioning collectively. In Murango and Kamgegi, there are WUGs which are not active currently.	No info.	No info.	No actual function/ activitiy as WUA	No	×	-	×	-	-	-	Ditto. As for the 5 villages being rehabilitated, there is no budget approved.
		Kamgegi	○													
		Lyamugabo	×	Under rehabiltation												
		Kiabakari	○													
		Myamisisi	○													
		Butiama	○													
		Bisarya	×	Under rehabiltation												
		Muriaza	×	Ditto												
		Bumangi	×	Ditto												
		Buturu	×	Ditto												
6)	**Buswahihi**	**Buswahihi**	×	Dry up of a dam in dry season. Only rainy season water is available.	×	-	-	-	-	-	-	-	-	-	-	-

Table 7.7-6: Conditions of Piped Scheme Based Water User Associations/Board (surveyed) in Bunda District in Mara Region

Name of Piped Scheme		Currently Served Villages	Water Supply/ Scheme Status		Organization & Management of WUA/Board					Financial Status/Collection of Water Fee						Note
			Water Supply Status: Functioning ○ or Not functioning ×	Reasons for Non functioning	Existence of WUA/Board : Yes ○ or Not ×	Year of Establishment	No of HHs in the WUA	WUA or Board just by Name? (=No substantial activity done)	Rules/Regulations of WUA/Board are Registered to Distirct Water Dept. or Not: Yes ○ or Not ×	Fund of WUA/Board in the Bank Account: Yes ○ or No ×	In case of Yes for the Fund, How much kept currently ? (Tsh)	Collection of Water Fee: Yes ○ or No ×	In case Yes for the fee collection, how much ? (Tsh)	Monthly HH contributions (Tsh)	Per Bucket (Tsh)	
1)	Bunda (=Urban Water Authority's Board)	Bunda	○		○Water Board (legally approved and committee members are approved by MOWLD as Authority)	2003		Functioning (District Water Dept Technician as Secretary of the Board)	○	○	Not known by the District Water Dept.	Paid by meter (assumed Tsh 5,000 average/month). Collection of the water fee/month during July 2004 to June 2005 ranged from Tsh 1,054,560 to Tsh 2,564,295, which are about 17% of the central government subsidy to run the scheme.					The running cost from July 2004 to June 2005 was 104 million, in which 83 % of the total cost was covered by the central government subsidy while 13 % covered by revenue generated from the users.
		Guta	○														
		Tairo	○														
		Migungani	○														
		Manyamanyama	×	Stolen booster (pumping)													
		Nyasuru	○														
		Kung'ombe	×	Stolen booster (pumping)													
		Balili	○ (partially)	Pipes are not fully extended.													
		Kunzugu	×	Stolen pipes													
2)	Kasahunga	Keruma	○		○: WUA but does not have legal status yet	2002	Not known by the District Water Dept.	Some substantial activities done.	×	○	Not known by the District Water Dept.	○	Not known by the District Water Dept.	(Assumed 500 Tsh)		District Water Dept. is encouraging to fix meters.
		Kasahunga	○	Rrehabilitated in 2004													
		Nyamitwebili	×	Stolen & broken pipes													
3)	Kibara	Kibara	○	Rehabilitated in 2003	○ Only at Kibara	2003	Not known by the District Water Dept.	Some substantial activities done while it's not active.	×	○	Tsh 1,600,000	○ But only less than 30% of the HHs pay the water fee.	Ths 500	○		In the area, some commercials exist. 52 KM from the district centre. It is observed that the District Water Dept. does not have information details
		Busambara	×	Disorder of pipes (bursting & stolen)												
4)	Iramba	Isanju	×	Under rehabilitation	×	-	-	-	-	-	-	-	-	-	-	
		Mugara	×													
		Mwiruruma	×													
		Sikiro	×													
		Namhula	×													

Table 7.7-7: Conditions of Piped Scheme Based Water User Associations/Board (surveyed) in Serengeti District in Mara Region

Name of Piped Scheme		Currently Served Villages	Water Supply/ Scheme Status		Organization & Management of WUA/Board					Financial Status/Collection of Water Fee						Note
			Water Supply Status: Functioning ○ or Not functioning ×	Reasons for Non functioning	Existence of WUA/Board : Yes ○ or Not ×	Year of Establishment	No of HHs in the WUA	WUA or Board just by Name? (=No substantial activity done)	Rules/Regulations of WUA/Board are Registered to District Water Dept. or Not: Yes ○ or Not ×	Fund of WUA/Board in the Bank Account: Yes ○ or No ×	In case of Yes for the Fund, How much kept currently ? (Tsh)	Collection of Water Fee: Yes ○ or No×	In case Yes for the fee collection, how much ? (Tsh)	Monthly HH contributions (Tsh)	Per Bucket (Tsh)	
1)	**Mugumu (Urban Water & Sewage Authority's Board)**	**Mugumu** (at 2 Mtee: streets of Mugum & Morotonga**)**	○	-	○	2003	221	Functioning	○Registered to MOWLD (not to District Water Dept.)	×	-	○	Tsh 20/per bucket		Tsh 20	"Authority" approved by MOWLD
2)	**Musati Gravity Scheme**	**Musati**	○	-	×	-	-	-	-	-	-	-	-	-	-	-

7.7.5 Technical Service Providers

There are some cases where management of the piped schemes is contracted out to Technical Service Providers (TSPs) in the Study area. [25] For example, Katunguru Water Supply in Sengerema District in Mwanza Region has been managed by TSPs. The scheme, currently functioning in one village with three domestic points serving about 2,000 people, had been out of order since the 1980s, and the District Department saw that it is beyond their reach to repair and manage it on a regular basis; thus, operation and maintenance has been entrusted to a private agent.

The private agent, a retired civil technician, has skills and knowledge to repair and run the scheme to meet the needs of the locality. The TSP has hired two Domestic Point (DP) attendants to collect 20Ths/20L per bucket/container, and one pump attendant. While the current served area is limited due to pipe problems, it is observed that maintenance has been done well. From the interview with the TSP, it is observed that the TSP does not seem to be generating a large net profit as a business because the scale of the merit of scheme management is not large enough.

According to the District Water Department in Sengerema in Mwanza region, use of the private agent is considered to be a temporary measure until the users can form and manage their groups to run the schemes. Compared with Shinyanga region, where the Dutch have been continuously supporting rural water supply programs for nearly 30 years, there is not much experience using TSPs in the Study area. It is assumed that it will take at least another several years until the system to manage the TSPs and Facilitation Service Providers (FSPs), as stipulated in the NRWSSP, is achieved.

7.8 Repair and Spare-parts Delivery/Procurement System

7.8.1 Current Practices of Spare Parts in the Study area

a. Issues of Repair

As for repairs, major repairs for communal water supply facilities, regardless of the type of technology or type of water supply facility, are assisted by the Water Technician of the district water engineer office in response to a request from the community. [26] On the other hand, minor repairs are supposed to be taken care of by the users themselves. To do so, in a village where the HESAWA Programme has intervened, four members of the 'technical' sub-committee in the respective Water User Group (WUG) Committee were trained for three days to cover minor repairs of their water supply facilities, and a tool kit for the work was distributed to ensure the sustainability of the water installations (refer Section 7.3, Figure 7.3-2: WUG Committee Organization and Functions of Each Sub-committee).

However, as stated in the final report of the HESAWA Programme in Mwanza region in 2002, [27] "the performance of WUGs deteriorates as time passes" since supervision and monitoring by the District Action Teams (DATs) and DWEOs have been inactive as well as because WUGs have been forgetting their training in not only technical maintenance but also financial

[25] Although the total number of TSPs for the piped scheme in the Study area is not identified, there is one in Sengerema which has been operated by the TSPs (civil technician) and another in Magu, which are contracted to the private business man but it is not yet operational as of November 2005.

[26] For the service of Water Technicians of the DWEO, the community is not requested to pay, but costs of spare parts need to be covered by the community in principle, and in general, the community prepares food for the Technician.

[27] Mwanza Regional HESAWA Office, "Mwanza Region Final HESAWA Programme Progress Report: FY1985/86-2001/02", August 2002, p.35

management and security issues. Other reasons pointed out regarding problems on the repair and sustainability of water supply installations in the report and interviews from relevant personnel through the Study are as follows:

- Activities of monitoring, advice and support from the district offices, such as DAT and DWEO, to WUGs and VHCs have been decreasing due to resource limitations (availability of budget and vehicles), in particular since 2002.
- Some key members of WUGs who were trained have left the villages
- Some WUGs lost the tool kits for repair works
- The O&M funds have not increased as planned, and currently most of the WUGs do not seem to be collecting funds. WUGs thereby do not have enough funds to purchase major and relatively costly spare parts
- Problem of pump theft in particular in Magu, Ukerewe and Mwanza city, where the bulk of the stolen pump market and the need for them exists

Spare parts for hand pumps are not readily available and not accessible (refer to Section 7.8.2 for details).

b. Issues of Spare-parts

There are two major shops for purchasing spare-parts in Mwanza region:

1） WASASO: a private shop in Mwanza city

2） Kwimba Revolving Shop: operated by the District Water Department under HESAWA

In addition to the above two, there are some shops carrying minor spare-parts at the respective Distinct Centre in Mwanza and Mara Region. Villagers, particularly those who live relatively nearer to Shinyanga, go to the Community Based Resource Centre (CBRC) in Shinyanga, which has been established by the support of the Dutch and keeps some stock. In the case of WASAO, it used to keep a stock of spare parts but does not carry them in the shop any more since the spare parts business is not profitable for a private person due to the slow movement of the parts. [28]

b.1 HESAWA Study on Spare Parts

According to the Study on 'availability of pump spare parts in the Region' carried out by HESAWA RPISC in Mwanza region, the following problems and issues are identified:

1) Problems for spare parts:
   - Long distance to purchase spare-parts, which requires a high transportation fee for villagers
   - Lack of spare parts, in particular, for the SWN pump
   - Spare parts are not readily available
   - Shortage of funds to purchase spare parts
2) Low demand for spare-parts:
   - Availability of alternative water sources
   - Repair work is rarely done
   - Leadership problems: moving and losing of key-active members trained by HESAWA.
3) Recommendation:
   - Repromotion of WUG to raise funds for better O&M
   - Joint venture of WUG to raise funds to establish a shop

[28] Mwanza Regional HESAWA Office, "Mwanza Region Final HESAWA Programme Progress Report: FY1985/86-2001/02", August 2002, p.8.

- Tax relief on spare parts to attract private business

As Table 7.8-2 shows, the transportation costs of WUGs from Sengerema, Ukerewe and Ukerewe are much higher than those from Magu, Kwimba and Misungwi. This is because to visit Mwanza city it is necessary to use ferries and buses.

b.2 Kwimba Revolving Fund Shops at District Water Department

In Kwimba, there is a small shop selling parts attached to the District Water Department. The shop was started by the HESAWA Programme as a pilot shop to provide spare parts for the users, and currently the revolving fund is used to sustain the shop. As seen in Figure 7.8-1 and Figure 7.8-2, it is observed that the stock of the shops is kept in an organized way with inventory records. The shop carries only spare parts for NIRA and SWN type pumps, and does not carry them for other types of Afridef pumps. [29] It is said that there was also a pilot shop in Geita district, similar to the one that Kwimba District currently operates, but it is no longer running.

As observed from the sales shown in Table 7.8-3, the movement of the spares is not fast so many private shops are discouraged from keeping stocks.

b.3 Purchase of Spare Parts

According to Bunda District Water Department in Mara region, a private shop named 'WASACO' in Mwanza City, located about 160 km away from the Bunda district centre, is a shop where most of the parts can be purchased. WASACO used to keep a stock of the spare-parts. However, because the spare-parts for the pumps are not fast moving items, WASACO no longer keeps them in stock. If a customer needs a spare part, he places an order and the shop purchases the ordered spare part from Dar es Salaam. In the case of Bunda, staff of the District Water Department assist in the ordering of the spare parts from WASACO on behalf of the users, and after WASACO buys the spare parts, the users goes to Mwanza city to obtain it from WASACO. If a user goes to WASACO directly rather than making an enquiry at the District Water Department, the District Water Department does not get involved in the purchase of the spare parts or the repair.

The Bunda District Water Department said that the repair and handling of the Afridef pump, which is used for relatively deeper wells from 15 to 60 meters depth, is technically complicated, and for the repair of the Afridef pump, it is necessary to assist communities. On the other hand, repairing SWN pumps, which are mainly used for medium and shallow wells, and NIRA pumps, which are only used for shallow wells, are technically very simple, so that trained community 'fundi' (=local artisans trained by the HESAWA Programme) can repair those two types of wells by themselves without technical support from the Water Department technicians.

[29] The Afridef pump itself is also sold there, but spares for it are not stocked. As mentioned prior, for the HESAWA Programme, Afridef pumps were not adopted much, and according to many District Water Engineers, there are, in general, not many trained pump attendants for the Afridef type of pump in the study target area.

Figure 7.8-1 and Figure 7.8-2 describe the Spare Parts Revolving Shop in Kwimba District Water Engineer Office. The shop is well organized and good inventory records are kept.

Figure 7.8-1: Pipes sold at the Shop

Figure 7.8-2: Parts sold at the Shop

Table 7.8-1: Fast-moving Spare Parts Requested by Users to the WASACO Shop through Bunda District (Mara) Water Department in FY2004/05

Afridef Pump	SWN Pump	NIRA Pump
Bush bearing	Cylinder	Sleeve bearing
Piston ring	Raising man	Handle
Bobbin	Bush	Handle Nipple
Plunger U seal	Socket	Rod Nipple
Rod connecter	Bearing	Socket
Rising man	Bolt & Nut	Raising man
Rod Container	Roods	Rod
		Bobbin
		Plunger

Source: Bunda District Water Engineer Office

Table 7.8-2: Costs of Pump Spare-parts Purchased in the 1 Year (Oct/03-Sep/04) by the Sampled WUGs in Mwanza Region

District	WUG		Cost of Spare-parts & Repair Work (Tsh)	Transportation Cost (Tsh)	Total Cost (Tsh)	% of Transportation Cost
Magu	1	Nyasimo	120,000	4,000	124,000	3%
	2	Umoja	36,000	2,000	38,000	5%
	3	Miswale	80,000	3,000	83,000	4%
	4	Kadashi	17,000	1,000	18,000	6%
	5	Katole	105,000	3,000	108,000	3%
	6	Wita	48,000	1,000	49,000	2%
	7	Solima 'B'	28,000	4,000	32,000	13%
	8	Budeba	80,000	2,000	82,000	2%
District Total			514,000	20,000	534,000	
Magu District average			**64,250**	**2,500**	**66,750**	**4%**
Kwimba	1	Nguma 'A'	4,000	0	4,000	0%
	2	Mwanbula	37,250	2,000	39,250	5%
	3	Mwazimba	40,000	4,000	44,000	9%
	4	Lugulu (Kinoja)	14,000	5,000	19,000	26%
	5	Nyanama	100,000	0	100,000	0%
	6	Bujingwa	6,000	3,000	9,000	33%
	7	Mondo	68,455	0	68,455	0%
	8	Nyamikoma 'A'	40,000	5,500	45,500	12%
	9	Nyamasaka	51,500	6,000	57,500	10%
	10	Jitejemee	39,600	0	39,600	0%
	11	Maguha	30,000	0	30,000	0%
	12	Chamlendi (Mahiga)	10,000	0	10,000	0%
District Total			440,805	25,500	466,305	
Kwimba District average			**36,734**	**2,125**	**38,859**	**8%**
Misungwi	1	Misungwi 'A'	4,000	0	4,000	0%
	2	Misungwi 'D'	15,000	0	15,000	0%
	3	Masame 'A'	15,000	0	15,000	0%
	4	Mabuki (Madukani)	117,000	3,000	120,000	3%
	5	Bungarama (Lubuga)	47,000	3,000	50,000	6%
	6	Bomani-Mbela	7,500	0	7,500	0%
	7	Ng'undi	61,000	4,000	65,000	6%
District Total			266,500	10,000	276,500	
Misungwi District average			**38,071**	**1,429**	**39,500**	**2%**
Sengerema	1	Ngusshi-Chamabanda	3,200	1,400	4,600	30%
	2	Senta-Katwe	7,900	8,400	16,300	52%
	3	Iseni 'C'	15,000	4,400	19,400	23%
	4	Ibisabageni	5,500	3,600	9,100	40%
	5	Bukara 'A'	7,800	2,400	10,200	24%
	6	Igogo 'A'	4,500	2,400	6,900	35%
	7	Igogo 'B'	6,000	2,400	8,400	29%
	8	Bilali Shuleni (School)	6,000	2,500	8,500	29%
	9	Umoja-Katwe	12,500	8,400	20,900	40%
	10	Nyampulukano-sekondary (Secondary School)	2,800	2,400	5,200	46%
District Total			71,200	38,300	109,500	
Sengerema District average			**7,120**	**3,830**	**10,950**	**35%**
Ukerewe	1	Haluwego	1,500	5,000	6,500	77%
	2	Muhula	30,000	10,000	40,000	25%
	3	Miembeni	80,000	6,000	86,000	7%
	4	Nkilizya	114,700	6,500	121,200	5%
District Total			226,200	27,500	253,700	
Ukerewe District average			**56,550**	**6,875**	**63,425**	**37%**
Geita	1	Nyampande 'B'	37,000	10,800	47,800	23%
	2	Kabuyambo	76,800	15,000	91,800	16%
	3	Kalangalala	35,700	0	35,700	0%
	4	Mwatulo (Ihayabuyaga)	30,000	1,000	31,000	3%
	5	Kigoma road	46,000	4,000	50,000	8%
	6	Buhalahala	82,000	2,000	84,000	2%
	7	Ng'wabasabi	40,000	8,000	48,000	17%
	8	Benki-Geita	15,000	0	15,000	0%
	9	Ndati-Shabaka	13,600	6,000	19,600	31%
	10	Lubando	53,500	8,000	61,500	13%
District Total			429,600	54,800	484,400	
Geita District average			**42,960**	**5,480**	**48,440**	**11%**

Source: Hesawa Regional Office, "Status of Availability & Demand for Water-wells Hand Pump Spares in Mwanza Region" (Study Conducted during October-November 2004), 2005

Table 7.8-3: Spare-parts Items, Prices and Sales at the HESAWA Revolving Fund Spares Shop of Kwimba District (Mwanza) Water Department

	Type of Pump		Types of Spares	Unit Prices (Tsh)	Number Sold during June 2004-September	Number of Stock (as of Nov 2005)
1	NIRA AF 85	1	Handle complete	8,518,700	2	0
		2	Handle nipple	21,000	4	49
		3	Base plate	60,000	0	0
		4	Bottom valve body	42,000	1	0
		5	Bottom valve limiter	10,400	2	0
		6	Spanner	14,500	3 sets	3 sets
		7	Cylinder	63,218	1	2
		8	Nitrile rubber	6,400	3	4
		9	Nut 12mm	1,400	12	350
		10	Pump stand	103,200	0	10
		11	Plunger nipple	14,014	0	6
		12	Plunger body	25,380	0	4
		13	Plunger ring	14,014	0	17
		14	Spring cotter	800	0	5
		15	Sholkabsorber	15,850	0	19
		16	Sleeve bearing	35,000	14	36
		17	Riser rod 11/2M	36,000	3	21
		18	Riser rod 2M	45,000	3	3
		19	Riser rod coupung	12,600	3	40
		20	Foot plate	25,000	2	0
		21	Piser scoket	15,000	3	30
		22	Rop nipple	141,400	6	63
2	SWN 80	1	Cylinder 2"	156,000	2	12
		2	Footvalve Seat 2 1/2"	13,500	3	24
		3	Cylinder 2 1/2"	160,000	0	10
		4	Nut 12mm	450	8	260
		5	Open spanner no.17	1,500	0	0
		6	Open spanner no.19	1,750	0	3
		7	Open spanner no.24	2,850	0	1
		8	Open spanner no. 30	3,650	1	2
		9	O ring	580	4	12
		10	Cylinder 3"	175,000	1	16
		11	Puppet valve 2"	9,910	6	24
		12	Puppet valve 2 1/2"	14,040	0	7
		13	Puppet valve body	9,655	4	0
		14	Piston seal 2"	16,750	12	0
		15	Piston seal 2 1/2"	16,750	4	18
		16	Piston seal cap 2 1/2"	8,000	0	2
		17	Pump head	191,070	1	0
		18	Pump stand	97,300	0	2
		19	Puppet valve 2 1/2"	14,040	0	7
		20	Puppet valve body	9,655	4	0
		21	Puppet valve nut	400	0	12
		22	Piston 3"	22,500	2	0
		23	Piston valve 2 1/2	41,500	1	4
		24	Riser rod 0.75M	40,000	3	2
		25	Riser rod 1.5M	50,000	3	7
		26	Riser rod 2.0M	55,000	2	0
		27	Riser rod 3.0M	68,000	3	1
		28	Plastic wahsers	160	0	180
		29	Rubber pad	9,500	4	7
		30	Stud 12mm	180	0	28
		31	Plastic bearing	35,000	25 sets	0
		32	Socket	1,040	5	0
		33	Main shaft	13,750	6	0
		34	Front shaft	6,000	6	2
		35	Wooden bearing	18,750	11 sets	24
		36	Bolt & nut 12mm	1,050	8	0
		37	Bolt 30mm	3,450	5	0
		38	Pump rod 0.75M	15,000	2	8
		39	Bearing house	9,000	6	3
		40	Foot valve seat 2"	11,800	0	16
		41	Cylinder socket 2 1/2"	12,000	0	22
		42	Universal spaner	5,650	0	30
		43	Washer	160	0	15

Source: Kwimba District Water Engineer Office

7.8.2 Suggestions

a. Spare Parts Shops by Mutual Funds contributed to by WUGs/WUAs in the neighboring Districts

As the HESAWA study on spare parts suggests, the most serious problem regarding spare parts for villagers is the long distance to purchase them. To ease the problem on accessibility, two plans are suggested.

One is that as the Kwimba District Water Office manages, some other selected District Water Department offices carry basic spare parts to provide to villagers by organizing a mutual fund jointly contributed to by VWCs/VHCs in the neighboring districts. For example, in the case of Mwanza city, the establishment of a new spare parts revolving shop in Sengerema in order to serve villagers in Sengerema and Geita could be considered. For Mara region, the shop could be established in Mimosa (Rural) District Water Department considering the convenience of the location. In addition, in order to encourage private businesses to carry spare parts, a tax exemption for spare parts and subsidies to private business for carrying the spare parts needs to be taken into consideration.

b. Recording System on Repairs at the District Water Departments

In general, there are a lack of records on spare parts purchases and repairs in not only the Bunda District Water Department but all the District Water Departments in both Mwanza and Mara regions, regardless of pump repairs assisted by the District Water Department or enquiries from users. Therefore, the situation concerning the magnitude of the problem of repairs, the need for pump repairs and the measures taken for repairs is not known. It is suggested that records on the purchase of spare parts and visits to communities for repairs need to be kept at the District Water Department as part of the baseline data on the status of each water facility. With records on both the fast-moving spare parts and the magnitude of the duties on assistance of maintenance, the planning and services of the department activities will be evidence based.

7.9 Supplementary Survey

The supplementary survey was carried out for the priority villages (100 villages and 77 villages) in the Water Supply Plan from February to April 2006 in order to reflect the Preliminary Design and to formulate detailed plans for 'Organization and Institutional Plan', 'Operation and Maintenance' and 'Community Awareness Plan'.

7.9.1 Objectives

The main objectives of the supplementary survey were:

- To identify effective institutional framework and plans for O&M of the water supply facility management
- To evaluate the feasibility of the institutional framework and plans in the Study area

7.9.2 Methodologies

The surveys were conducted by 2 different teams: one team for 77 villages where piped scheme improvements were proposed and the other was for the priority 100 villages. Methodologies, targets and major questions for the respective surveys are described in Table 7.9-1 as follows.

Table 7.9-1: Supplementary Survey Method and Questions

	O&M Status and Evaluation Survey		DWST Survey
	A	**B**	**C**
Target	77 villages	100 villages	10 districts
Type of Water Supply Facility	17 Existing Piped schemes	Hand pump and newly piped scheme	-
Methodologies	Structured interview	Structured interview	Structured interview
Interviewees	Village leaders (Village Chairperson, VEO, VWC members, WUG members, Village government members)	Village leaders (Village Chairperson, VEO, VWC members, WUG members, Village government members)	DWST members (DED, DWE, DPLO, DHO, DCDO etc)
Major Questions	①General O&M status on water facility or traditional water source	①General O&M status on water facility or traditional water source	①Establishment of DWST
	②Financial management (Water fund, water fee collection, willingness to pay)	②Financial management (Water fund, water fee collection, willingness to pay)	②Activities of health/sanitary education
	③Support from DWEO	③Support from DWEO	③Top 5 water-borne diseases
	④O&M experience (repair, spare parts, technical training etc)	④O&M experience (repair, spare parts, technical training etc)	④Prospects of budget allocation for water/sanitation repromotion
	⑤Health/ sanitary practice	⑤Health/ sanitary practice	

The details of the target villages for 17 piped schemes are as described in Section 6.4.1 of Chapter 6. The 100 target villages are listed in Table 7.9-2. Out of the 100 target villages, there were 52 villages in the Mwanza region and 48 villages in the Mara region. For the DWST survey, the administration leaders of each district in both Mwanza and Mara were interviewed.

Table 7.9-2: 100 Target Villages

Region	District	Village
Mwanza	Misungwi	Busongo, Ngaya (2)
	Sengerema	Sogoso, Nyamapande, Nyitundu, Lubanda, Juma kisiwani, Mwaliga, Nyakahako, Sotta, Isole, Mlaga, Buswelu, Luharanyonga, Busekeseke, Katoma, Magulukenda, Bukokwa, Nyancheche, Nyamiswi, Nyakasasa, Lugata, Lushamba, Bulyaheke, Ilyamchele, Isengeng'he (24)
	Kwimba	Hungumalwa, Mhulya (2)
	Magu	Kijereshi (1)
	Geita	Kaseni, Buligi, Kakubilo, Nyabalasana, Busisi, Kamena, Ndelema, Nyashishima, Busogo, Ikina, Bugulula, Kasota, Ntono, Ihega, Nyaruyeye, Ibondo, Isima, Kasanghwa, Lewenzera, Idosera, Nyamilyango (21)
	Ukerewe	Namasabo, Masonga (2)
Mara	Bunda	Macharo, Buzimbwe, Namalama (3)
	Musoma Rural	Isaba, Songora, Kisamwene, Mmazami, Nyabekwabi, Sirori Simba, Ryamisanga, Bukumi, Butata, Rusoli, Musanja, Chirorwe, Bugoji, Kaburabura, Saragana, Kiriba, Kiemba, Kigera, Mkirira (19)
	Tarime	Magena, Kebweye, Nyankunguru, Matongo, Kiwanja, Ng'ereng'ere, Kikomori, Nkerege, Sombanyasoko, Bisarwi, , Kisumwa, Nyankonge, Omoche, Thabache, Radienya, Masike, Bukama, Nyarombo, Rwang'enyi, Oliyo, Ryagoro, Nyamsi, Tatwe (23)
	Serengeti	Busawa, Nyasurura, Kebancha (3)

7.9.3 Survey Results and Analysis

Survey A: 17 Existing Piped Schemes (77 Villages)

Current Operation & Maintenance Status and Evaluation of Possibility for Operation and Maintenance:

(1) Suspensions of the Facilities

From the result of supplementary survey, it was confirmed that all the existing piped schemes targeted for the survey have currently suspended their operations. The year and reasons of suspensions vary from scheme to scheme. According to the village leaders, the most reasons for the suspension were shortage of running cost, breakdown of the machinery and lack of maintenance. This result implies that the operation and maintenance of the piped schemes is a crucial hurdle for the sustainability of the piped scheme. In this part, the custom of the operation and maintenance activities of the existing piped scheme is briefly analyzed.

(2) Current Status of the WUA

In 2002, the Tanzania government addressed the institutional framework for water supply in the National Water Policy, comprising community participation and the local level management roles of Water User Associations (WUAs) or Water User Groups (WUGs). Under the DWE's operations of the surveyed piped scheme, however, **no WUAs have been**

established yet. Although the lack of education and awareness of the policy was acknowledged in the field survey, the most possible reason for the non-existence of WUAs and WUGs is that the existing piped schemes were already run down in 2002.

(3) Responsibility of Facility Operations by DWE

While the existing piped schemes were operated, the responsibility of the operation for the existing piped schemes was subject to the District Water Engineer (DWE), with the exception of one piped scheme (Ukiriguru Scheme, Misungwi). It was confirmed by the field survey that few village leaders have knowledge on technical aspects of the operations of the scheme. It was reported by this survey and the other survey that the DWE appointed villagers as care takers or pump attendants for dairy operation. However, most of the village leaders such as members of the village water committees have no technical knowledge about the operation. Apart from the physical operation of the facility, the overall piped schemes were operated as follows.

- Half the functioned piped schemes provided water with the communities **all day**. The other half of the facilities was operated within limited hours, generally 3 to 5 hours each morning and afternoon.
- The number of water points under the schemes **depended on the villages.** Generally, villagers used to fetch the water from any water point(s).
- At the all water points, water from the piped schemes was **free of charge**.

An example of the operation of the piped scheme was found in the **Ukiriguru piped scheme** in Misungwi. The Ukiriguru piped scheme had three water points in the village. When the facility was operational, a WUG, composed of 100 water users, was established at each water point. According to the villagers, the chairman of each Water Committee in sub-village collected the monthly water fee (Tsh 200 per household) and paid totally Tsh 60,000 to the Ukiriguru Agricultural Research Institute (UARI). When the water facilities needed repair, villagers had technical support from the UARI.

As a summary of the above operational customs, most of villagers were getting free water at any water points at any time. The way of supplying water could contribute to increasing water demand, followed by shortage of running cost for the DWE, and rapid consumption of the facilities.

(3) Responsibility of Facility Maintenance

As well as the responsibility of the operation of the facility, the District Water Engineer (DWE) was responsible for the **maintenance** (i.e. repair) of the existing piped schemes. In the same way as the operation of the piped schemes, few village leaders have the knowledge and skills to carry out technical maintenance of the piped schemes. In some villages the piped schemes were repaired by the DWE. However, no villagers remembered the details of the technical problems. Generally, villagers did not know how the DWE technically maintained the facility. In addition to that, any maintenance costs were collected from the villagers.

The years of water supply services by the piped schemes vary from scheme to scheme. In this survey, it was not confirmed how long and how often the piped schemes had been maintained by the DWE. On the other hands, it was revealed in most villages that there were different memories between villagers and the DWE offices in terms of the year of suspension of the piped scheme.

Although information about the maintenance of the piped schemes is limited, the results indicate that that the DWE failed to share both the cost of the maintenance, and technical and

management information of the maintenance with the villagers.

However, at a private level, an example of the current maintenance of water points was found in the water supply of the **KAHAMA Goldmine Company**. Although it is not a planned piped scheme - it is a water pipeline to the gold mining sites across the villages-, the company organized the WUGs at the communal water points in order to collect maintenance cost for minor repairs. In one of the villages, the representatives of the WUG received a training program especially on the maintenance of water points and they practically repaired the water points.

In summary, as the customs of the O&M of all the surveyed existing piped schemes, the **leadership and responsibility of the DWE** was confirmed. It is found that water users of the piped schemes have been accustomed to receiving the free water services without awareness of the importance of O&M in terms of facility sustainability. Amongst these customs, several key aspects, including **timing of water supply; cost collection; organizational arrangement; technical knowledge and skills, and information sharing**, were pointed out.

Based on these analyses, a sustainable Water Supply Plan for the piped scheme is designed in the main report. The data obtained in the survey is available in Chapter 9 of Data Book.

Survey B: 100 Villages for Hand Pump and Piped Scheme

Current Operation & Maintenance Status

(1) General observations

The supplementary survey observed the following points in the surveyed area.

- Limited access to water sources especially during the dry season
- Heavier workload of women and female children by fetching water
- Closer access to water from each household
- Lower awareness of villagers for environmental sanitation

(2) Organization related to water

The VWCs were formed in 88 villages out of 100 villages: Mwanza 49 villages out of 52 villages (94%) and Mara 39 villages out of 48 villages (81%). The Water Users Groups (WUGs) including sub-village WUGs or relevant groups taking care of water sources were formed in 48 villages (Mwanza 54% and Mara 42%). The number of the WUGs and relevant groups varies from 1 to 9 according to the number of the sub-village or the water sources. In addition, 47 villages had VWC by laws and 97 villages did not recognize the ‘water right’ application.

(3) Status of water facilities

Most villages did not protect the traditional water sources (TWS) such as springs and dug wells although cleaning around TWSs was done by users in some cases. There were 33 villages which experienced the HESAWA project. In 31 villages out of 33 villages (14 villages in Mwanza and 17 villages in Mara), the SWs/BHs were constructed. In the Mwanza region, 85% of the wells in the surveyed villages produced water throughout year, and 47% in the Mara region.

(4) Water fee collection

The water fees were collected regularly in 13 villages with a range from 20 to 200

Tsh/Month/HH. 2 villages in Sengerema collected a water fee every two months and 1 village in Musoma collected every month as Ifoghongo contribution.

The survey revealed that water facilities were maintained poorly in terms of collecting the O&M cost as the water fees in a number of villages. The shallow wells or boreholes constructed by the HESAWA were poorly maintained due to the fact that the villages had not been collecting water fees for the purpose of O&M of water facilities.

(5) Water fund collection

The water funds of the VWCs were collected in 43 villages ranging from 10,000 to 900,000 Tsh while the funds of WUGs were collected only in 8 villages with the amount of 20,000 to 1.8 million Tsh (Ifoghongo).

(6) Willingness to pay/ Capacity to pay

To obtain the data which measures willingness to pay and capacity to pay, two questions were asked. First, one question for how much villagers can pay for water without telling them the cost of O&M of the proposed water facility (hand pump or piped scheme) preceded another question for the preferable mode of payment after telling the calculated cost in the proposed facility plan.

For willingness to pay per month (per bucket and per annum were converted to monthly calculation) for Hand Pump, the majority is followed by **'500-999 Tsh' (46%)**, 'more than 1000 Tsh' (28%) and 'less than 499' (26%) ranging from 100 Tsh to 3,000 Tsh. To the question for the capacity to pay with preferable mode of payment, the results show that the sum of **'1000-1999 Tsh' and 'more than 2000' was 56%** while the ratio of 'less than 999 Tsh monthly' was 44%.

(7) Preferred mode of payment for water fee

83 % of villages responded that monthly household contribution is preferable in general. It is most likely that the monthly payment is less of a financial burden for them than that of per bucket payment. On the other hand 17 % of villages prefer to choose per bucket (16%) or per day (3%) payment because it is easier to control the fee collection at the domestic point.

(8) Organization problems

The villagers recognized the reasons of inactiveness of the VWC or WUGs as ***'no/few water facility to operate***', '***poor leadership to manage fee collection***', and 'no education is available in the village'. Other answers were followed by 'poor financial management', 'poor implementation of rules' and 'people do not want to pay for traditional water sources'. A village answered that 'there is a conflict between one sub-village which has no shallow well and the other sub-village which has two shallow wells'. Problems of financial management were pointed out 'misuse of the water fund collected' and 'finance is not transparent'.

(9) Frequency of supports from District Water Engineer Office

In the case of 2005, there were 74% of villages which had support such as the HESAWA follow-up, water quality check-up etc including a village visit) from the DWE office. The result of the frequency of visits varies 'never' to 'more than 10 times'. Among 4 districts (Sengerema, Geita, Musoma rural and Tarime), approximately 90% of the surveyed villages in Geita were visited by the staff of DWE office, and Musoma rural 89%, Tarime 65%, and Sengerema 58% respectively. Some comments were made by the villagers that the villages need more guidance how to formulate and manage the VWC and the WUGs.

(10) Health/Sanitary awareness

99 % of the surveyed villages answered that they wash their hands before and after meals. On the other hand, few people wash their hands after excretion (64%), after cleaning the bottom of a child, and before feeding children (57%), before preparing foods (57%), after cleaning house (35%) and before feeding a child (35%) respectively. Regarding a question of environmental health, 75% answered that their environmental health condition was 'fair'.

(11) Water-borne diseases

It was identified that water-borne diseases were major a health problem in the Study area. The leading diseases that were answered are as follows:

No.1 Malaria > No.2 Intestinal parasites > No.3 Diarrhea > No.4 Dysentery > No.5 Typhoid > No.6 Bilharzias > No.7 Skin disease > No.8 Eye disease

(12) Needs of water facility

79 % of the surveyed villages recognized the importance of a '**Water supply facility**' in their villages followed by 'Health and sanitary education' and 'Better health facility'.

Evaluation of Possibility for Operation and Maintenance

The results of Survey B were evaluated in order to compare future prospects on operation and maintenance capacity of the 100 villages respectively. The criteria and points considered for the evaluation are listed in Table 7.9-3 for piped schemes and Table 7.9-4 for hand pumps in order to make a ranking of the surveyed 100 villages.

The focal points of the criteria are 1) the existence of VWC, WUG or relevant groups/organization, 2) current activities such as collecting regular water fees and water fund of VWC, WUG or relevant groups/organization, 3) willingness to pay and capacity to pay, 4) project experience for smooth implementation of the water project and, last but not least, 5) capacity of the district water department.

The survey results for the 100 priority villages are described in detail in Chapter 9 of the Data Book. The ranking of 100 villages for hand pumps and newly piped schemes is shown in Table 7.9-5 by using the criteria depicted in Table 7.9-3 (for the piped schemes) and Table 7.9-4 (for the hand pumps) in light of the facility sustainability and the O&M prospects.

Table 7.9-3: Criteria of Ranking for 100 Candidate Villages (From viewpoints of sustainability and O&M prospects): Piped Schemes

Criteria		Present Conditions	Point
I O&M System of Existing Water Supply Facilities and Traditional Water Sources (TWSs)	(1) Existence of the VWC	Yes	1
		No	0
	(2) Activeness of the VWC	Active	1
		Inactive	0
	(3) Existence of the VWC Fund	Yes	1
		No	0
	(4) Regular Collection of Water Fee	Yes	1
		No	0
	(5) Existence of WUG or Alternative Organization for O&M (e.g., Sub-village)	Yes	1
		No	0
	(6) Activeness of WUG or Alternative Organization for O&M (e.g., Sub-village) about Water Supply Facility or TWS	Active	1
		Inactive	0
	(7) Existence of the Water Fund by the WUG or Alternative Organization for O&M (e.g., Sub-village)	Yes	1
		No	0
	(8) Regular Collection of Water Fee by the WUG or Alternative Organization for O&M (e.g., Sub-village)	Yes	1
		No	0
II Willingness to Pay	(1) Villagers' Answer on Possible Monthly Payment of Water *	Less than Tsh 999	1
		Tsh1,000 to 1,999	2
		More Than Tsh 2,000	3
	(2) If the Villagers Accept the Required/Estimated Cost for O&M **	Possible to Pay for the Estimated/Required O&M Cost	1
		Impossible to Pay for the Estimated/Required O&M Cost	0
III Capacity to Pay	Capacity to Pay	Possible to Pay for the Estimated/Required O&M Cost	3
		Impossible to Pay for the Estimated/Required O&M Cost	0
IV Project Experiences of HESAWA or Other Community Based Development Projects	(1) HESAWA	Yes	1
		No	0
	(2) Other Community Based Development Projects	Yes	1
		No	0
V Capacity of District Water Department	Number of Water Technicians (Engineer Full Techinitian+Trade Test Technician)		
	(1) Below 9 (Geita, Ukerewe, Musoma, Tarime)		Total Points X 0.6
	(2) 10 to 14 (Kwimba, Bunda)		Total Points X 0.8
	(3) Above 15 (Magu, Misungwi, Sengerema, Serengeti)		Total Points X 1.0

Note: * For the purpose of the Survey, costs are computed to monthly O&M costs. ** At each village, the required/estimated O&M costs by facility types are introduced.

Table 7.9-4: Criteria of Ranking for 100 Candidate Villages (From viewpoints of sustainability and O&M prospects): Hand Pump

Criteria		Present Conditions	Point
I O&M System of Existing Water Supply Facilities and Traditional Water Sources (TWSs)	(1) Existence of the VWC	Yes	1
		No	0
	(2) Activeness of the VWC	Active	1
		Inactive	0
	(3) Existence of the VWC Fund	Yes	1
		No	0
	(4) Regular Collection of Water Fee	Yes	1
		No	0
	(5) Existence of WUG or Alternative Organization for O&M (e.g., Sub-village)	Yes	1
		No	0
	(6) Activeness of WUG or Alternative Organization for O&M (e.g., Sub-village) about Water Supply Facility or TWS	Active	1
		Inactive	0
	(7) Existence of the Water Fund by the WUG or Alternative Organization for O&M (e.g., Sub-village)	Yes	1
		No	0
	(8) Regular Collection of Water Fee by the WUG or Alternative Organization for O&M (e.g., Sub-village)	Yes	1
		No	0
II Willingness to Pay	(1) Villagers' Answer on Possible Monthly Payment of Water *	Les than Tsh 499	1
		Tsh 500 to Tsh 999	2
		More than Tsh 1,000	3
	(2) If the Villagers Accept the Required/Estimated Cost for O&M **	Possible to Pay for the Estimated/Required O&M Cost	1
		Impossible to Pay for the Estimated/Required O&M Cost	0
III Capacity to Pay	Capacity to Pay	Possible to Pay for the Estimated/Required O&M Cost	3
		Impossible to Pay for the Estimated/Required O&M Cost	0
IV Project Experiences of HESAWA or Other Community Based Development Projects	(1) HESAWA	Yes	1
		No	0
	(2) Other Community Based Development Projects	Yes	1
		No	0
V Capacity of District Water Department	Number of Water Technicians (Engineer Full Techinitian+Trade Test Technician)		
	(1) Below 9 (Geita, Ukerewe, Musoma, Tarime)		Total Points X 0.6
	(2) 10 to 14 (Kwimba, Bunda)		Total Points X 0.8
	(3) Above 15 (Magu, Misungwi, Sengerema, Serengeti)		Total Points X 1.0

Note: * For the purpose of the Survey, costs are computed to monthly O&M costs. ** At each village, the required/estimated O&M costs by facility types are introduced.

Analyses on the Results of Survey A and B

As discussed earlier regarding facility maintenance, WUA/VWC/WUG, and other current issues, several points were addressed. Poor maintenance caused serious damage to the facility which resulted in breakdowns and kept the facility non-functioning for a long period. Even after forming the VWC/WUG, the villagers did not know how to manage the organization, how to maintain the facility, and how and why to collect water fees. They did not have a clear vision for collecting water fees. These analyses are illustrated as shown in the following flow to reflect the Community Awareness Plan. Strengthening of the DWEO is highlighted as a fundamental path in 'Community Awareness Plan'.

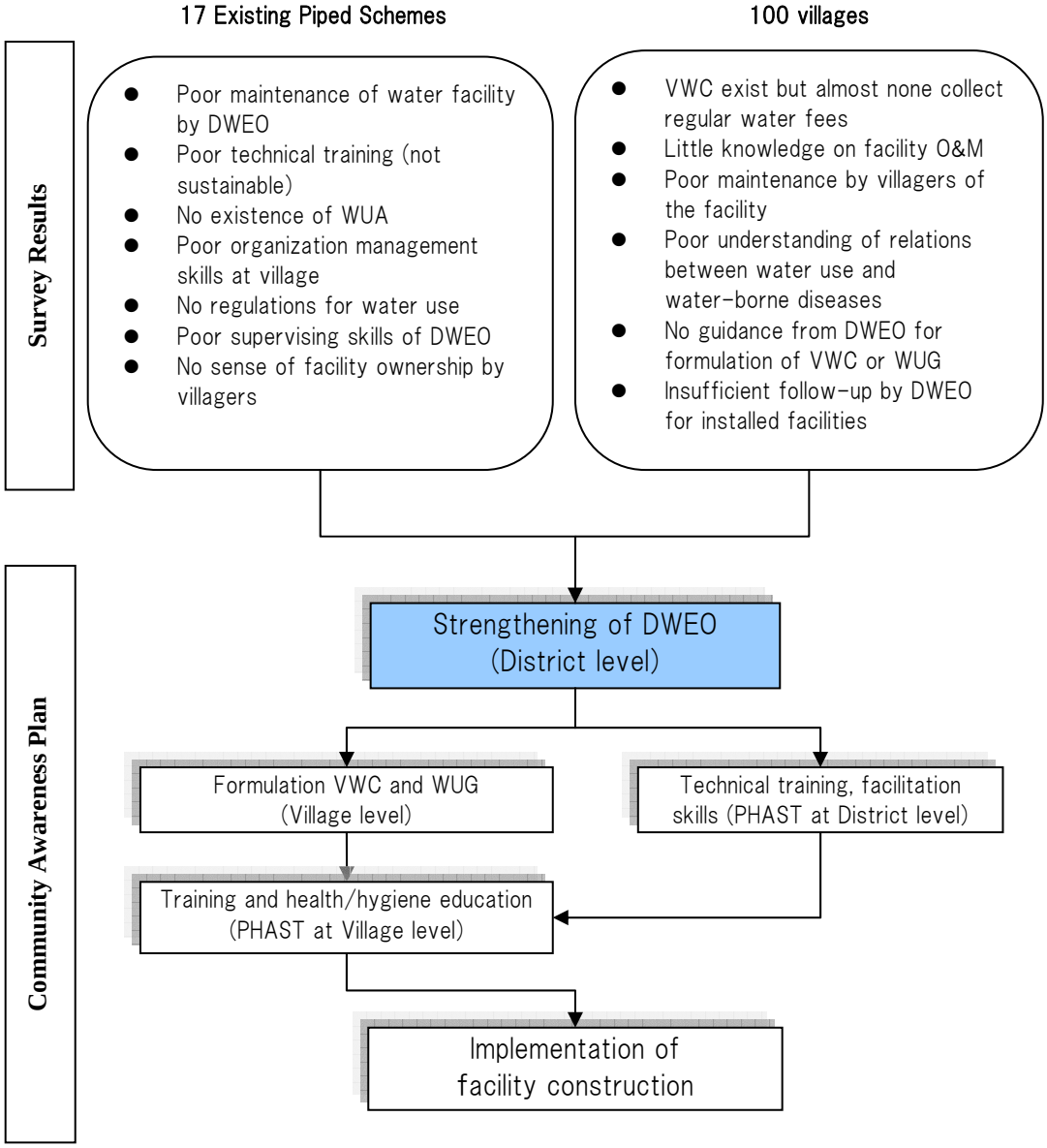


Figure 7.9-1: Flow of Suggested Awareness Plan

Based on these analyses, a sustainable Water Supply Plan for the piped scheme is designed in Chapter 5 of the main report. Reflecting the analyses made as above, the 'O&M Plan' and the 'Institutional Framework' for the selected 428 villages are discussed in Chapter 5.8 of the main report. Furthermore the more practical 'O&M Plan' and 'Community Awareness Plan' for the priority villages for the JICA project are recommended in Chapter 9 of the main report to expand the suggested flow as shown in Figure 7.9-1.

Table 7.9-5: Ranking of the 100 Priority Villages (1/2)

No	DISTRICT	Ward	No. by District	Village	I-(1)	I-(2)	I-(3)	I-(4)	I-(5)	I-(6)	I-(7)	I-(8)	II-(1)	II-(2)	III	IV-(1)	IV-(2)	Sub-total Scores	V	TOTAL SCORES	Ranking	Ranking with DWO Capacity
					Availability of VWC	Activeness of VWC	Water fund collection	Water fee collected by VWC	Availability of WUG/SV-WUG or relevant org	Activeness of WUG/SV-WUG or relevant	Water fund collected by WUG, SV-WUG or relevant	Water fee collected by WUG, SV-WUG or relevant org	O&M cost	Preference of payment	Capacity to pay	HESAWA experience	Project experience		District Capacity			
					Available…1, Not available…0	Active…1 Inactive….0	Water fund collected by VWC	Water fee collected by VWC (incl caretaker's salary)	Available…1, Not available…0	Active….1 Inactive….0	Water fee collected by WUG or relevant org	Water fund collected by WUG or SV-WUG	BH <499Tsh…1 500-999Tsh..2 1000Tsh>..3 Pipe schem e <999TSh..1 1000-1999Tsh ….2 2000TSh>…3	Possible to pay yes…1 No…0	The amount they can pay exceeds….3, Less than O&M cost…0	Yes…1, No…2	Kind of projects (CSPD, PEDEP,DDP, VI, LVEMP etc)					
1	MISUNGWI	Busongo	25	Busongo	1	1	0	0	1	1	0	0	2	1	3	1	1	12	1	12	15	9
2	MISUNGWI	Mbarika	28	Ngaya	1	0	0	0	1	1	0	0	2	1	3	1	1	11	1	11	30	14
3	SENGEREMA	Sima	13	Sogoso	1	1	1	0	1	1	0	0	1	1	3	0	1	11	1	11	30	14
4	SENGEREMA	Tabaruka	18	Nyampande	1	1	1	1	1	1	0	0	3	1	3	1	1	15	1	15	2	2
5	SENGEREMA	Busisi	24	Nyitundu	1	1	0	0	1	1	0	1	3	1	3	0	1	13	1	13	3	3
6	SENGEREMA	Busisi	26	Lubanda	1	1	1	0	1	1	0	0	3	1	3	0	1	13	1	13	3	3
7	SENGEREMA	Katunguru	30	Juma kisiwani	1	0	0	0	0	0	0	0	2	1	3	0	1	8	1	8	83	28
8	SENGEREMA	Nyamazugo	37	Mwaliga	1	1	0	0	0	0	0	0	1	1	3	0	1	8	1	8	83	28
9	SENGEREMA	Chifunfu	44	Nyakahako	1	0	1	0	1	1	0	0	3	1	3	1	1	13	1	13	3	3
10	SENGEREMA	Igalula	67	Sotta	1	1	1	1	1	1	0	0	1	1	3	1	1	13	1	13	3	3
11	SENGEREMA	Buyagu	69	Isole	1	1	1	0	1	1	0	0	1	1	3	1	1	12	1	12	15	9
12	SENGEREMA	Buyagu	73	Mlaga	1	1	0	0	1	1	0	0	3	1	3	0	1	12	1	12	15	9
13	SENGEREMA	Nyanzenda	75	Buswelu	1	0	0	0	0	0	0	0	3	1	3	0	1	9	1	9	64	24
14	SENGEREMA	Kalebezo	83	Busekeseke	1	0	0	0	1	1	1	1	2	1	3	1	1	13	1	13	3	3
15	SENGEREMA	Kalebezo	84	Katoma	0	0	0	0	1	1	0	0	2	1	3	1	1	10	1	10	44	21
16	SENGEREMA	Kalebezo	86	Magulukenda	0	0	0	0	1	1	0	1	2	1	3	1	1	11	1	11	30	14
17	SENGEREMA	Nyakaliro	93	Bukokwa	1	0	0	0	0	0	0	0	2	1	3	0	1	8	1	8	83	28
18	SENGEREMA	Kagunga	96	Nyancheche	1	1	1	0	1	1	1	1	3	1	3	1	1	16	1	16	1	1
19	SENGEREMA	Nyakasasa	99	Nyamiswi	1	1	0	0	1	1	1	0	1	1	3	0	1	11	1	11	30	14
20	SENGEREMA	Nyakasasa	100	Nyakasasa	1	1	0	1	1	1	0	1	2	1	3	0	1	13	1	13	3	3
21	SENGEREMA	Lugata	104	Lugata	0	0	0	0	1	1	0	0	2	1	3	0	1	9	1	9	64	24
22	SENGEREMA	Kazunzu	106	Lushamba	0	0	0	0	0	0	0	0	3	1	3	0	1	8	1	8	83	28
23	SENGEREMA	Kazunzu	108	Bulyaheke	1	0	0	0	1	1	0	0	1	1	3	0	1	9	1	9	64	24
24	SENGEREMA	Kazunzu	110	Ilyamchele	1	0	0	0	0	0	0	0	1	0	0	0	1	3	1	3	100	100
25	SENGEREMA	Kazunzu	114	Luharanyonde	1	0	0	0	1	1	0	0	2	1	3	1	1	11	1	11	30	14
26	SENGEREMA	Kazunzu	115	Isengeng'he	0	0	0	0	0	0	0	0	1	1	3	0	1	6	1	6	98	55
27	KWIMBA	Hungumalwa	22	Hungumalwa	1	1	1	0	1	1	1	0	1	1	3	1	1	13	0.8	10.4	3	20
28	KWIMBA	Nugullla	71	Mhulya	1	0	0	0	1	1	1	0	2	1	3	0	1	11	0.8	8.8	30	27
29	MAGU	Mkula	75	Kijereshi	1	1	0	0	0	0	0	0	2	1	3	1	1	10	1	10	44	21
30	GEITA	Nzera	3	Idosero	1	1	1	0	0	0	0	0	2	1	3	0	1	10	0.6	6	44	55
31	GEITA	Nzera	4	Lwenzera	1	1	1	0	1	1	0	0	1	1	3	0	1	11	0.6	6.6	30	48
32	GEITA	Senga	6	Buligi	1	1	1	0	1	1	1	1	1	1	3	0	1	13	0.6	7.8	3	33
33	GEITA	Senga	8	Kakubilo	1	1	1	1	0	0	0	0	3	1	3	0	1	12	0.6	7.2	15	39
34	GEITA	Senga	9	Nyabalasana	1	1	1	0	0	0	0	0	3	1	3	0	1	11	0.6	6.6	30	48
35	GEITA	Senga	10	Kaseni	1	0	0	0	1	1	0	0	3	1	3	0	1	11	0.6	6.6	30	48
36	GEITA	Kagu	17	Bugulala	1	0	1	0	0	0	0	0	3	1	3	0	1	10	0.6	6	44	55
37	GEITA	Kagu	18	Kasota	1	1	0	0	0	0	0	0	3	1	3	0	1	10	0.6	6	44	55
38	GEITA	Kagu	19	Nyamilongo (Nyamilango)	1	1	0	0	0	0	1	0	1	1	3	0	1	9	0.6	5.4	64	73
39	GEITA	Kamena	22	Kamena	1	1	0	0	0	0	1	0	2	1	3	0	1	10	0.6	6	44	55
40	GEITA	Kamena	23	Busisi (Bushishi)	1	0	0	0	0	0	0	0	1	1	3	0	1	7	0.6	4.2	92	93
41	GEITA	Kamena	24	Ndelema	1	1	0	0	0	0	1	0	2	1	3	0	1	10	0.6	6	44	55
42	GEITA	Kamena	25	Nyashishima	1	1	1	0	0	0	0	0	2	1	3	0	1	10	0.6	6	44	55
43	GEITA	Bukoli	26	Bogogo	1	1	0	0	0	0	0	0	3	1	3	1	1	11	0.6	6.6	30	48
44	GEITA	Bukoli	27	Ikina	1	1	0	0	0	0	0	0	3	1	3	0	1	10	0.6	6	44	55
45	GEITA	Bukoli	29	Ntono	1	0	1	0	0	0	0	0	2	1	3	0	1	9	0.6	5.4	64	73
46	GEITA	Bukoli	30	Ihega	1	0	0	0	0	0	0	0	3	1	3	0	1	9	0.6	5.4	64	73
47	GEITA	Nyarugusu	32	Nyaruyeye	1	0	0	0	0	0	0	0	3	1	3	0	1	9	0.6	5.4	64	73
48	GEITA	Katoro	42	Ibondo	1	0	0	0	1	0	1	0	2	1	3	0	1	10	0.6	6	44	55
49	GEITA	Nyachililuluma	53	Kasangwa	1	1	1	0	1	1		0	3	1	3	0	1	13	0.6	7.8	3	33
50	GEITA	Nyachililuluma	54	Isima	1	1	0	0	0	0	1	0	1	1	3	0	1	9	0.6	5.4	64	73

Table 7.9-5: Ranking of the 100 Priority Villages (2/2)

No	DISTRICT	Ward	No. by District	Village	I-(1) Availability of VWC Available…1, Not available…0	I-(2) Activeness of VWC Active….1 Inactive….0	I-(3) Water fund collection Water fund collected by VWC	I-(4) Water fee collected by VWC Water fee collected by VWC (incl caretaker's salary)	I-(5) Availability of WUG,SV-WUG or relevantorg Available…1, Not available…0	I-(6) Activeness of WUG / SV-WUG or relevant Active….1 Inactive….0	I-(7) Water fund collected by WUG, SV-WUG or relevant Water fee collected by WUG or relevantorg	I-(8) Water fee collected by WUG, SV-WUG or relevantorg Water fund collected by WUG or SV-WUG	II-(1) O&M cost BH <499Tsh…1 500-999Tsh..2 1000Tsh>..3 Pipe schem e <999TSh..1 1000-1999Tsh ….2 2000TSh>…3	II-(2) Preference of payment Possible to pay yes…1 No…0	III Capacity to pay The amount they can pay exceeds….3, Less than O&M cost…0	IV-(1) HESAWA experience Yes….1, No…2	IV-(2) Project experience Kind of projects (CSPD, PEDEP,DDP, VI, LVEMP etc)	Sub-total Scores	V District Capacity	TOTAL SCORES	Ranking	Ranking with DWO Capacity
51	UKEREWE	Bukanda	12	Namasabo	1	0	0	0	1	0	0	0	2	1	3	0	1	9	0.6	5.4	64	73
52	UKEREWE	Ilangala	38	Masonga	1	1	1	1	0	0	0	1	1	1	3	0	1	11	0.6	6.6	30	48
53	BUNDA	Mcharo	33	Mcharo	1	0	1	1	1	1	0	0	1	1	3	1	1	12	0.8	9.6	15	23
54	BUNDA	Butimba	51	Buzimbwe	1	1	1	0	0	0	0	0	1	1	3	1	1	10	0.8	8	44	28
55	BUNDA	Igundu	88	Namalama	0	0	1	0	1	1	0	0	1	1	3	0	1	9	0.8	7.2	64	38
56	MUSOMA	Nyamimange	6	Sirorisimba	0	0	1	0	1	1	0	1	3	1	3	1	1	13	0.6	7.8	3	33
57	MUSOMA	Bwiregi	8	Ryamisanga	0	0	1	0	0	0	0	0	3	1	3	1	1	10	0.6	6	44	55
58	MUSOMA	Butuguri	21	Kisamwene	1	1	1	0	0	0	0	0	3	1	3	0	1	11	0.6	6.6	30	48
59	MUSOMA	Bukabwa	24	Mmazami	1	0	0	0	0	0	0	0	2	1	3	1	1	9	0.6	5.4	64	73
60	MUSOMA	Suguti	31	Chirorwe	1	0	0	0	0	0	0	0	2	1	3	0	1	8	0.6	4.8	83	88
61	MUSOMA	Nyambono	33	Bugoji	1	1	1	1	0	0	0	0	1	1	3	0	1	10	0.6	6	44	55
62	MUSOMA	Nyambono	35	Saragana	1	1	1	0	1	0	0	0	1	1	3	0	1	10	0.6	6	44	55
63	MUSOMA	Nyambono	36	Kaburabura	1	1	1	0	0	0	0	0	1	1	3	0	1	9	0.6	5.4	64	73
64	MUSOMA	Nyankanga	54	Nyabekwabi	1	0	0	0	0	0	0	0	1	1	3	0	1	7	0.6	4.2	92	93
65	MUSOMA	Buruma	55	Isaba	1	1	0	0	1	1	0	0	2	1	3	1	1	12	0.6	7.2	15	39
66	MUSOMA	Buruma	56	Songora	0	0	0	0	1	1	0	0	2	1	3	0	1	9	0.6	5.4	64	73
67	MUSOMA	Murangi	65	Musanja	1	1	1	0	0	0	0	0	1	1	3	0	1	9	0.6	5.4	64	73
68	MUSOMA	Bukima	67	Butata	1	1	0	1	1	1	0	0	2	1	3	0	1	12	0.6	7.2	15	39
69	MUSOMA	Bukima	69	Rusoli	1	1	1	0	1	1	0	0	2	1	3	0	1	12	0.6	7.2	15	39
70	MUSOMA	Bukumi	72	Bukumi	0	0	0	0	0	0	0	0	2	1	3	0	1	7	0.6	4.2	92	93
71	MUSOMA	Etaro	92	Mkirira	1	0	0	0	1	1	1	1	2	1	3	0	1	12	0.6	7.2	15	39
72	MUSOMA	Nyakatende	97	Kiemba	1	1	1	0	0	0	0	0	2	1	3	0	1	10	0.6	6	44	55
73	MUSOMA	Nyakatende	98	Kigera	1	0	0	0	0	0	0	0	1	1	3	0	1	7	0.6	4.2	92	93
74	MUSOMA	Kiriba	103	Kiriba	1	1	1	0	1	1	0	0	1	1	3	0	1	11	0.6	6.6	30	48
75	TARIME	Turwa	8	Magena	1	0	0	0	0	0	0	0	3	1	3	1	1	10	0.6	6	44	55
76	TARIME	Nyakonga	22	Kebweye	1	0	0	0	0	0	0	0	1	1	3	0	1	7	0.6	4.2	92	93
77	TARIME	Kibesuka	24	Nyankunguru	1	1	1	0	0	0	0	1	3	1	3	0	1	12	0.6	7.2	15	39
78	TARIME	Matongo	41	Matongo	1	0	0	0	1	0	0	0	1	1	3	0	1	8	0.6	4.8	83	88
79	TARIME	Kemange	44	Kiwanja	1	0	0	0	1	0	0	0	3	1	3	0	1	10	0.6	6	44	55
80	TARIME	Sirari	50	Ng'ereng'ere	0	0	0	0	0	0	0	0	2	1	3	1	1	8	0.6	4.8	83	88
81	TARIME	Susuni	59	Kikomori	1	1	0	0	0	0	0	0	2	1	3	0	1	9	0.6	5.4	64	73
82	TARIME	Nyandoto	64	Nkerege	0	0	0	0	0	0	0	0	1	0	3	1	1	6	0.6	3.6	98	99
83	TARIME	Manga	69	Sombanyasoko	1	1	1	0	0	0	0	0	1	1	3	1	1	10	0.6	6	44	55
84	TARIME	Manga	71	Bisarwi	1	1	1	1	1	1	0	0	1	1	3	1	1	13	0.6	7.8	3	33
85	TARIME	Kisumwa	94	Kisumwa	1	1	1	1	1	1	1	0	1	1	3	0	1	13	0.6	7.8	3	33
86	TARIME	Nyahongo	112	Nyankonge	1	1	1	0	0	0	1	0	2	1	3	1	1	12	0.6	7.2	15	39
87	TARIME	Nyahongo	113	Omoche	1	0	0	0	0	0	0	0	2	1	3	1	1	9	0.6	5.4	64	73
88	TARIME	Bukura	119	Thabache	0	0	0	0	1	1	0	0	1	1	3	1	1	9	0.6	5.4	64	73
89	TARIME	Kirogo	128	Radienya	1	1	0	0	1	0	0	0	1	1	3	0	1	9	0.6	5.4	64	73
90	TARIME	Kirogo	129	Masike	1	0	1	0	0	0	0	0	2	1	3	1	1	10	0.6	6	44	55
91	TARIME	Kirogo	131	Bukama	1	0	1	0	1	1	0	0	2	1	3	1	1	12	0.6	7.2	15	39
92	TARIME	Nyamtinga	137	Nyarombo	1	0	0	0	0	0	0	0	2	1	3	0	1	8	0.6	4.8	83	88
93	TARIME	Nyamtinga	138	Rwang'enyi	1	0	0	0	0	0	0	0	1	1	3	0	1	7	0.6	4.2	92	93
94	TARIME	Rabour	144	Oliyo	1	1	0	0	0	0	0	1	3	1	3	1	1	12	0.6	7.2	15	39
95	TARIME	Mirare	151	Ryagoro	1	0	0	0	0	0	0	0	3	1	3	0	1	9	0.6	5.4	64	73
96	TARIME	Goribe	155	Nyamsi	0	0	0	0	0	0	0	0	3	1	3	0	1	8	0.6	4.8	83	88
97	TARIME	Goribe	157	Tatwe	1	0	1	0	1	0	0	0	2	1	3	0	1	10	0.6	6	44	55
98	SERENGETI	Busawe	37	Busawe	1	1	0	0	1	1	0	0	2	1	3	0	1	11	1	11	30	14
99	SERENGETI	Kibanchabancha	66	Nyansurura	1	0	0	0	1	0	1	0	3	1	3	1	1	12	1	12	15	9
100	SERENGETI	Kibanchabancha	67	Kebanchabancha	1	1	0	0	1	1	0	0	2	1	3	1	1	12	1	12	15	9

Survey C: DWST Water and Sanitation Activities Survey

Current Status of DWST and District Budget for Water Sanitation Activities

This survey was intended to clarify the status of the progress on the formation of the District Water Sanitation Team (DWST) and to hear intentions for water and sanitation activities from the district leaders. The major findings from the interview surveys for water and sanitation promotion are summarized as follows.

(1) Establishment of the DWSTs

Excluding Geita and Ukerewe in the Mwanza region and Bunda and Tarime in the Mara region, **6 DWSTs** were already organized in either 2004 or 2005. However, in most districts where the DWSTs are available, they are not yet active and regular activities have been carried out at only 2 districts in Sengerema in Mwanza and Musoma in Mara. At present the roles of the RWSTs remain similar to an advisory steering committee for inter-sectoral coordination while the DWSTs are supposed to be a more active oriented team within the district.

(2) Water/Sanitation education activities

Among 10 districts visited, only Bunda and Tarime do not have any education programs that are carried out currently. In other districts, 2-3 recurrent health education programs are implemented using support from either the HESAWA monitoring program, CSPD (UNICEF supported Mother and Child health program), IFAD, or the basket fund for the health sector. It is observed that the district health office has extension staff attached at ward level and in general active at village level.

(3) Top 5 diseases

It is identified that Malaria is the most seriously affected disease in the 10 Study districts following Diarrhea, Intestinal parasite, Respiratory infection and Pneumonia. Bilharzia is also pointed out as a common disease along Lake Victoria. There are some districts where screening of parasites for pupils has taken place and medication has been provided.

(4) Prospects of budget allocation for Water/Sanitation repromotion

In general district leaders showed concerns on the urgent need for repromotion of water and sanitation activities at community level. With the exception of Geita, the other 9 districts answered that it is possible to allocate/secure budget for Water/Sanitation repromotion when needs arise. According to the responses to the interviews, the central government subsidy and the basket fund for the health sector shall be main sources for the activities since district revenues are currently small and limited to allocate for those activities. In fact, some districts such as Serengeti, Musoma in Mara and Sengerema and Magu in Mwanza started to prepare the budget for repromotion of VWCs and community mobilization for water and sanitation activities for the next fiscal year.

Analyses on the Results of Survey C

Before starting the construction of improved water supply facilities, community mobilization such as re-promotion of the existing VWCs and WUGs need to be started as preparation by the district. All districts responded positively to the needs for water and sanitation repromotion and they intend to allocate budget to the promotion of community based water and sanitation activities while it is observed that coordination though the DWSTs are not active enough yet.

There are three points summarized below.

- **Establishment of DWST and Clarification of its Roles**

It is suggested that the DWST be formulated in each district and clarified with its roles with other steering pre-existing committees such as the Welfare Committee in the district council administration.

- **Inter-sectoral Cooperation under DWST**

As mentioned previously the district health department has extension staff at ward level, it is critical to learn the experiences of the health sector and to utilize available resources of people who are trained by the health sector for water related sanitation activities such as the PHAST promotion at community level.

- **Budget Allocation to the DWST Activities**

The budget allocation for water and sanitation repromotion is identified as an essential arrangement under each DWST by utilizing district resources available at present in light of sustainability of these activities on the ground.

These results and analyses are reflected in the O&M Plan (428 villages) in Chapter 5.8 of the main report and in the 'Organization and Institutional Plan' in line with the discussions of Institutional Framework in Chapter 8 of the main report. The practical recommendations are made in Chapter 9 of the main report for the detailed 'O&M' and 'Community Awareness Plan' for the 100 villages targeted in the supplementary survey and also the priority villages selected out of the 100 targeted villages.