

6. 2) Outline of Social Condition Survey

1) Location of Survey Area and Number of Candidate Sites

The Social Condition Survey was conducted in May 2010, covering Mwanza and Neno Districts which are in the Southern Region of the Republic of Malawi. In Malawi, for administration purposes, all the districts, under the Ministry of Local Government and Rural Development, are divided into Traditional Authorities (TA) or Sub-TA and further into Group Villages (GV) and further into Villages that are manned by the Traditional Authority Chiefs, Group Village Heads and Village Heads, respectively. The following TAs were considered for the Survey. The Survey area covers 411 candidate sites for the project (refer to Table 8-1).

Table 8-1 Candidate Sites by TA

District	TA or Sub-TA	Candidate Sites for the Project 1/
Mwanza	Nthache	47
	Govati (Sub-TA)	46
	Kanduku	80
	Sub-total	173
Neno	Dambe	92
	Chekucheku	41
	Mlauli	49
	Symon	57
	Sub-total	238
	Total	411

Note: 1/ Candidate sites = sites proposed for handpump installation. In some villages, there are more than 2 candidate sites in a village.

2) Village Population

The target villages include 267 villages with 411 sites in Mwanza and Neno districts, having a total of 192,834 persons with 42,756 households. Village population data is presented in Table 8-2.

Table 8-2 Village Population Data by TA

District	TA/Sub-TA	No. of Villages	No. of Candidate Sites	Village Population	No. of Households	Average Population per Village
Mwanza	Nthache	46	47	33,527	7,672	729
	Govati	40	46	17,738	3,908	443
	Kanduku	60	80	44,025	9,952	734
	Sub-total	146	173	95,290	21,532	653
Neno	Chekucheku	26	40	20,071	5,052	772
	Dambe	46	92	31,358	6,247	682
	Mlauli	23	49	20,214	4,641	879
	Symon	26	57	25,901	5,284	996
	Sub-total	121	238	97,544	21,224	806
Total		267	411	192,834	42,756	722

3) Economic Conditions

Main economic activities in the Project area is agriculture, i.e. crops production. About 90% of the total population are engaged in agricultural activities. Other economic sectors include fish culture, commerce, construction and small-scale industries. Main food crops produced are, among others, maize (staple food), cassava, millet, and sorghum. Main cash crops include tobacco, cotton, potatoes, and groundnuts.

4) Social Infrastructure

Medical facilities include district hospitals, health centers, clinics and health posts. In addition to a district hospital in each district headquarters, there are 3 and 9 health centers and 58 and 54 health posts in Mwanza and Neno district, respectively. Main diseases include, among others, malaria, diarrhea, dysentery, eye infections, skin infections, and respiratory infections. The percentage of the patients who have suffered from any water related diseases (e.g. diarrhea) averaged about 30% per village. The village people have spent medical expenses of 75 Kwacha (STA Govati) to 135 Kwacha (TA Symon), with average amount of 100 Kwacha per household per month.

There are 43 and 121 primary schools in Mwanza and Neno district, respectively. On average, there are one primary school per every 3 villages. The number of teachers are 5 to 6 persons per school on average.

5) Existing Handpumps and Village Organizations

About 77% of villages in Mwanza and 75% of villages in Neno have hand pump facilities as shown in Table 8-3. The Village Health and Water Committees (VHWCs) to operate and maintain the water supply facilities are also established in more than 70% of the villages, except TA Dambe where only about 46% of the villages have established the same..

Table 8-3 Existing Handpumps and Village Organizations

District	TA/Sub-TA	No. of Village	Existing Hand Pump (HP)	Percentage of villages with HP	No. of Villages with VHWC	Percentage of Villages with VHWCs
Mwanza	Nthache	46	40	87.0%	29	63.0%
	Govati	40	26	65.0%	31	77.5%
	Kanduku	60	46	76.7%	44	73.3%
	Sub-total	146	112	76.7%	104	71.2%
Neno	Checkucheku	26	22	84.6%	22	84.6%
	Dambe	46	25	54.3%	21	45.7%
	Mlauli	23	18	78.3%	17	73.9%
	Symon	26	26	100.0%	26	100.0%
	Sub^total	121	91	75.2%	86	71.9%
Total		267	203	76.0%	190	71.5%

Note: VHWC = Village Health and Water Committee

6) Main Water Sources

Water sources in the survey area consists of: (i) boreholes with handpumps (HPs); (ii) traditional water sources such as small rivers, springs, and dug wells; (iii) gravity fed water supply system with standpipes; and (iv) taking water from nearby village.

Main water sources signifies the water sources which more than 50% of the village population use at their daily life. As presented in Table 8-4, the traditional water sources are considered to be main water sources in the survey area as more than 50% of the village population use them

Table 8-4 Number and Percentage of Villages by Main Water Sources

Main Water Sources	Mwanza District		Neno District	
	No. of Villages	Percentage	No. of Villages	Percentage
Borehole with HP	63	43%	40	33%
Traditional water sources	80	55%	81	67%
Gravity fed water supply system	2	1.4%	0	0%
Taking water from nearby village	1	0.6%	0	0%
Totsal	146	100.0%	121	100.0%

7) Average Distance to Handpump Site

Average distance to handpump site is more than 500 meters in the target villages as shown in Table 8-5.

Table 8-5 Average Distance to Handpump Site

Unit: Meter

District	TA / Sub-TA	Wet Season	Dry Season
Mwanza	Govati (Sub-TA)	866	858
	Nthache	569	571
	Kanduku	1,213	927
Neno	Dambe	520	525
	Chekucheku (Ngozi)	918	933
	Mlauli	913	992
	Symon	716	743

6) Water Collection and Storage

A plastic bucket or container of 20 liter volume is mainly used to carry water from Handpump site to home. A container of 10 to 15 liter volume is also utilized. Water is usually carried on the head. Water collection works are mostly done by women and girls. Sometimes bicycles are used to carry water in most cases by men. A water jar of 50 liter volume or plastic bucket is used to keep the collected water at home.

7) Water Consumption

Water consumption varies according to the kinds of water sources and distance. Average water consumption ranges from 22 liters per capita per day (lpcd) to 30 lpcd as shown in Table 8-6.

Table 8-6 Average Water Consumption by TA

Unit: Liter

District	TA / Sub-TA	Household Consumption	Household Size	Per Capita Consumption
Mwanza	Govati (Sub-TA)	120	4.5	26
	Nthache	105	4.4	24
	Kanduku	130	4.4	29
Neno	Dambe	110	5.0	22
	Chekucheku (Ngozi)	105	4.0	26
	Mlauli	130	4.4	30
	Symon	110	4.9	22

8) Household Income and Willingness to pay

Average household income by TA in Mwanza district exceeds more than 2,000 Kwacha, i.e. 2,366 Kwacha in Sub-TA Govati, 2,739 Kwacha in TA Nthache, and 4,368 Kwacha in TA Kanduku. In Neno district, the same indicates 2,939 Kwacha in TA Mlauli, 2,618 Kwacha in

TA Chekucheku, 2,598 Kwacha in TA Symon and 4,138 Kwacha in TA Dambe. (Refer to Table 8-7.)

Based on the household income data, capacity to pay for water fee has been calculated. Four percent of the total income has been considered to be the capacity to pay for water fee. Whereas, the willingness to pay for water fee is the result of interview survey, which indicates average amount of between 51 Kwacha to 64 Kwacha as shown in Table 8-7.

Table 8-7 Household Income and Willingness to Pay

Unit: Malawi Kwacha

District	TA / Sub-TA	Household Income	Capacity to pay for Water Fee	Willingness to Pay for Water Fee
Mwanza	Govati (Sub-TA)	2,366	95	49
	Nthache	2,739	110	59
	Kanduku	4,368	175	51
Neno	Dambe	4,138	166	64
	Chekucheku (Ngozi)	2,618	105	62
	Mlauli	1,939	78	64
	Symon	2,598	104	63

6. 3) Results of Water Quality Analysis

Results of Water Quality Analysis in Mwanza and Nenodistricts

District		MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	
T/A		KANDULU	KANDULU	KANDULU	KANDULU	KANDULU	KANDULU	KANDULU	KANDULU	KANDULU	KANDULU	KANDULU	KANDULU	
Community		NSAKAMBEW A	MOFFATI	NGADZIWE	KUNENEKUD E Trading	CHILALA	THAMBALA	HAU	SILEDI	AMOSI	CHIPONDENI	CHATHA	MLONGOLOL A	
Item	WHO 1993	Malawai MoIWD	Borehole	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	
pH Value	6.5-8.5	6.0-9.5	6.91	7.07	6.78	6.11	7.9	6.58	6.55	6.34	6.53	6.59	6.4	6.69
CONDUCTIVITY ($\mu\text{s/cm}$ at 25 °C)	-	-	555	974	882	282	325	323	379	355	162	136	332	792
TOTAL DISSOLVED SOLIDS,	1,000	2,000	312	529	483	169	192	196	224	218	110	93	200	439
CARBONATE (as CO_3^{2-}), mg/l	-	-	0	58	0	0	5	0	0	0	0	0	0	0
BICARBONATE (as HCO_3^-), mg/l	-	-	268	493	439	93	140	159	175	174	69	38	165	470
CHLORIDE (as Cl-), mg/l	250	750	37.3	37.2	44	33.8	20	16.9	23.7	18.6	12	20.3	16.9	15
SULPHATE (as SO_4^{2-}), mg/l	500	800	6.5	25	4.5	2.1	5.5	2.1	14	5.4	2.6	2.1	2.7	2.2
NITRATE (as NO_3^-), mg/l	45	100	1.18	0.04	1.15	0.13	0.04	0.03	0.01	0.01	0.03	0.01	0.22	0.01
FLUORIDE (as F ⁻), mg/l	1.5	3	1.14	1.32	0.8	0.48	1.16	1.23	1.03	1.17	0.49	0.68	1.05	1.23
SODIUM (as Na ⁺), mg/l	200	500	20	36	40	20	13	14	16	17	9	9	12	28
POTASSIUM (as K ⁺), mg/l	-	-	6.5	6.4	5.4	2.5	2.3	2.3	2.5	2.6	2.7	2.4	1.1	2.9
CALCIUM (as Ca ⁺⁺), mg/l	200	250	64	128	128	20	30	26	29	28	16	9	38	100
MAGNESIUM (as Mg ⁺⁺), mg/l	150	200	13.6	21.4	19.4	9.7	13	17	17.5	15.6	5.8	3.8	9.7	25
TOTAL IRON (Fe ⁺⁺), mg/l	1.5	3	0.01	0.45	0.03	0.11	0.43	0.79	0.13	0.03	0.03	0.04	0.08	0.06
MANGANESE (Mn ⁺⁺), mg/l	0.5	1.5	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TOTAL HARDNESS (as CaCO_3),	500	800	216	408	364	90	129	136	145	134	59	38	136	352
TOTAL ALKALINITY (as CaCO_3),	-	-	220	404	360	76	123	130	143	143	57	31	135	385
TURBIDITY, NTU	5	25	<0.01	<0.01	4.8	<0.01	7.1	15.4	<0.01	4.6	<0.01	6.5	<0.01	<0.01
SUSPENDED SOLIDS, mg/l	-	-	<0.01	<0.01	2.1	<0.01	3	12	<0.01	2.9	<0.01	4	<0.01	<0.01
COLOUR, TCU	15	50	<5.0	<5.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
ODOUR	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant
TASTE	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant
COPPER (Cu), mg/l	1.5	2	0.069	0.079	0.082	0.105	0.1	0.101	0.111	0.105	0.143	0.148	0.153	0.165
LEAD (Pb ⁺⁺), mg/l	0.05	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ARSENIC (As), mg/l	0.05	0.5	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BACTERIA TYPE ENUMERATED (FC/100 ml)		50	0	0	0	0	0	0	0	800	0	0	0	0
BACTERIA TYPE LEVELS (FC/100 ml)		50	0	0	0	0	0	0	0	170	0	0	0	0

Results of Water Quality Analysis in Mwanza and Nenodistricts

District		MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA
T/A		KANDULU,	KANDULU,	KANDULU,	KANDULU,	KANDULU,	KANDULU,	KANDULU,	KANDULU,	KANDULU,	KANDULU,	KANDULU,	KANDULU,	KANDULU,
Community		SANJIKA PRIMARY	KATUNGA	LUPIYA	NJOLOMOLE	TULONKHON DO	MGANGO	ZIKALONGA	JIMU	WINGOLO	ZIYAYA	MANDOLO	MKWICHI	CHIWUNGUZI
Item	WHO 1993	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE
pH Value	6.5-8.5	6.08	6.34	8.38	7	6.5	6.43	6.17	6.39	6.31	6.48	6.53	6.13	8.16
CONDUCTIVITY ($\mu\text{s/cm}$ at 25 °C)	-	235	226	478	787	540	349	132	333	269	187	798	111	481
TOTAL DISSOLVED SOLIDS,	1,000	149	148	252	424	305	211	91	204	168	98	400	57	258
CARBONATE (as CO_3^{2-}), mg/l	-	0	0	27	0	0	0	0	0	0	0	0	0	28
BICARBONATE (as HCO_3^-), mg/l	-	94	104	168	400	232	170	34	163	99	90	398	52	163
CHLORIDE (as Cl^-), mg/l	250	20.3	13.5	20.3	37.2	44	18.6	18.6	17.8	28	10.1	37.2	5.8	27.1
SULPHATE (as SO_4^{2-}), mg/l	500	4	4	6.1	9.5	4.4	4.7	5.6	3.8	5.4	3.9	20	4.4	5.8
NITRATE (as NO_3^-), mg/l	45	0.15	0.04	0.01	0.14	<0.001	<0.001	0.02	0.03	0.03	0.04	0.74	0.02	0.03
FLUORIDE (as F^-), mg/l	1.5	1.19	1.01	1.25	0.81	1.07	1.23	0.62	1.22	1.22	0.75	1.21	0.67	1.21
SODIUM (as Na^+), mg/l	200	16	11	14	25	40	16	10	15	20	10	29	4.5	8
POTASSIUM (as K^+), mg/l	-	2.3	3.4	1.8	2	3.6	2.5	0.9	2.9	2.4	2.5	3	0.3	3.6
CALCIUM (as Ca^{++}), mg/l	200	17	19.2	48	106	44	37	7	30.4	18.4	16	85	9.5	58
MAGNESIUM (as Mg^{++}), mg/l	150	8.6	9.7	18.5	19.4	17.5	12	4.8	14.6	9.4	7.4	30	5.2	11.7
TOTAL IRON (Fe^{++}), mg/l	1.5	0.15	0.05	0.2	0.04	0.1	0.2	0.1	0.04	0.12	0.08	0.07	0.08	0.05
MANGANESE (Mn^{++}), mg/l	0.5	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TOTAL HARDNESS (as CaCO_3),	500	78	88	196	344	182	142	37	136	85	70	336	45	193
TOTAL ALKALINITY (as CaCO_3),	-	77	85	183	328	190	139	28	134	81	74	326	43	180
TURBIDITY, NTU	5	<0.01	<0.01	<0.01	5.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SUSPENDED SOLIDS, mg/l	-	<0.01	<0.01	<0.01	4	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
COLOUR, TCU	15	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
ODOUR	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant
TASTE	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant
COPPER (Cu), mg/l	1.5	0.16	0.169	0.167	0.187	0.178	0.185	0.175	0.176	0.186	0.17	0.181	0.188	0.188
LEAD (Pb^{++}), mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ARSENIC (As), mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BACTERIA TYPE ENUMERATED (FC/100 ml)		0	0	0	0	0	0	0	7	0	0	0	0	0
BACTERIA TYPE LEVELS (FC/100 ml)		0	0	0	0	0	0	0	0	0	0	0	0	0

Results of Water Quality Analysis in Mwanza and Nenodistricts

District		MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA
T/A		KANDULU,	NTHACHE,	NTHACHE,	NTHACHE,	NTHACHE,	NTHACHE,	NTHACHE,	NTHACHE,	NTHACHE,	NTHACHE,	NTHACHE,	NTHACHE,	NTHACHE,
Community		RAUNDI	NTHACHE	KAGONAMWA KE	KAPHELAMA	LOPONGWE L.E.A.	EMVULO	NDILIRE	MTSAMIKA F.P. SCHOOL	THAWARE PRIMARY	KABANGO	MKWETE	MUWALE CLINIC	MPANDASONI
Item	WHO 1993	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE
pH Value	6.5-8.5	6.79	6.71	6.63	6.43	6.98	6.77	6.99	6.01	8.19	6.48	6.42	6.97	6.7
CONDUCTIVITY ($\mu\text{s}/\text{cm}$ at 25 °C)	-	634	581	419	357	644	328	301	86	272	383	342	384	680
TOTAL DISSOLVED SOLIDS,	1,000	319	319	238	210	330	176	166	68	167	226	207	198	340
CARBONATE (as CO_3^{2-}), mg/l	-	0	0	0	0	0	0	0	0	0	0	0	0	0
BICARBONATE (as HCO_3^-), mg/l	-	350	249	219	160	354	144	132	13	139	158	173	168	296
CHLORIDE (as Cl^-), mg/l	250	20.3	44	16.9	24	20.3	20	19.8	13.5	10.9	26	10.1	19.2	40.6
SULPHATE (as SO_4^{2-}), mg/l	500	4.5	18	5.2	11	3.9	12	12.1	6	3.8	17	19	19.2	17.3
NITRATE (as NO_3^-), mg/l	45	0.01	0.34	0.37	0.09	1.06	0.54	0.015	0.04	0.03	0.62	0.05	14.3	0.078
FLUORIDE (as F^-), mg/l	1.5	0.81	0.77	0.97	1.27	1.17	1.88	1.4	0.31	0.98	0.97	0.92	1.72	0.98
SODIUM (as Na^+), mg/l	200	17	14	14	17	15	12.1	10.1	7	8	22	8.9	9.7	21.7
POTASSIUM (as K^+), mg/l	-	3.4	2.5	1.2	2.5	2.6	0.1	0.1	1.1	2.8	1.7	1.7	0.3	0.6
CALCIUM (as Ca^{++}), mg/l	200	72	66.4	45	35	100	38	32.8	5	26	34	28	42	80.8
MAGNESIUM (as Mg^{++}), mg/l	150	27.2	19.4	18	11.7	11.7	9.4	11.2	2.3	14	13	19	12.3	18.5
TOTAL IRON (Fe^{++}), mg/l	1.5	0.04	0.05	0.12	0.08	0.07	0.13	0.04	0.16	0.12	0.08	0.65	0.071	0.163
MANGANESE (Mn^{++}), mg/l	0.5	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	0.001	<0.001	<0.001	<0.001	<0.001	0.001	21.7
TOTAL HARDNESS (as CaCO_3),	500	292	246	187	136	298	134	128	22	123	138	149	156	276
TOTAL ALKALINITY (as CaCO_3),	-	287	204	179	131	290	118	108	11	114	129	142	138	243
TURBIDITY, NTU	5	2.8	<0.01	4.8	<0.01	<0.01	0.6	0.4	0.4	4.2	2.4	<0.01	<0.01	<0.01
SUSPENDED SOLIDS, mg/l	-	2	<0.01	3.5	<0.01	<0.01	<0.01	<0.01	<0.01	2	1	<0.01	<0.01	<0.01
COLOUR, TCU	15	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
ODOUR	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant
TASTE	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant
COPPER (Cu), mg/l	1.5	0.183	0.172	0.183	0.181	0.179	0.105	0.031	0.17	0.181	0.179	0.167	0.116	0.004
LEAD (Pb^{++}), mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ARSENIC (As), mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BACTERIA TYPE ENUMERATED (FC/100 ml)		0	0	0	0	0	0	0	0	0	0	0	0	0
BACTERIA TYPE LEVELS (FC/100 ml)		0	0	0	0	0	0	0	0	0	0	0	0	0

Results of Water Quality Analysis in Mwanza and Nenodistricts

District		MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA
T/A		NTHACHE,	NTHACHE,	NTHACHE,	NTHACHE,	NTHACHE,	NTHACHE,	NTHACHE,	NTHACHE,	STA GOVATI,	STA GOVATI,	STA GOVATI,	STA GOVATI,	STA GOVATI,
Community		CHIMULANG O	KADOLE F.P.SCHOOL	MALOWA SCHOOL	NGUTEYA	KAGULO I	KASAPHA	KABANGO CDSS	NDILIRE CLINIC	KAMKOMA	CHIMWALIRA	MINJALE	CHATAMBAL ALA	MSEMBEDZE RA
Item	WHO 1993	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE
pH Value	6.5-8.5	6.69	6.38	6.73	7.01	6.8	6.98	6.75	6.9	7.87	8.19	7.76	8.06	6.55
CONDUCTIVITY ($\mu\text{s}/\text{cm}$ at 25 °C)	-	423	226	382	337	465	396	552	307	368	347	357	227	348
TOTAL DISSOLVED SOLIDS,	1,000	245	144	210	190	274	194	283	165	210	191	213	147	210
CARBONATE (as CO_3^{2-}), mg/l	-	0	0	0	0	0	0	0	0	6	12	2	6	0
BICARBONATE (as HCO_3^-), mg/l	-	206	112	176	127	254	170	276	120	132	134	112	70	160
CHLORIDE (as Cl ⁻), mg/l	250	17	7.4	17.2	19	11.8	24	18	24	26	18.6	40.6	15.2	22
SULPHATE (as SO_4^{2-}), mg/l	500	19	11	12.2	24	10	20	26	11.8	20	8.8	11	14	6.3
NITRATE (as NO_3^-), mg/l	45	0.04	0.19	0.081	0.1	0.16	0.071	0.48	0.01	0.12	0.04	0.03	0.54	0.003
FLUORIDE (as F ⁻), mg/l	1.5	1.01	0.65	1.42	1.32	1.08	1.04	0.9	1.2	1.21	1.17	1.19	0.97	1.19
SODIUM (as Na ⁺), mg/l	200	15	6	10.3	9.1	10	11	10	12	21	12	30	12	18
POTASSIUM (as K ⁺), mg/l	-	4.9	2.5	0.4	0.3	0.6	0.5	0.4	0.2	2	2.1	2.7	1.8	3.1
CALCIUM (as Ca ⁺⁺), mg/l	200	38.4	19	39.6	36.8	54	32	80	29.4	29	34	23	19	26
MAGNESIUM (as Mg ⁺⁺), mg/l	150	18	12	14.6	9.6	21	22	12	13	12	7.1	10	7.2	17
TOTAL IRON (Fe ⁺⁺), mg/l	1.5	0.71	0.1	0.317	0.03	0.06	0.003	0.131	0.049	0.08	0.06	0.07	0.01	0.08
MANGANESE (Mn ⁺⁺), mg/l	0.5	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TOTAL HARDNESS (as CaCO_3),	500	171	97	160	132	465	188	249	127	122	134	99	77	135
TOTAL ALKALINITY (as CaCO_3),	-	169	92	146	104	274	142	226	98	188	130	95	67	131
TURBIDITY, NTU	5	<0.01	4.1	0.5	0.6	12	0.1	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SUSPENDED SOLIDS, mg/l	-	<0.01	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
COLOUR, TCU	15	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
ODOUR	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant
TASTE	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant
COPPER (Cu), mg/l	1.5	0.177	0.164	0.126	0.041	0.188	0.02	0.031	0.03	0.194	0.187	0.177	0.189	0.182
LEAD (Pb ⁺⁺), mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ARSENIC (As), mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BACTERIA TYPE ENUMERATED (FC/100 ml)		0	0	0	0	0	0	0	0	0	0	0	4	0
BACTERIA TYPE LEVELS (FC/100 ml)		0	0	0	0	0	0	0	0	0	0	0	0	0

Results of Water Quality Analysis in Mwanza and Nenodistricts

District		MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	MWANZA	NENO	NENO	NENO	NENO	NENO	NENO	NENO
T/A		STA GOVATI,	STA GOVATI,	STA GOVATI,	STA GOVATI,	STA GOVATI,	STA GOVATI,	DAMBE,	DAMBE,	DAMBE,	DAMBE,	DAMBE,	DAMBE,	DAMBE,
Community		KAMPHIRIMO	KAYERA	JAMU	GOVATI (I)	TSEGULANI I	GOVATI II	CHIKALEMA I	CHINYANI	KHOMERA	KUMBWANI	CHIOMBA	CHAKHUMBI RA	CHAKHUMBI RA II
Item	WHO 1993	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE
pH Value	6.5-8.5	7.15	6.6	7.8	6.52	7.34	6.65	8.1	6.54	8.31	8.01	7.92	7.92	7.9
CONDUCTIVITY ($\mu\text{s}/\text{cm}$ at 25 °C)	-	122	361	245	445	125	458	346	266	121	161	115	148	132
TOTAL DISSOLVED SOLIDS,	1,000	93	210	151	254	98	258	185	165	84	103	80	94	96
CARBONATE (as CO_3^{2-}), mg/l	-	0	0	4	0	0	0	16	0	0	2	2	3	2
BICARBONATE (as HCO_3^-), mg/l	-	45	168	95	228	49	198	133	120	47	12	32	19	52
CHLORIDE (as Cl^-), mg/l	250	10.1	15.2	11.8	18	8.5	29	15.2	18.6	10.1	8	10.1	25	8.4
SULPHATE (as SO_4^{2-}), mg/l	500	5.8	13	11	5.9	6.5	19	4.9	4.1	4.7	39	5.7	5.3	5.3
NITRATE (as NO_3^-), mg/l	45	0.01	0.04	0.03	0.03	0.01	0.22	0.01	0.03	0.4	0.06	0.19	0.1	0.02
FLUORIDE (as F^-), mg/l	1.5	0.77	1.03	1.19	1.21	0.7	1.24	1.09	0.98	0.39	0.5	0.71	0.3	0.42
SODIUM (as Na^+), mg/l	200	18	12	8	14	5.6	22	13	12	10	7	6.9	18	6.8
POTASSIUM (as K^+), mg/l	-	1.8	3.1	2	1	3	4.1	0.6	1.9	1.5	1.5	2.4	1.7	1.2
CALCIUM (as Ca^{++}), mg/l	200	9	34	25	44	10	39	29	28.4	7.8	14	8	5.7	11
MAGNESIUM (as Mg^{++}), mg/l	150	4	18	10	23	1.94	18	16	8.2	3.9	4	4.3	2	4.7
TOTAL IRON (Fe^{++}), mg/l	1.5	0.03	0.15	0.04	0.04	0.039	0.09	0.1	0.06	0.03	0.04	0.04	0.03	0.03
MANGANESE (Mn^{++}), mg/l	0.5	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.001
TOTAL HARDNESS (as CaCO_3),	500	39	159	104	204	45	171	138	105	36	51	38	22	47
TOTAL ALKALINITY (as CaCO_3),	-	37	138	85	187	40	162	136	98	39	13	30	21	46
TURBIDITY, NTU	5	4.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	4.1	<0.01	<0.01	<0.01	<0.01
SUSPENDED SOLIDS, mg/l	-	3.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	3	<0.01	<0.01	<0.01	<0.01
COLOUR, TCU	15	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
ODOUR	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant
TASTE	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant
COPPER (Cu), mg/l	1.5	0.174	0.176	0.177	0.171	0.169	0.182	0.177	0.176	0.178	0.175	0.168	0.169	0.171
LEAD (Pb^{++}), mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ARSENIC (As), mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BACTERIA TYPE ENUMERATED (FC/100 ml)		0	0	0	0	0	0	4	0	0	0	8	0	0
BACTERIA TYPE LEVELS (FC/100 ml)		0	0	0	0	0	0	0	0	160	4	288	208	0

Results of Water Quality Analysis in Mwanza and Nenodistricts

District		NENO	NENO	NENO	NENO DISTRICT	NENO	NENO	NENO	NENO	NENO	NENO	NENO	NENO	NENO
T/A		DAMBE,	DAMBE,	DAMBE,	MLAULI	MLAULI	MLAULI	MLAULI	MLAULI	MLAULI	MLAULI	MLAULI	MLAULI	MLAULI
Community		KAMOTO II	HAINDI	CHILIM' BONDO	KAMBALAME	ZIDALA	NSALAWATH A II	BUTAO	KAMTUWALE	NELSON	KAMOTO I	DAUDI	NSALAWATH A III	GONTHI
Item	WHO 1993	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE
pH Value	6.5-8.5	6.75	7.8	6.91	7.13	7.76	8.43	6.88	7.05	8.08	6.28	6.57	7.58	7.13
CONDUCTIVITY ($\mu\text{s/cm}$ at 25 °C)	-	172	155	90	834	331	1276	704	944	2347	239	929	1095	457
TOTAL DISSOLVED SOLIDS,	1,000	114	98	75	454	199	663	405	535	1213	154	482	591	261
CARBONATE (as CO_3^{2-}), mg/l	-	0	4	0	0	2	10	0	0	24	0	43	2	0
BICARBONATE (as HCO_3^-), mg/l	-	66	41	28	443	158	581	380	547	468	95	298	477	234
CHLORIDE (as Cl^-), mg/l	250	15	16	10.1	27.1	17	77.8	22	15.2	230	19	60.9	50	18.6
SULPHATE (as SO_4^{2-}), mg/l	500	3.4	4.2	3.7	6.8	6.5	8.8	9	5.4	290	10	12	59	6.8
NITRATE (as NO_3^-), mg/l	45	0.06	0.37	0.02	0.52	0.01	0.11	2.21	1.02	0.13	0.36	5.5	0.88	0.07
FLUORIDE (as F^-), mg/l	1.5	1.18	0.5	0.6	0.96	1.23	1.24	1.27	1.32	1.24	0.84	1.3	1.18	1.06
SODIUM (as Na^+), mg/l	200	12	13	7	17	12	69	18	19	200	16	20	48	14
POTASSIUM (as K^+), mg/l	-	3.4	1.4	1.1	3.2	2	6	3	4.8	19	1.3	7.3	1.4	2.5
CALCIUM (as Ca^{++}), mg/l	200	13.2	10	6.2	118	32	118	92	128	139	17	122	102	58
MAGNESIUM (as Mg^{++}), mg/l	150	5.7	4.5	2.6	26	14	49	23.1	34	48	9	19	47	14.1
TOTAL IRON (Fe^{++}), mg/l	1.5	0.05	0.05	0.2	0.03	0.02	0.02	0.03	0.02	0.02	0.03	0.05	0.02	0.01
MANGANESE (Mn^{++}), mg/l	0.5	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TOTAL HARDNESS (as CaCO_3),	500	56	44	27	401	137	496	325	459	544	79	383	448	203
TOTAL ALKALINITY (as CaCO_3),	-	54	40	23	363	133	493	311	448	424	78	316	394	192
TURBIDITY, NTU	5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SUSPENDED SOLIDS, mg/l	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
COLOUR, TCU	15	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
ODOUR	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant
TASTE	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant
COPPER (Cu), mg/l	1.5	0.17	0.19	0.17	0.175	0.188	0.189	0.2	0.184	0.191	0.205	0.199	0.203	0.218
LEAD (Pb^{++}), mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ARSENIC (As), mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BACTERIA TYPE ENUMERATED (FC/100 ml)		0	12	0	0	0	0	0	0	0	11	0	0	0
BACTERIA TYPE LEVELS (FC/100 ml)		0	40	0	0	0	0	0	0	0	140	0	0	0

Results of Water Quality Analysis in Mwanza and Nenodistricts

District		NENO	NENO	NENO	NENO	NENO	NENO	NENO	NENO	NENO	NENO	NENO	NENO	NENO
T/A		MLAULI	MLAULI	MLAULI	MLAULI	SYMON,	SYMON,	SYMON,	SYMON,	SYMON,	SYMON,	SYMON,	SYMON,	SYMON,
Community		PA LEVEN	CHIMBAMILA PRIMARY	JANA	NSALAWATH A I	KACHINGWE	PAJO	NDELEMA	KANDOJE CLINIC	NGWENYAMA I	NKUNDIKA	NAMINJALE CLINIC	LISUNGWI CLINIC	NGWENYAMA II
Item	WHO 1993	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE
pH Value	6.5-8.5	6.39	8.47	7.12	8.05	8.47	8.35	8.6	8.06	8.56	8.42	8.01	8.25	8.21
CONDUCTIVITY ($\mu\text{s}/\text{cm}$ at 25 °C)	-	421	589	2742	2516	455	1621	1336	630	1183	1088	1176	4249	3304
TOTAL DISSOLVED SOLIDS,	1,000	254	332	1380	1268	255	820	693	343	616	554	626	2098	1516
CARBONATE (as CO_3^{2-}), mg/l	-	0	7	125	88	12	20	12	19	20	36	12	149	251
BICARBONATE (as HCO_3^-), mg/l	-	183	240	1030	786	98	490	539	264	429	381	592	1044	998
CHLORIDE (as Cl ⁻), mg/l	250	28.8	40	137	200	16.9	190	109	27.1	98	77.8	49	332	155
SULPHATE (as SO_4^{2-}), mg/l	500	18	12	57	98	75	20	5.4	9.7	24	17	5.4	260	20
NITRATE (as NO_3^-), mg/l	45	0.01	0.27	0.06	1.55	<0.001	0.62	0.02	0.78	0.13	1.54	0.14	0.09	0.01
FLUORIDE (as F ⁻), mg/l	1.5	1.27	1.25	1.34	1.35	1.19	1.29	1.25	1.16	1.3	1.17	1.21	1.43	1.2
SODIUM (as Na ⁺), mg/l	200	20	36	230	200	12	152	86	16	79	62	36	376	107
POTASSIUM (as K ⁺), mg/l	-	3.2	3	6.3	2.1	6.6	6	7.4	5	6	4.2	6	6.1	4.9
CALCIUM (as Ca ⁺⁺), mg/l	200	32	37	243	240	37	108	128	72	106	98	168	374	336
MAGNESIUM (as Mg ⁺⁺), mg/l	150	18	10.1	36.4	32.3	17	42	38	16.8	31	33	21.2	48.7	105
TOTAL IRON (Fe ⁺⁺), mg/l	1.5	0.08	0.03	0.02	0.01	0.07	0.02	0.01	0.18	0.02	0.06	0.02	0.05	0.05
MANGANESE (Mn ⁺⁺), mg/l	0.5	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TOTAL HARDNESS (as CaCO_3),	500	154	214	756	682	162	442	476	266	392	380	506	1133	1278
TOTAL ALKALINITY (as CaCO_3),	-	150	208	1052	791	100	435	462	248	385	372	505	1104	1236
TURBIDITY, NTU	5	<0.01	<0.01	5.2	3.3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
SUSPENDED SOLIDS, mg/l	-	<0.01	<0.01	38	1.9	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
COLOUR, TCU	15	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
ODOUR	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant
TASTE	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant
COPPER (Cu), mg/l	1.5	0.182	0.204	0.21	0.198	0.197	0.214	0.198	0.205	0.176	0.178	0.176	0.163	0.218
LEAD (Pb ⁺⁺), mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ARSENIC (As), mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BACTERIA TYPE ENUMERATED (FC/100 ml)		0	0	0	0	0	0	0	0	0	0	0	0	0
BACTERIA TYPE LEVELS (FC/100 ml)		0	0	0	0	0	0	0	0	0	0	0	0	0

Results of Water Quality Analysis in Mwanza and Nenodistricts

District		NENO	NENO	NENO	NENO	NENO	NENO	NENO	NENO	NENO	NENO
T/A		SYMON,	SYMON,	SYMON,	SYMON	SYMON,	SYMON,	CHECHUCHE KU,	CHECHUCHE KU,	CHECHUCHE KU,	CHECHUCHE KU,
Community		MAPUNDI II	MBEMBA	CHIKAPA	NGAIYAYE	ZALEWA	MANYENJE	HIWA II	TIYESE	SANJILE PRIMARY	CHITANI
Item	WHO 1993	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE	BOREHOLE
pH Value	6.5-8.5	7.98	8.15	8.08	7.9	6.7	7.7	7.69	7.98	7.77	7.62
CONDUCTIVITY ($\mu\text{s}/\text{cm}$ at 25 °C)	-	1026	2685	836	2510	1032	274	562	281	400	246
TOTAL DISSOLVED SOLIDS,	1,000	566	1302	420	1190	549	135	322	172	234	157
CARBONATE (as CO_3^{2-}), mg/l	-	15	78	39	56	0	4	8	8	6	2
BICARBONATE (as HCO_3^-), mg/l	-	53	700	322	729	480	69	234	106	189	103
CHLORIDE (as Cl^-), mg/l	250	24	342	49	119	50	9	38.9	13.5	18.6	15.2
SULPHATE (as SO_4^{2-}), mg/l	500	300	18	11	263	33	57	55	8.4	6.4	6.8
NITRATE (as NO_3^-), mg/l	45	0.07	0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.08	0.01
FLUORIDE (as F^-), mg/l	1.5	1.32	1.24	0.8	0.8	1.71	<0.01	1.06	1.06	1.22	0.92
SODIUM (as Na^+), mg/l	200	18	220	37	101	43	6.7	29	44	14	12
POTASSIUM (as K^+), mg/l	-	7.1	5.1	1.5	10	2.1	2.6	6.9	4.9	4.9	2.3
CALCIUM (as Ca^{++}), mg/l	200	76	172	110	181	144	21	50	35	35	20
MAGNESIUM (as Mg^{++}), mg/l	150	21.2	73	10	109	16	13	19.7	10.3	18	11
TOTAL IRON (Fe^{++}), mg/l	1.5	0.12	0.03	<0.01	<0.001	0.018	3.1	0.09	0.39	4.01	0.05
MANGANESE (Mn^{++}), mg/l	0.5	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.011	0.371	<0.001
TOTAL HARDNESS (as CaCO_3),	500	383	729	316	900	425	112	206	105	168	95
TOTAL ALKALINITY (as CaCO_3),	-	68	704	307	691	393	63	205	100	165	88
TURBIDITY, NTU	5	<0.01	<0.01	0.01	0.52	0.01	1	<0.01	23.9	<0.01	<0.01
SUSPENDED SOLIDS, mg/l	-	<0.01	<0.01	<0.01	<0.01	<0.10	0.4	<0.01	19	<0.01	<0.01
COLOUR, TCU	15	<5	<5	<5	<5	<5	<5	<5	15	<5	<5
ODOUR	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant
TASTE	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant	Not unpleasant
COPPER (Cu), mg/l	1.5	0.171	0.12	0.011	0.016	0.082	0.112	0.012	0.049	0.158	0.146
LEAD (Pb^{++}), mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
ARSENIC (As), mg/l	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BACTERIA TYPE ENUMERATED (FC/100 ml)		0	0	0	0	0	0	0	0	0	0
BACTERIA TYPE LEVELS (FC/100 ml)		0	0	0	0	0	0	0	0	0	0

6. 4) - 1 Geophysical Explanation Survey

Resistivity of structures around existing wells

To show the relationship between underground water and resistivity, the results around an existing well are shown below.

(1) Dug well A (GP60、 Neno, Ndelema)

This is a traverse line, a dug well in an offshoot of the Lisungwe river system that flows in Nelema village of Symon. The width of the riverbed is about 10m, the depth from the peripheral surface is about 3m. At the measurement time, the groundwater level was the same as the riverbed. Therefore, the peripheral groundwater level is about 3m from surface.



Photo2.1.2 Dug well

There is a low-resistivity zone under the dug well that extends left and right. This implies excellent permeability under the river and good permeability in the surrounding area.

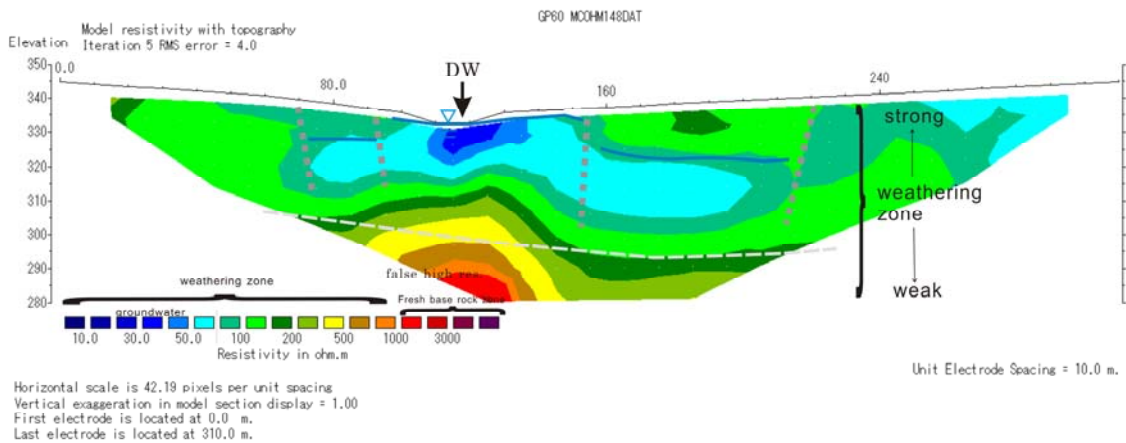


Figure 11(1) Resistivity structure section (dug well A)

(2) Borehole B (GP28、 Neno, Butawo)

This borehole is located on the east side of main road T397 which runs from Mwanza to Neno, and follows the topology of the loose ridge that comes in from the north. According to local villagers, the depth of the borehole is about 24m, and the well remains bone dry throughout the year.

The resistivity at the borehole position increases with depth to $75\Omega\cdot\text{m}$ or more. We believe that the high resistivity layer shows fresh basement rock with a very thin weathering layer. So, the chance of a good aquifer there is quite low.

(3) Borehole C (GP32、Neno, Matemba)

This borehole is on the west side, 40m away from main route T397, which connects Mwanza and Neno. It is located on a declining slope, oriented south-southeast. The depth of the borehole is shallow, according to local villagers, and dries up during the dry season. The resistivity at the borehole position shows $40\Omega\cdot\text{m}$ or less, as in the previous dug well example, and the low resistivity part extends horizontally. The thickness is about 20m, and the place at the borehole position has thinned.

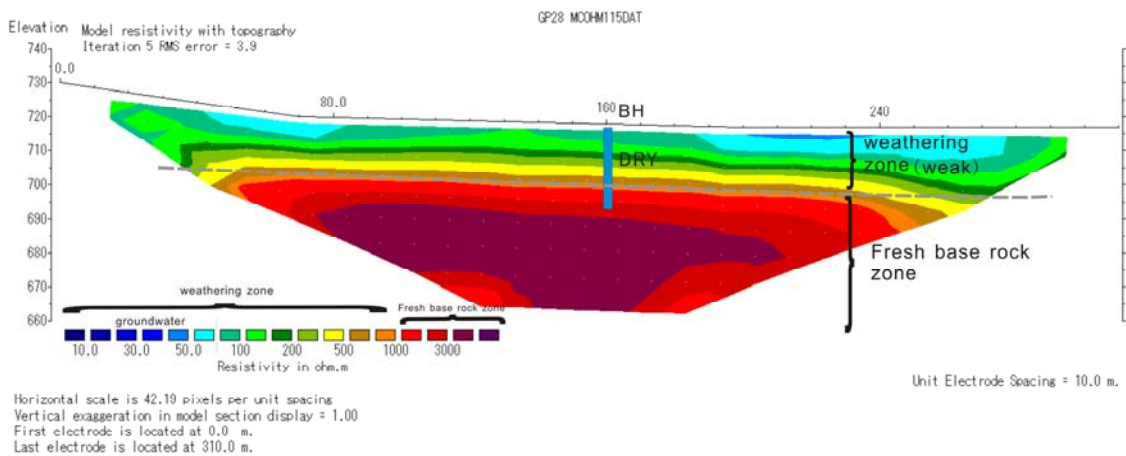


Figure 11 (2) Resistivity structure section (Borehole B)

strong

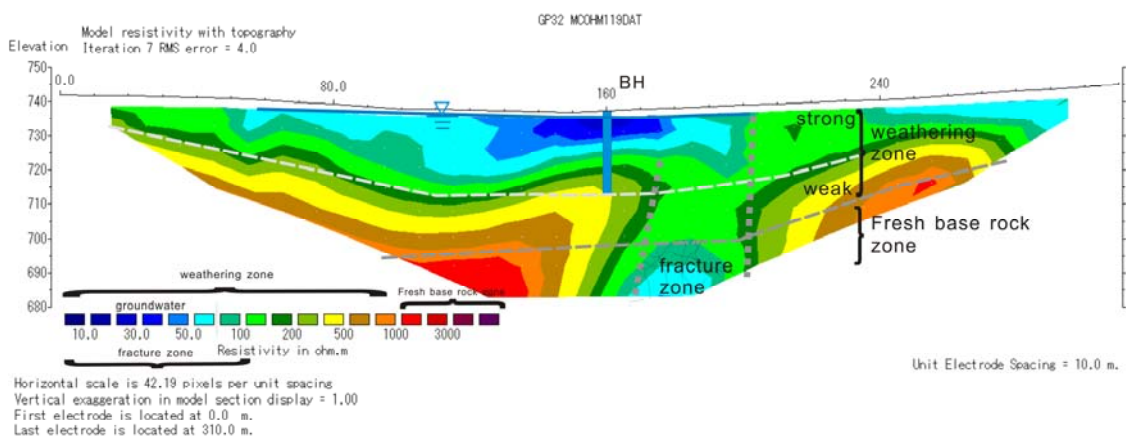


Figure 11 (3) Resistivity structure section (Borehole C)

The resistivity of the aquifer is about $40\Omega\cdot\text{m}$ around dug well A and borehole C in the above-mentioned results. Moreover, we can expect that the resistivity rises when the permeability worsens or the saturation fraction lowers.

(f) Comparison between test borehole results and resistivity structure

Next, we compared the hydrogeological structure from test borehole to the resistivity structure, and the results are as follows.

① GP15 (Amosi No2)

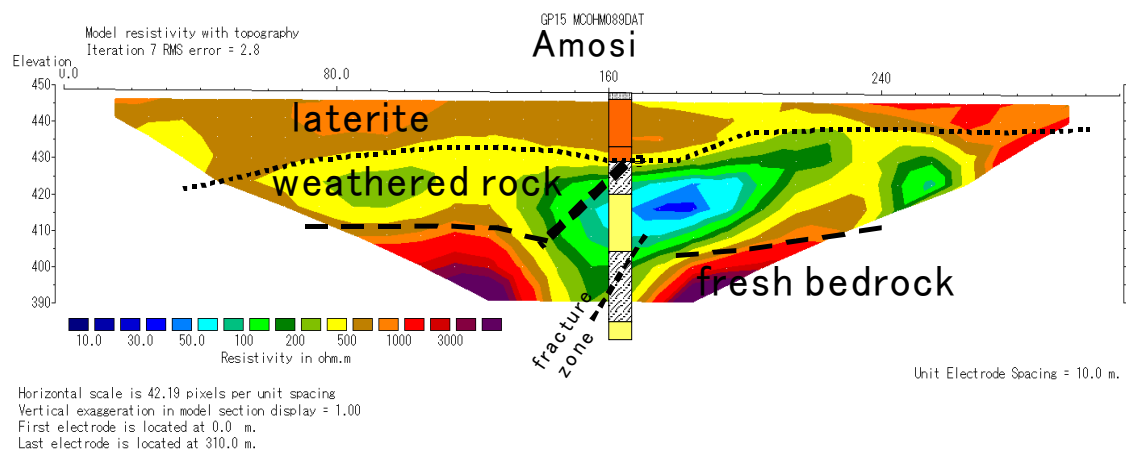


Figure 12(1) Resistivity structure section (Amosi)

The surface was covered with laterite in the weathering layer in Amosi, and the thickness was 16m. At lower layers, weathering soft rock was consecutive to the hole bottom. Two fracture zones exist, at 19m and 44m in depth. The groundwater level was -19m. The resistivity below the groundwater level showed a reading of almost $100\Omega\cdot\text{m}$ or less, and $50\Omega\cdot\text{m}$ or less in about 30m depth, especially. We expect that $100\Omega\cdot\text{m}$ is pretty standard for the resistivity of aquifers around Amosi. Also, a discontinuity in resistivity is seen in the vicinity of the fracture zone, which corresponds structurally to the well.

② GP57 (Lumbe, No5)

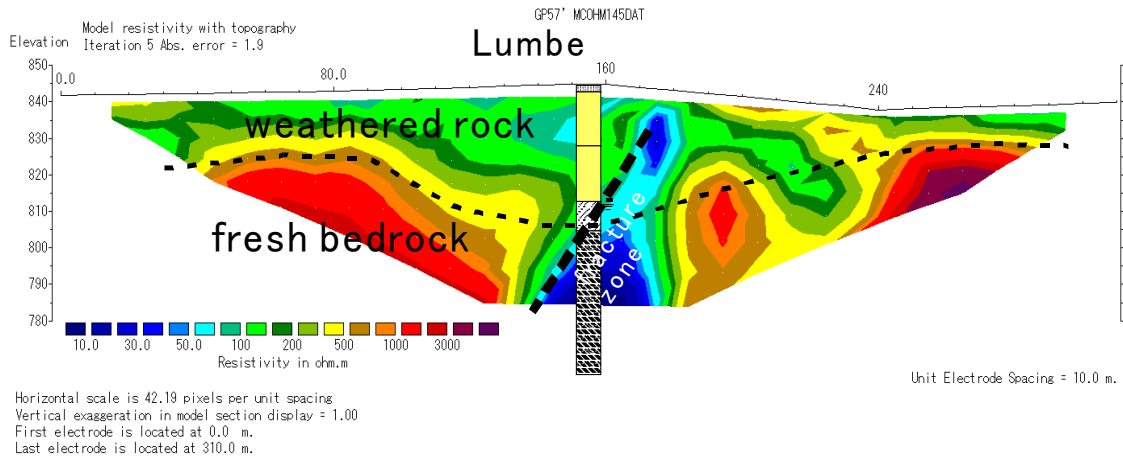


Figure 12 (2) Resistivity structure section (Lumbe)

In Lumbe, the surface was covered with weathering soft rock, 34m thick, and fresh basement rock, from 40m in depth. A fracture zone about 6m thick was found near the boundary of soft rock and fresh rock. The water level was -33.8m, the same as at the position where the fracture zone appeared, though there was very little underground water. The resistivity under the groundwater level was $50\Omega\cdot\text{m}$ or less, and discontinuity in resistivity is seen near the fracture zone, structurally corresponding to the well.

From these two points and other results above, the resistivity of the aquifer is not constant, but is a regional feature. We think that a standard for regional resistivity can be obtained by gathering more data in the future. Also, it is possible to understand geological structures, such as fracture zones, from the resistivity structure.