

### **16.3.2 Groundwater Potential Evaluation of the Target Districts**

Main geology of target districts is called the Basement Complex composed by granite or gneiss formed in Precambrian era. After the Precambrian era, this area didn't get large tectonic movement. Therefore, peneplain has formed by weathering and erosion. Characteristically, granite is easy to be weathered and has many fractures from near surface to several dozen meters in depth. Weathered granite forms sandy state near surface. Clay mineral called "Kaoline" derives from weathered granite. Since the topography is flat in this area, thick clay layer which has 20 to 30m thickness is formed occasionally. Since clay has very low hydraulic permeability, the recharge of groundwater from surface is very limited. Lowness of groundwater yield of wells in this area is caused by this thick clay layer. In the existing well data analysis, average well yield is very low, i.e. 2.5 m<sup>3</sup>/h in Iganga and Soroti districts, and 1.9 m<sup>3</sup>/h in Pallisa district.

Two types of aquifer are considered, which are the weathered granite before argillization and the fracture zone in the rock. Fractures occur not only vertical but also horizontal in granitic rocks. Many small hills of granite called "Inselberg" with more resistant rock masses, which formed through weathering process, are observed in this area. This inserberg is considered as good groundwater recharge area. Therefore, the important thing is to understand the distribution of exposed bedrock place and continuity of decomposed granite layer or fracture.

Well data which has hydrogeological data were extracted and analyzed by comparing between the existing well data (NGWDB) and WATSUP data in the priority districts. Accuracy of position of wells is very improved after analyzing data of whole area in Lake Kyoga Basin. Table 16-22 shows the average value of hydrogeological parameters in each subcounty. Figure 16-12 to Figure 16-14 shows the well yield distribution of each district.

In Iganga district, very low yield areas are in Waibuga subcounty, Bukanga subcounty, and the border area between Namungalwe and Nakalama subcounty. The oldest geologies in this area, i.e. Nyanzian formation and Granitoid, are distributed in Makuutu sobcounty. This subcounty has also very low yield. Nambale subcounty and Ibulanku subcounty are relatively high yield.

Pallisa district has low yield in whole area, i.e. most of subcounties have below 2m<sup>3</sup>/h yield. Especially, Bulangira, Agula, and Butebo subcounty have very low yield. But Kakoro subcounty, Trinyi subcounty, and the area along Lake Kyoga or Mpologoma river are relatively high yield.

Southern part of Soroti district, Kadungulu, Pingire, Kateta and Kyere subcounties, are high yield area. But the northern part of Soroti district has low yield.

Additionally, test boreholes were drilled to confirm the hydrogeological condition in the priority districts. The result is shown in Table 16-23 Maximum yield was 13.2 m<sup>3</sup>/h at Kidetok RGC in Soroti district. On the other hand, 4 boreholes were dry. The average yield of test boreholes is 2.82m<sup>3</sup>/h. This is the same level as existing data mentioned above. Additionally, if the yield 0.5 m<sup>3</sup>/h or more is success borehole, the success rate is calculated 60%.

**Table 16-22 Hydrogeological Condition by Subcounty from Existing Data**

District	County	Subcounty	Drilling Depth	Bedrock Depth (n)	Yield (m <sup>3</sup> /h)	Static Water Level (m)	Conductivity (μS/cm)	TDS
Iganga	Buguweril	Buyanga	63.0	20.3	1.27	10.70	332.0	198.67
		Ibulanku	60.4	27.2	3.38	12.73	483.0	309.50
		Makuutu	56.8	24.3	1.46	13.79	284.6	166.40
		Namalemba	56.3	24.6	4.58	9.86	298.2	175.80
	Kigulu	Bulamagi	53.5	31.4	2.01	14.10	318.2	155.50
		Nabitende	66.5	29.6	3.27	18.22	—	—
		Nakalama	48.8	24.8	2.14	11.50	337.0	89.00
		Nakigo	52.5	30.8	2.20	11.97	405.1	243.29
		Nambale	56.6	26.9	4.79	15.48	195.0	97.50
		Namungalwe	54.0	30.0	2.81	11.39	253.3	126.30
		Nawandala	56.0	25.2	1.26	11.97	599.3	308.50
	Luuka	Bukanga	56.7	21.6	1.63	13.38	342.3	215.25
		Bukooma	69.5	20.1	1.74	23.04	288.7	266.57
		Bulongo	62.3	22.1	1.83	13.63	500.0	320.00
		Ikumbya	58.4	28.9	2.33	17.84	515.4	290.20
		Irongo	62.9	40.7	2.52	11.89	881.0	440.00
		Nawampiti	63.9	23.4	2.23	14.34	276.5	159.50
	Waibuga	58.3	33.3	1.04	13.11	273.3	183.67	
	Iganga Total		59.9	27.3	2.50	13.65	377.3	225.35
Pallisa	Pallisa	Agule	59.3	25.0	1.23	9.74	262.0	315.83
		Aponong	53.3	27.0	2.43	9.75	845.7	542.11
		Gogonyo	57.6	22.6	2.04	7.01	—	—
		Kameke	70.1	27.6	2.01	10.06	241.3	141.25
		Kamuge	49.3	22.7	1.38	9.72	248.0	215.00
		Kasodo	60.6	29.6	2.73	12.84	902.3	577.67
		Pallisa	52.1	29.2	1.41	11.69	599.0	383.00
		Puti-Puti	57.8	22.1	1.73	10.01	280.0	183.00
	Butebo	Butebo	60.4	25.8	1.23	8.78	372.6	196.55
		Kabwangasi	67.1	30.8	1.65	10.60	286.5	158.75
		Kakoro	57.9	25.5	3.44	8.60	337.0	215.53
		Kibale	64.5	24.8	1.50	8.03	306.2	204.17
		Petete	49.9	44.7	1.51	8.00	535.3	342.25
	Kibuku	Bulangira	53.9	28.1	1.14	7.70	217.3	139.33
		Buseta	53.7	27.1	1.77	10.88	1809.6	946.32
		Kadama	66.2	30.2	1.49	9.13	611.6	342.49
		Kagumu	59.7	20.6	1.34	10.71	—	—
		Kibuku	54.1	23.5	1.52	10.00	301.0	180.00
		Kirika	59.2	29.6	1.56	9.33	623.0	399.00
Tirinyi	66.1	38.8	3.50	6.46	842.0	538.75		
Pallisa Total		58.2	27.8	1.91	9.84	636.1	382.51	
Soroti	Soroti	Arapai	61.1	33.7	2.12	7.36	240.7	144.03
		Asuret	56.7	19.6	2.05	8.15	249.0	145.33
		Gweri	61.7	25.0	2.06	6.43	227.5	128.40
		Kamuda	67.7	37.2	2.44	10.13	430.2	257.42
		Katine	58.9	29.5	1.70	6.96	283.0	176.30
		Soriti	62.1	32.8	3.03	6.71	236.0	114.00
		Tubur	65.8	26.8	1.21	7.19	343.0	219.50
	KASILO	Bugondo	55.5	26.2	2.67	8.13	525.3	336.33
		Kadungulu	74.1	29.2	6.69	7.82	895.4	602.60
		Pingire	66.8	38.3	5.84	11.53	921.3	588.43
	SERERE	Atiira	63.6	18.2	1.77	7.22	130.0	83.20
		Kateta	58.6	35.0	3.95	11.31	522.8	398.40
		Kyere	61.2	21.0	3.67	8.56	480.4	301.97
		Serere/Olio	59.6	22.4	1.55	12.12	294.0	158.00
Soroti Total		62.6	26.8	2.51	8.61	476.4	304.69	

**Table 16-23 Result of Test borehole Drilling**

RGC Name	Bore-hole No.	UTM-E (m)	UTM-N (m)	Drilled depth (m)	Depth of aquifer and fissure water zones (m)	SWL (GL-m)	Safe yield (m <sup>3</sup> /h)	Dynamic water level (m)	Transmissivity (m <sup>3</sup> /h/m)	Storage Co-efficient	Total Residue Solid (mg/L)
Nabitende	JTB-1	555211	93570	71.00	Dry hole	-	-	-	-	-	-
	JTB-2	556605	94312	101.00	Dry hole	-	-	-	-	-	-
Ikumbya	JTB-3	536283	110016	78.00	39-45, 53-62, 64- 67	16.00	3.9	30.21	0.246	0.016	162
	JTB-4	536549	108910	83.00	40-49, 55-61, 64-72, 76-78	13.19	1.2	32.62	0.058	2.3x10 <sup>-4</sup>	241
Naigobya	JTB-5	540745	90151	65.00	Dry hole	-	-	-	-	-	-
	JTB-6	540671	90044	45.00	21.98-30.80, 33.74-39.62	6.80	3.65	19.21	0.842	3.4x10 <sup>-6</sup>	125
Lambala	JTB-7	525603	79395	65.00	30-36, 40-55, 59-62	7.13	0.32	20.55	-	-	703
	JTB-8	526207	78988	60.00	33-48, 51-57	3.60	1.2	17.60	0.075	4.5x10 <sup>-4</sup>	177
Kibale	JTB-9	587203	133792	80.00	36-45, 71-77	7.00	0.32	36.00	-	-	159
	JTB-10	587168	133833	60.00	Dry hole	-	-	-	-	-	-
Kameke	JTB-11	584511	139903	70.00	29-38, 44-50, 52-58, 61-67	3.45	7.2	23.16	0.194	0.28	237
	JTB-12	584571	139941	70.00	45-48, 50-59, 62-68	3.36	1.8	32.32	0.061	0.008	177
Kadama	JTB-13	599409	113709	87.00	52-58,61-64, 69-72,75-87	4.03	0.6	33.13	0.007	0.054	198
	JTB14	597907	114227	55.00	36-39, 42-54	1.93	0.6	9.98	0.042	0.004	312
Kabweri	JTB-15	598108	117233	55.00	35-41, 44-53	4.71	0.32	36.55	-	-	241
	JTB-16	599036	117098	55.00	23-31, 40-52	5.02	1.5	17.83	0.102	0.002	713
Kidetok	JTB-17	545498	162649	80.00	51-54, 57-65, 68-77	8.64	7.2	22.69	0.186	0.433	529
	JTB-18	546246	162351	80.00	39-42, 54-62, 65-78	13.20	13.2	32.12	0.508	0.406	383
	JTB-19	547671	165028	87.00	40-43, 46-52, 60-72, 75-84	12.42	1.8	37.26	0.025	0.051	180
Achuna	JTB-20	553725	220705	50.00	22-25, 27-33, 42-48	5.3	< 0.3	37.77			285

### 1) Well Yield Distribution

Well yield distributions in Iganga, Pallisa and Soroti district are shown in Figure 16-12, Figure 16-13 Figure 16-14, respectively.

In Iganga district, very low yield areas are in Waibuga subcounty, Bukanga subcounty, and the border area between Namung'alwe and Nakalama subcounty. The oldest geologies in this area, i.e. Nyanzian formation and Granitoid, are distributed in Makuutu sobcounty. This subcounty has also very low yield. Nambale subcounty and Ibulanku subcounty are relatively high yield.

Pallisa district has low yield in whole area, i.e. most of subcounties have below 2m<sup>3</sup>/h yield. Especially, Bulangira, Agula, and Butebo subcounty have very low yield. But Kakoro subcounty, Trinyi subcounty, and the area along Lake Kyoga or Mpologoma river are relatively high yield. Southern part of Soroti district, Kadungulu, Pingire, Kateta and Kyere subcounties, are high yield area. Geology of this area is metamorphic rock which originated sedimentary rock. This type of rocks, e.g. slate, phyllite, is relatively possible to keep much groudwater. But the northern part of Soroti district, Basement complex area, has low yield.

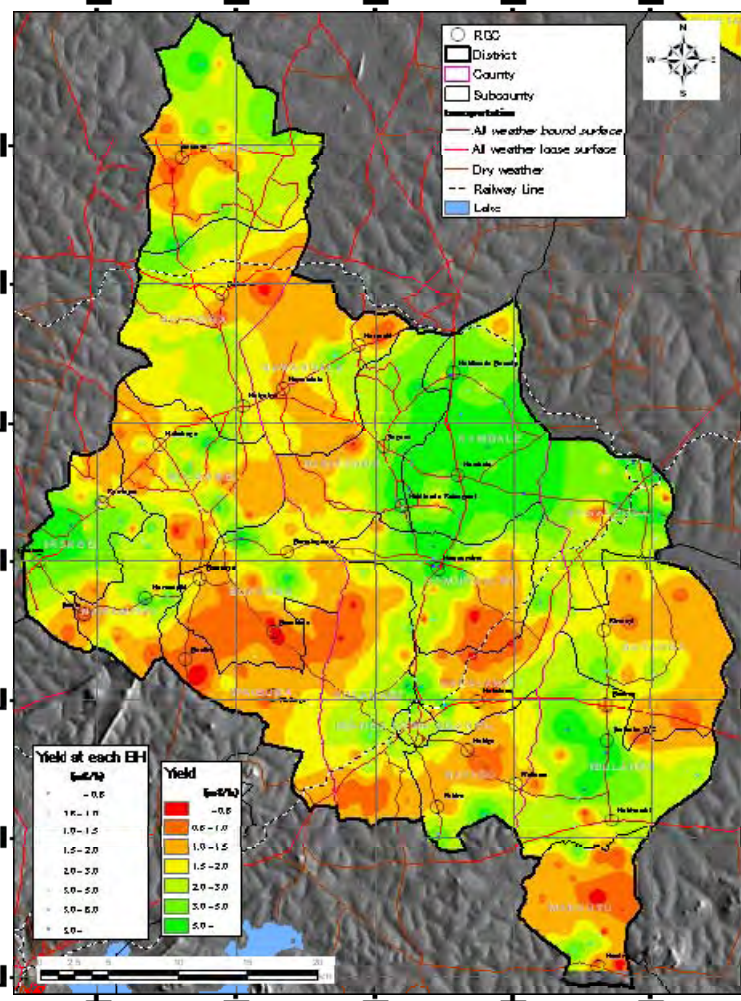


Figure 16-12 Groundwater Yield Distribution in Iganga District

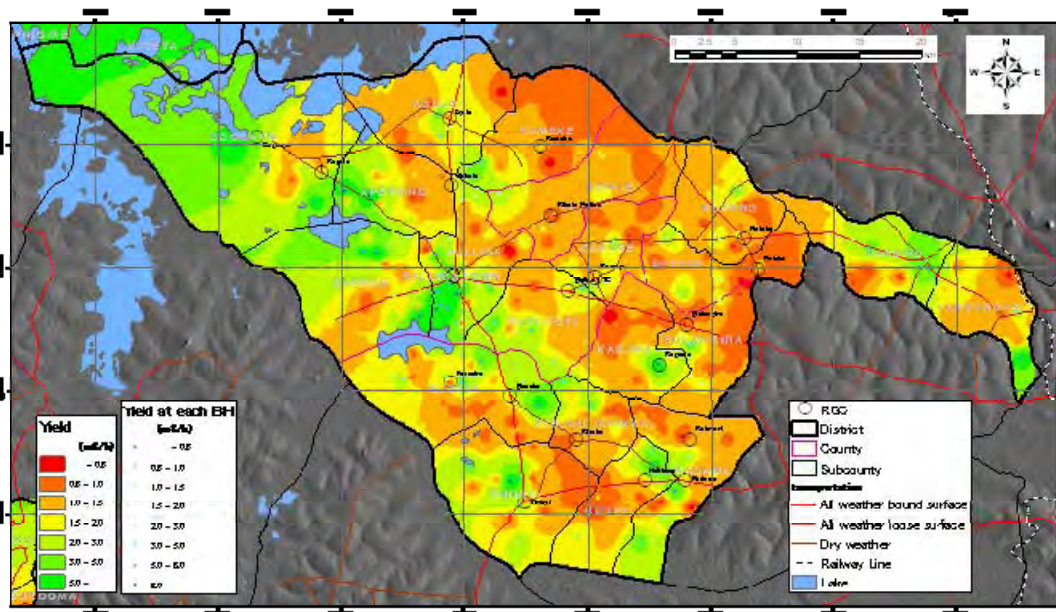


Figure 16-13 Groundwater Yield Distribution in Pallisa District



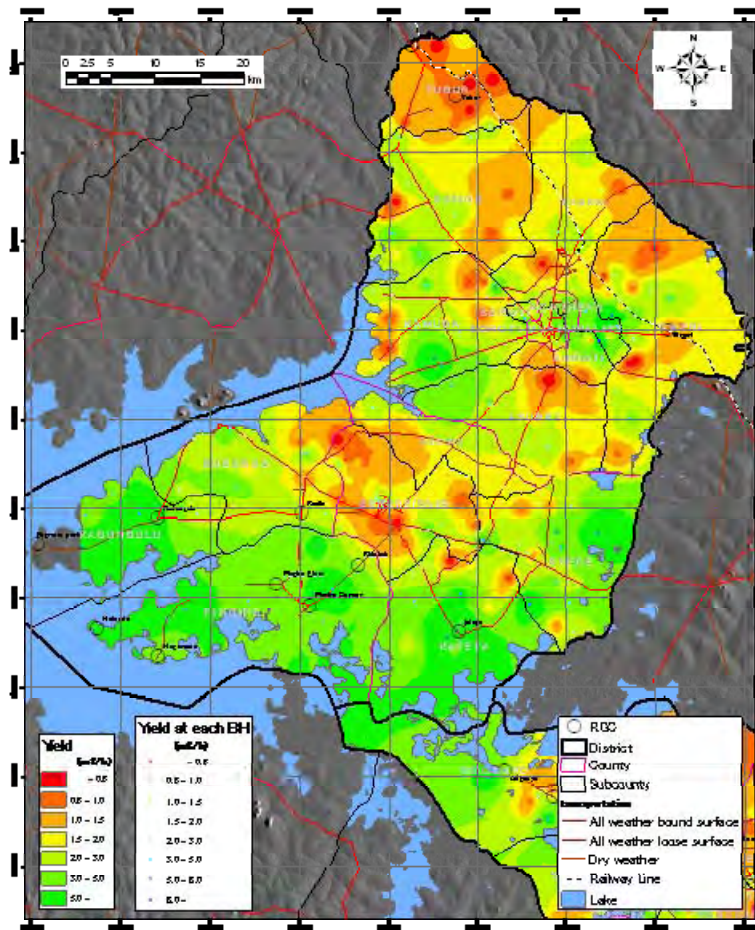


Figure 16-14 Groundwater Yield Distribution in Soroti District

## 2) Drilling Depth

Average of drilling depth in the existing wells is about 60m. Figure 16-15 shows the distribution of drilling depth of existing well. Along the Lake Kyoga in Soroti district, deeper wells are many. Shallower wells are many in the central part of Iganga district. In Pallisa district, deeper part and shallower part are shown like patchy pattern.

## 3) Bedrock Depth

Average of bedrock depth in the existing wells is 27m. Bedrock depth is shallower in whole Iganga district as shown in Figure 16-16. Central part of Soroti district and northern central part of Pallisa district has very shallow area.

## 4) Static Water Level

Static water level (SWL) also is shallower in whole priority district as shown in Figure 16-17. In Soroti district and Pallisa district, most of SWL in existing wells are shallower than 10m. Average of SWL in Iganga district is relatively deep, i.e. 13 m. There is deeper area in northern part of Iganga district. But, it is no problem for lifting by handpump.



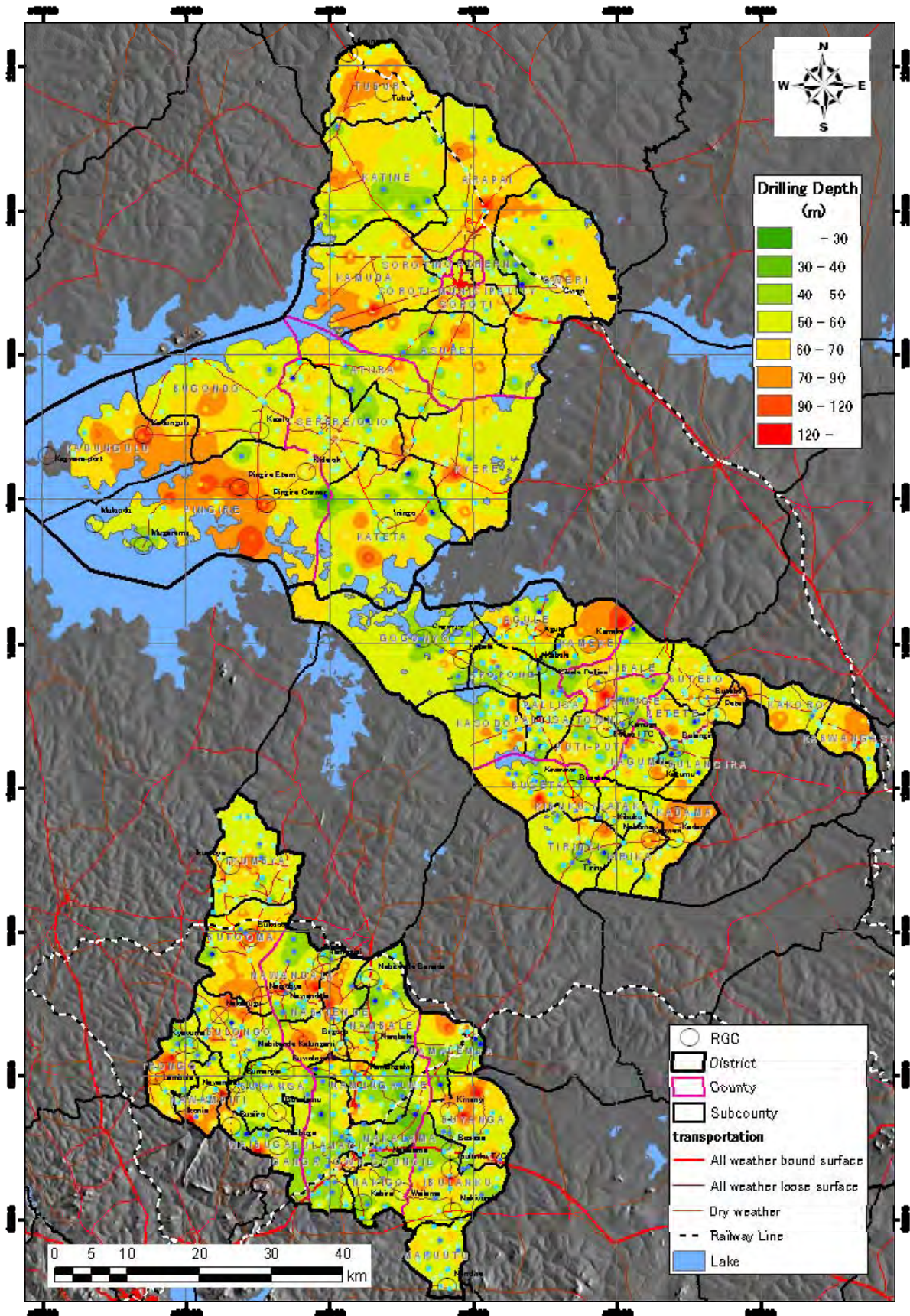


Figure 16-15 Drilling Depth Distribution in the Priority Districts



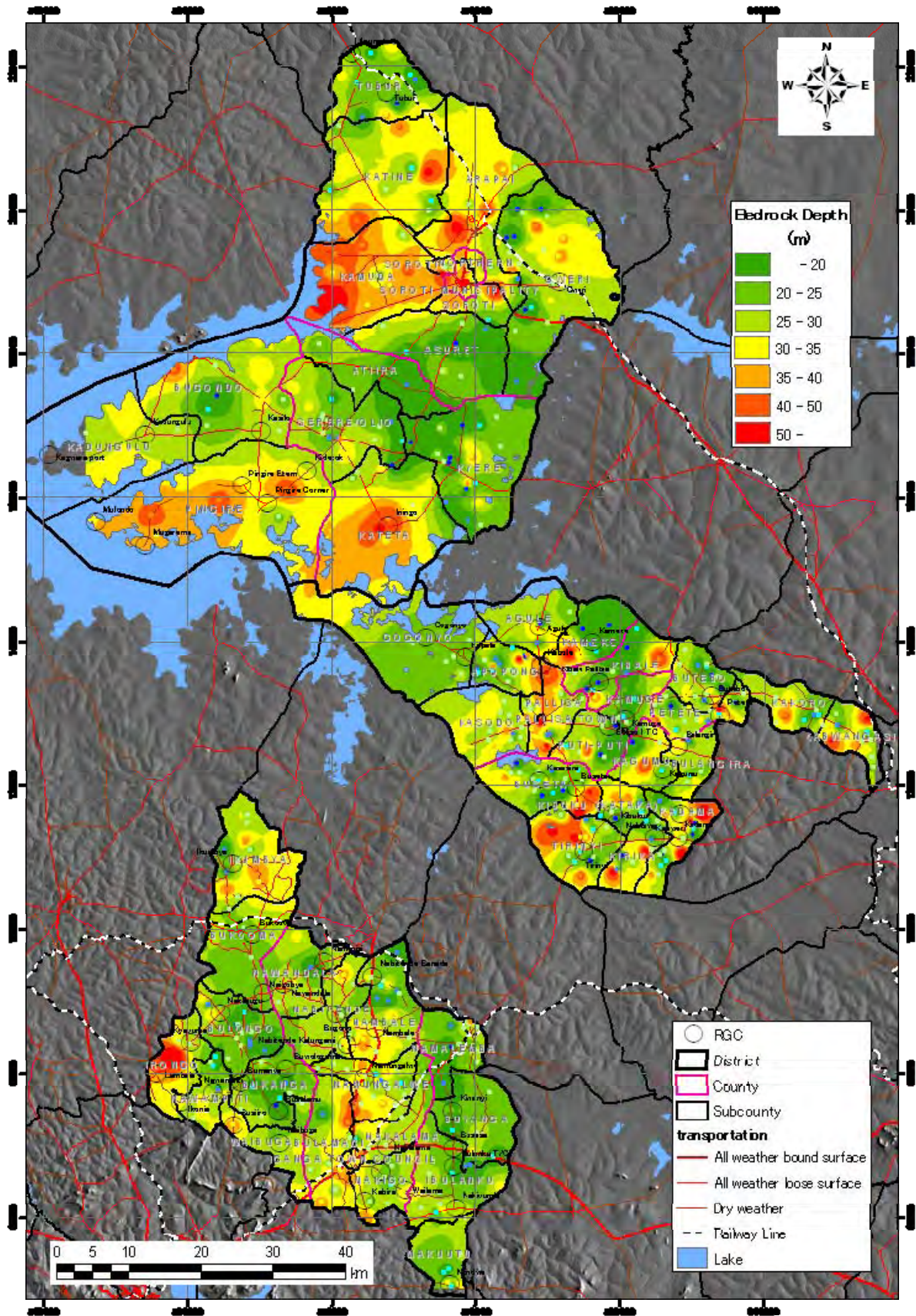


Figure 16-16 Distribution of Bedrock Depth in the Priority Districts



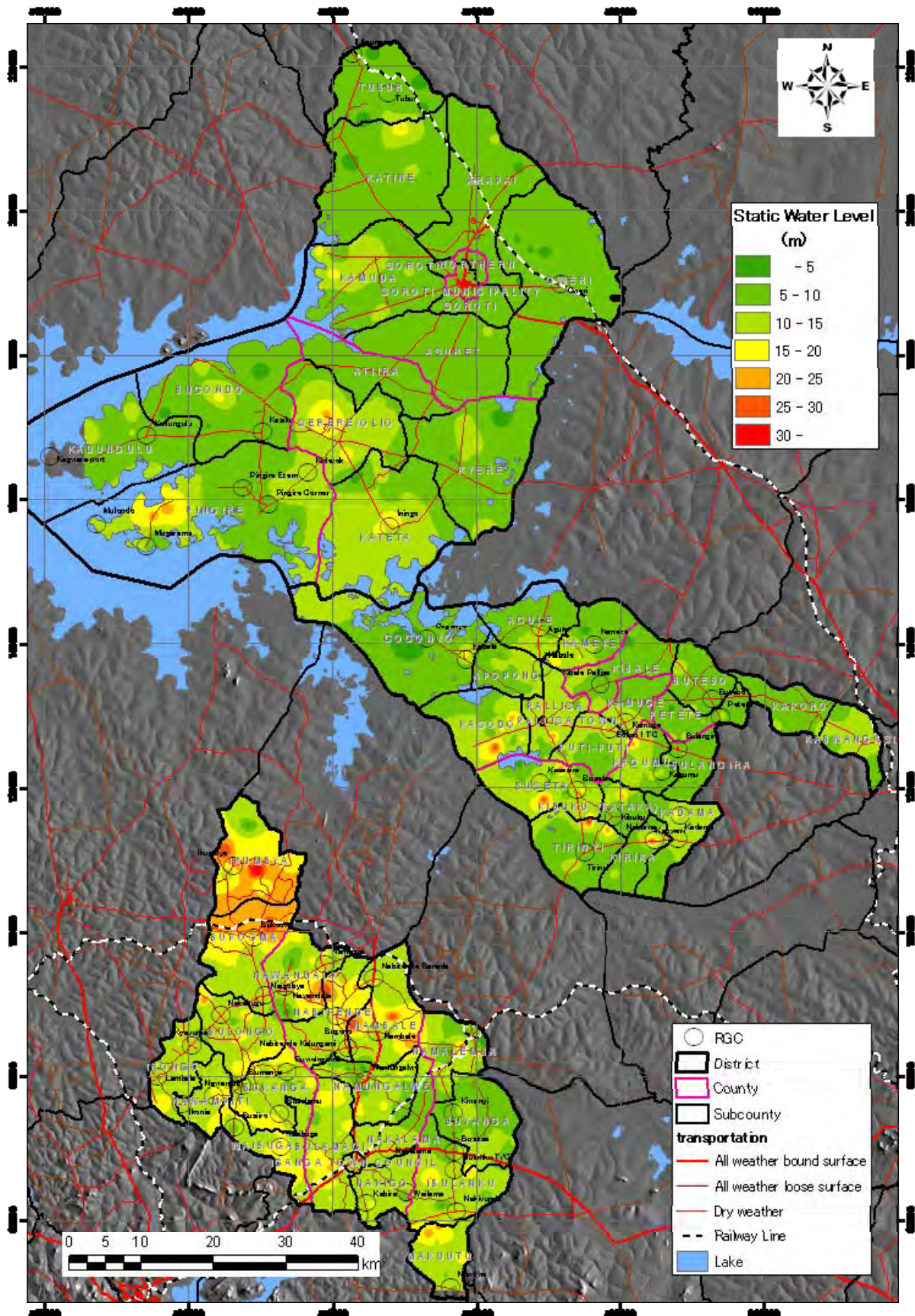


Figure 16-17 Distribution of Static Water Level in the Priority District



### 5) Water Quality

Wells which is exceeding drinking water quality standard are very few in the database. However, saline water wells are existing along the Lake Kyoga in Soroti district and along the Mpologoma river in Pallisa district. Figure 16-18 shows the distribution of Total Dissolved Solid value.

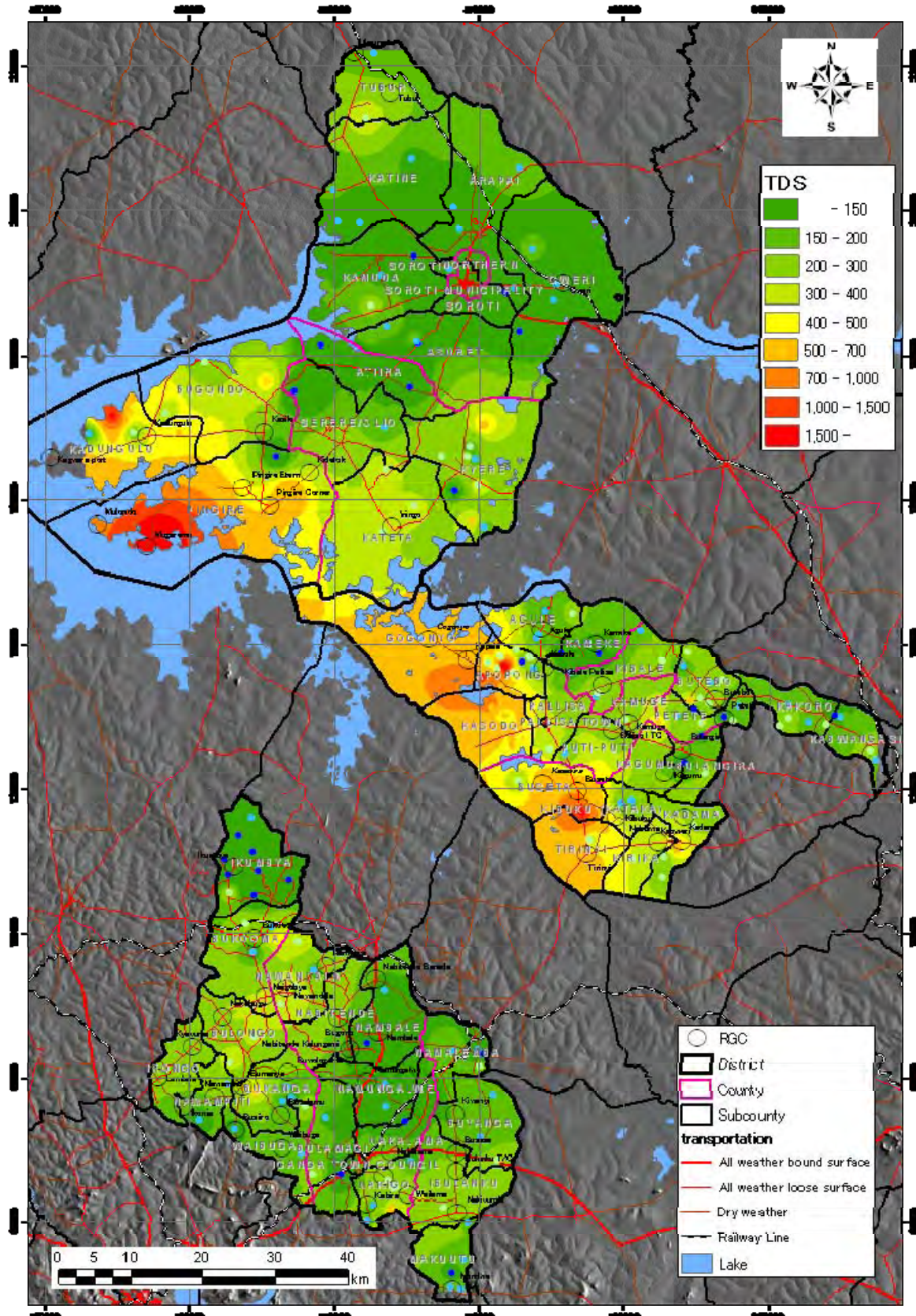


Figure 16-18 Distribution of Water Quality (TDS) in priority district

### Success Rate

Probability density functions against yield of each subcounty were obtained from the calculation of average value and the standard deviation of the groundwater yield from statistic data of the existing boreholes. Success rate of well is considered on the cumulated curve of the function.

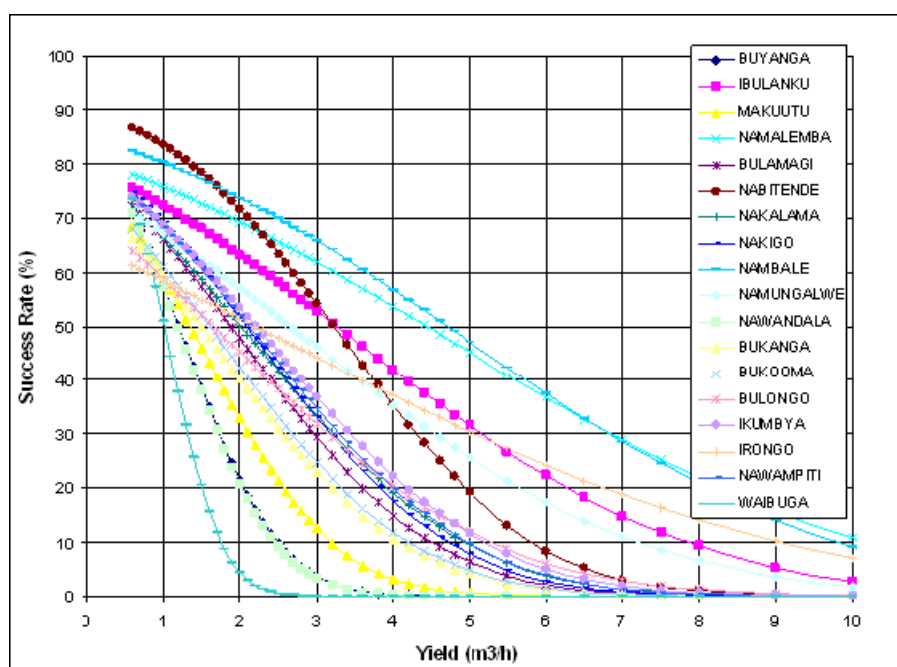
Success rate of the yield  $Y \text{ m}^3/\text{h}$  was calculated by the following equation.

$$\text{SuccessRate}(Y) = \frac{1}{\sqrt{2\pi}} \int_Y^{\infty} \exp\left(-\frac{(x - \bar{x})^2}{2\sigma^2}\right) dx$$

Where,  $\bar{x}$  is the average of the yield,  $\sigma$  is the standard deviation.

However, the data of unsuccess well in the database of existing well are not much. It seems that unsuccess wells are much more. Therefore, the success rate in this calculation is limited as maximum rate 90%.

Figure 16-19 shows the success rate which are calculated mentioned above.. Horizontal axis shows well yield ( $\text{m}^3/\text{h}$ ), and vertical axis shows the success rate. Table 16-24 shows the success rate for production well by subcounty in case of  $1 \text{ m}^3/\text{h}$  pumping rate is needed..



**Figure 16-19 Relationship between well yield and Success Rate by Subcounty**

Table 16-25 shows the planned hydrogeological parameters in this master plan. The values are assumed and calculated from the existing wells near the RGC.

Figure 16-20 shows the average well yield by subcounty. Additionally, the circles on the map are shown the position of RGC and the color indicates the planned well yield. Figure 16-21 shows the success rates by subcounty in case of  $1 \text{ m}^3/\text{h}$  yield for handpump. The circles on the map indicate the success rate of wells on the RGC.



**Table 16-24 Calculated Success Rate for Production Well by Subcounty in Case of 1.0m<sup>3</sup>/h Yield**

District	County	Subcounty	Average Yield (m <sup>3</sup> /h)	Max Yield (m <sup>3</sup> /h)	SD	Success Rate (%)
Iganga	Buguweril	Buyanga	1.27	4.00	0.93	57.7
		Ibulanku	3.38	9.25	3.28	72.5
		Makuutu	1.46	4.71	1.32	59.3
		Namalemba	4.58	14.00	4.20	75.9
	Kigulu	Bulamagi	2.01	8.10	1.86	66.1
		Nabitende	3.27	6.00	1.86	83.7
		Nakalama	2.14	6.51	2.08	66.5
		Nakigo	2.20	6.00	1.88	69.2
		Nambale	4.79	12.00	3.69	80.3
		Namungalwe	2.81	11.00	3.25	67.3
		Nawandala	1.26	4.14	0.91	57.5
	Luuka	Bukanga	1.63	8.17	1.85	59.3
		Bukooma	1.74	7.20	1.86	61.3
		Bulongo	1.83	13.62	2.59	58.9
		Ikumbya	2.33	8.00	2.13	68.9
		Irongo	2.52	18.23	4.96	58.6
		Nawampiti	2.23	7.50	2.04	68.3
Waibuga		1.04	2.00	0.54	51.0	
Pallisa	Pallisa	Agule	1.23	3.18	0.84	57.2
		Aponong	2.43	12.70	3.27	63.2
		Gogonyo	2.04	6.90	2.22	63.8
		Kameke	2.01	7.30	2.03	64.9
		Kamuge	1.38	3.50	0.94	61.4
		Kasodo	2.73	13.80	3.74	64.2
		Pallisa	1.41	4.15	1.10	60.1
		Puti-Puti	1.73	4.40	1.22	67.5
	Butebo	Butebo	1.23	4.00	0.85	56.7
		Kabwangasi	1.65	7.30	1.67	61.0
		Kakoro	3.44	10.00	2.85	76.1
		Kibale	1.50	4.30	0.98	64.6
		Petete	1.51	2.04	0.64	73.1
	Kibuku	Bulangira	1.14	4.08	0.84	53.3
		Buseta	1.77	6.75	1.52	64.7
		Kadama	1.49	6.00	1.34	59.9
		Kagumu	1.34	8.20	1.74	54.0
		Kibuku	1.52	5.08	1.24	61.7
		Kirika	1.56	6.60	1.67	59.1
Tirinyi		3.50	8.74	7.42	59.1	
Soroti	Soroti	Arapai	2.12	3.60	0.98	80.9
		Asuret	2.05	4.50	1.30	73.5
		Gweri	2.06	15.69	3.10	59.8
		Kamuda	2.44	9.00	2.21	69.8
		Katine	1.70	4.90	1.21	67.0
		Soriti	3.03	10.20	3.18	69.9
	KASILO	Tubur	1.21	2.77	0.80	56.5
		Bugondo	2.67	4.99	1.18	85.7
		Kadungulu	6.69	10.80	3.87	87.6
	SERERE	Pingire	5.84	10.55	2.53	92.7
		Atiira	1.77	2.66	0.64	81.5
		Kateta	3.95	12.24	3.91	73.3
		Kyere	3.67	11.00	2.88	77.9
Serere/Olio	1.55	14.00	2.28	56.0		

Table 16-25 Planned Well Specification by RGC

District	NO	RGC	Sub-county	掘削深度 (m)	岩盤深度 (m)	静水位 (m)	揚水量 (m <sup>3</sup> /h)	動水位 (m)	成功率 (%)	
Iganga	IG-01	Namungalwe	Namungalwe	54.0	33.0	10.0	8.00	32.6	25.0	
	IG-02	Nambale	Nambale	47.0	34.0	15.0	4.70	30.5	56.0	
	IG-03	Nabitende Banada	Nambale	57.0	21.0	18.2	7.20	37.2	42.0	
	IG-04	Nawandala	Nawandala	47.0	28.0	8.6	1.90	22.4	34.0	
	IG-05	Bugono	Nabitende	54.0	32.0	30.0	3.40	41.2	56.0	
	IG-06	Nakalama	Nakalama	61.0	24.0	18.2	3.90	31.1	30.0	
	IG-07	Bumanya	Bukanga	120.0	32.0	18.0	2.90	29.8	29.0	
	IG-08	Kiwanyi	Buyanga	36.0	15.0	4.0	2.00	12.1	31.0	
	IG-09	Nakivumbi	Ibulanku	69.0	15.0	12.2	2.30	28.9	63.0	
	IG-10	Busesa	Ibulanku	36.0	15.0	4.0	3.20	27.2	54.0	
	IG-11	Nondwe	Makuutu	62.0	16.0	8.5	2.80	28.9	21.0	
	IG-12	Ikumbya	Ikumbya	86.0	40.0	16.0	2.60	25.6	48.0	
	IG-13	Naigobya	Bukooma	66.0	30.0	15.0	4.80	30.8	35.0	
	IG-14	Bukoova	Bukooma	60.0	20.0	12.5	2.50	30.7	38.0	
	IG-15	Namusisi	Nawandala	61.0	12.0	15.0	3.20	26.8	20.0	
	IG-16	Nakabugu	Bulongo	41.0	5.0	11.6	3.80	24.1	29.0	
	IG-17	Kyavuma	Irongo	36.0	24.0	12.5	5.10	29.3	34.0	
	IG-18	Lambala	Irongo	120.0	75.0	20.0	6.20	36.4	31.0	
	IG-19	Nawampiti	Nawampiti	55.0	29.0	15.1	4.20	26.2	25.0	
	IG-20	Ikonja	Nawampiti	130.0	22.0	15.9	2.70	35.5	45.0	
	IG-21	Busiuro	Waibuga	45.0	15.0	12.9	2.20	28.8	20.0	
	IG-22	Nabitende Kalungami	Nabitende	87.0	31.0	11.6	3.50	37.0	56.0	
	IG-23	Busalamu	Bukanga	71.0	15.0	7.4	3.30	18.2	26.0	
	IG-24	Kabira	Nakigo	54.0	40.0	13.6	2.80	34.0	42.0	
	IG-25	Nakigo	Nakigo	61.0	24.0	18.2	4.10	31.8	26.0	
	IG-26	Wailama	Nakigo	67.0	36.0	6.5	1.30	16.0	69.0	
	IG-27	Ibulanku T/C	Ibulanku	51.0	17.0	12.0	5.20	29.2	37.0	
	IG-28	Buwologoma	Bukanga	71.0	15.0	7.4	3.70	19.6	22.0	
	IG-29	Waibuga	Waibuga	45.0	15.0	12.9	1.40	23.0	44.0	
Pallisa	PL-01	Kasasira	Buseta	52.0	20.0	11.6	4.50	32.4	20.0	
	PL-02	Kameke	Kameke	77.0	17.0	3.5	3.90	16.3	27.0	
	PL-03	KibalePallisa	Kibale	51.0	22.0	10.9	2.40	38.6	26.0	
	PL-04	Kagumu	Kagumu	120.0	18.0	10.4	2.40	18.3	31.0	
	PL-05	Kapala	Gogonyo	72.0	26.0	9.5	2.20	25.5	49.0	
	PL-06	Kamuge	Kamuge	66.0	8.0	10.6	2.20	17.9	28.0	
	PL-07	Buseta	Buseta	58.0	52.0	9.0	3.60	20.9	20.0	
	PL-11	Kabole	Pallisa	61.0	52.0	10.5	2.50	18.7	23.0	
	PL-12	Petete	Petete	33.0	30.0	7.2	2.50	25.4	20.0	
	PL-13	Butebo	Butebo	110.0	19.0	9.2	2.30	25.9	20.0	
	PL-14	Gogonyo	Gogonyo	67.0	21.0	0.3	3.80	12.8	29.0	
	PL-15	Kadama	Kadama	61.0	34.0	10.3	5.40	28.1	32.0	
	PL-16	Nabiswa	Kadama	78.0	18.0	11.0	3.50	22.5	25.0	
	PL-17	Bulangira	Bulangira	55.0	25.0	9.0	4.10	38.8	25.0	
	PL-20	Agule	Agule	62.0	35.0	6.7	3.30	17.6	28.0	
	PL-21	Kabweri	Kadama	78.0	18.0	11.0	2.60	19.6	26.0	
	PL-22	Boliso I TC	Puti-puti	66.0	8.0	10.6	1.60	15.9	59.0	
	Soroti	SO-01	Acuna	Tubur	66.0	32.0	6.5	2.60	25.4	8.0
		SO-02	Kidetok	Pingire	88.0	31.0	13.2	7.00	27.7	56.0
		SO-03	Pingire Etem	Pingire	66.0	42.0	7.2	2.90	13.2	86.0
		SO-04	Kadungulu	Kadungulu	58.0	25.0	10.1	5.70	21.9	67.0
		SO-05	Kagwara port	Kadungulu	58.0	25.0	5.2	7.00	19.6	60.0
SO-06		Mugarema	Pingire	55.0	39.0	5.7	4.70	23.3	74.0	
SO-07		Kasilo Corner	Bugondo	66.0	30.0	6.7	2.10	11.0	72.0	
SO-08		Pingire Corner	Pingire	58.0	24.0	5.1	2.80	10.9	86.0	
SO-09		Gweri	Gweri	62.0	37.0	5.6	3.10	19.9	40.0	
SO-10		Mulondo	Pingire	57.0	42.0	21.0	4.10	29.5	80.0	
SO-11		Iningo	Kateta	58.0	40.0	11.2	7.50	26.8	30.0	
SO-12		Tubur	Tubur	66.0	36.0	12.3	2.10	27.6	22.0	



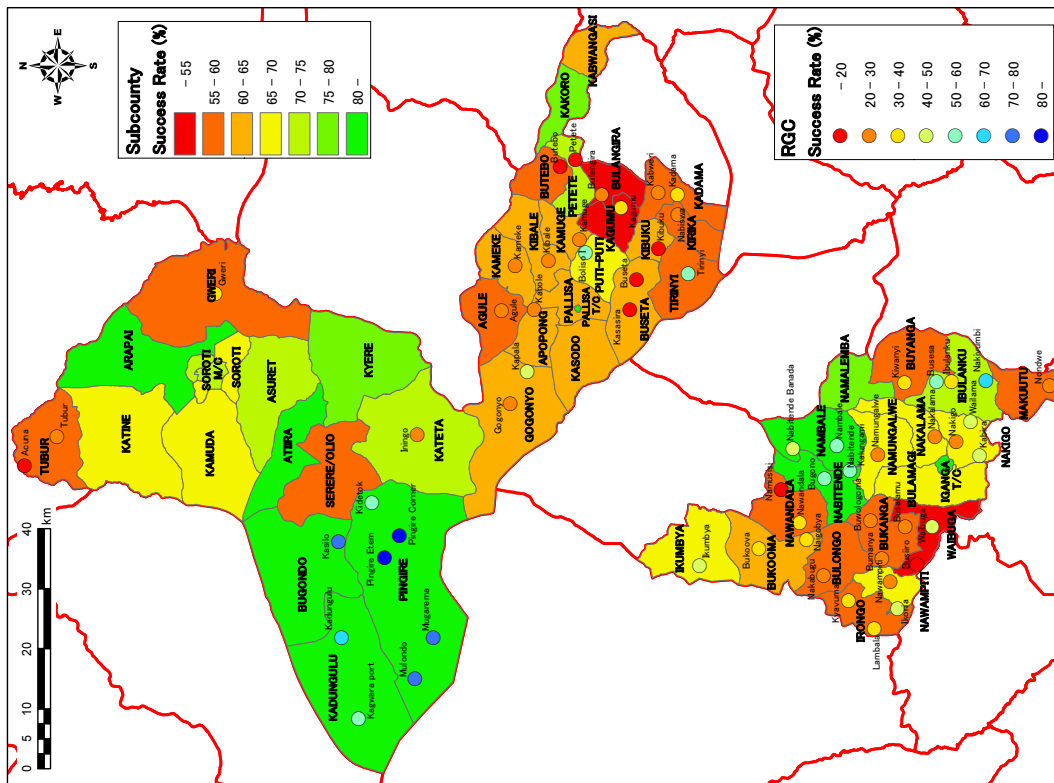


Figure 16-21 Success Rate of Wells by Subcounty in Case of 1.0 m<sup>3</sup>/h Yield and Success Rate of Wells by RGC in Case of Planned Yield

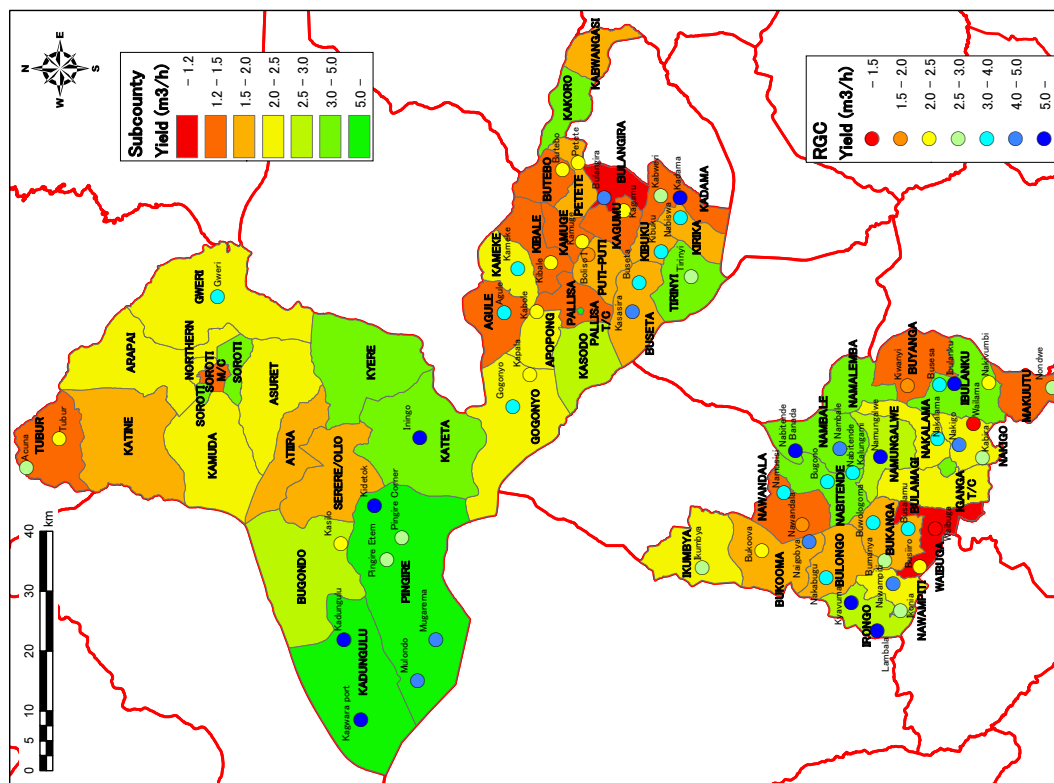


Figure 16-20 Average of Well Yield by Subcounty and Planned Yield by RGC

### 16.3.3 Groundwater Balance Between Groundwater Resource and Water Demand

Water balance was considered between groundwater resource amount and groundwater demand planned in this master plan in 2035. Annual groundwater recharge amount is used as sustainable water resource amount. Annual groundwater recharge by sub-basin in Chapter 2 was used as groundwater resource amount, and it was re-distributed by subcounty. Water demand was calculated from population frame. Table 16-26 shows the result. Used groundwater amount is only 1% out of groundwater amount. Then, even in 2035, the groundwater amount is enough, but there is one subcounty which is exceeded 10% of usable groundwater amount.

**Table 16-26 Comparison between Water Demand and Available Groundwater Amount**

District	County	Subcounty	Water Demand (m <sup>3</sup> /year)				Available Groundwater Amount (m <sup>3</sup> /year)	Ratio (2035/Amount)
			2010	2015	2020	2035		
Iganga	Buguweri	Buyanga	196,151	309,261	457,122	906,994	32,412,618	3%
		Iublanku	271,377	427,867	632,434	1,254,836	26,204,696	5%
		Makuutu	147,947	233,262	344,786	684,104	5,629,606	12%
		Namalemba	105,396	166,172	245,621	487,346	21,971,364	2%
	Kigulu	Bulamagi	246,883	389,248	575,352	1,141,577	31,128,992	4%
		Nabitende	167,386	263,909	390,087	773,986	17,192,295	5%
		Nakalama	183,016	288,553	426,513	846,260	13,092,056	6%
		Nakigo	125,482	197,842	292,432	580,226	12,133,556	5%
		Namabale	222,838	351,337	519,315	1,030,394	30,462,023	3%
		Namungalwe	199,364	314,327	464,611	921,852	21,334,257	4%
		Nawandala	162,647	256,438	379,043	752,074	25,278,008	3%
	Luuka	Bukanga	238,326	375,757	555,410	1,102,010	15,768,432	7%
		Bukooma	206,000	324,790	480,075	952,535	36,272,868	3%
		Bulongo	161,686	254,923	376,805	747,632	19,486,510	4%
		Ikumbya	162,960	256,931	379,772	753,519	38,422,628	2%
		Irongo	173,915	274,203	405,303	804,177	13,247,061	6%
		Nawampiti	130,648	205,986	304,470	604,110	12,380,014	5%
Waibuga	171,235	269,979	399,058	791,786	15,418,081	5%		
District Total (Rural)			3,273,256	5,160,783	7,628,208	15,135,420	387,835,065	4%
Pallisa	Pallisa	Agule	151,104	239,150	354,845	712,183	28213586.29	3%
		Apopong	129,155	204,413	303,302	608,735	20438052.47	3%
		Gogonyo	123,954	196,181	291,089	584,223	62789317.84	1%
		Kameke	147,452	241,511	346,268	694,970	26768643.77	3%
		Kamuge	104,225	164,955	244,756	491,232	9930668.096	5%
		Kasodo	150,643	238,421	353,762	710,010	29428512.93	2%
		Pallisa	75,606	119,661	177,549	356,346	18448417.38	2%
	Butebo	Puti-Puti	118,393	187,380	278,030	558,013	17554083.56	3%
		Butebo	134,284	212,530	315,346	632,908	16456391.05	4%
		Kabwangasi	105,823	167,485	248,510	498,765	14520109.8	3%
		Kakoro	98,202	155,423	230,613	462,846	15770546.1	3%
		Kibale	153,416	242,810	360,275	723,081	28370628.2	3%
	Kibuku	Petete	121,923	192,967	286,318	574,649	10383696.54	6%
		Bulangira	119,647	189,364	280,973	563,920	6919556.407	8%
		Buseta	174,795	276,647	410,481	823,846	31038588.39	3%
		Kadama	157,226	248,841	369,223	741,041	10383597.17	7%
		Kagumu	124,905	197,686	293,322	588,704	9753571.404	6%
		Kibuku	94,788	150,020	222,596	446,757	8339688.89	5%
		Kirika	103,396	163,644	242,811	487,328	11991203.19	4%
Tirinyi	148,842	235,571	349,533	701,522	20434225.91	3%		
District Total (Rural)			2,537,779	4,024,660	5,959,601	11,961,078	397,933,085.4	3%
Soroti	Soroti	Arapai	209,119	339,234	515,913	1,114,956	44,095,318	3%
		Asuret	204,270	331,368	503,949	1,089,101	33,949,110	3%
		Gweri	263,518	427,480	650,118	1,404,992	61,519,754	2%
		Kamuda	189,194	306,911	466,755	1,008,719	40,017,125	3%
		Katine	170,590	276,732	420,858	909,530	52,763,379	2%
		Soroti	96,629	156,752	238,391	515,195	8,253,777	6%



*The Development Study on Water Resources Development and Management for Lake Kyoga Basin  
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District	County	Subcounty	Water Demand (m <sup>3</sup> /year)				Available Groundwater Amount (m <sup>3</sup> /year)	Ratio (2035/Amount)
			2010	2015	2020	2035		
	Kasilo	Tubur	119,041	193,109	293,683	634,689	21,378,985	3%
		Bugondo	186,294	302,207	459,601	993,259	35,758,236	3%
		Kadungulu	141,470	229,493	349,017	754,271	37,563,291	2%
		Pingire	267,698	434,261	660,431	1,427,279	83,454,590	2%
	Serere	Atiira	112,325	182,214	277,114	598,880	18,138,328	3%
		Kateta	288,582	468,139	711,953	1,538,625	75,392,355	2%
		Kyere	257,157	417,161	634,425	1,371,077	48,261,572	3%
		Serere/Olio	174,760	283,497	431,147	931,765	34,756,698	3%
District Total (Rural)			2,680,648	4,348,557	6,613,356	14,292,336	595,302,516	2%

In this study, test borehole drilling were conducted. After completion of the borehole, groundwater monitoring were conducted every month in one year. The result is shown in Table 16-27 and Figure 16-22. Groundwater levels are stable in whole year., and there are no wells which the water level go down enormously. Water level were come up at JTB-18 and JTB-19 in rainy season.

**Table 16-27 Result of Groundwater Level Monitoring at Test Borehole**

No.	GC	Water Level (m bgl)											
		2010/2	3	4	5	6	7	8	9	10	11	12	2011/1
JTB-1	Nabitende	1.270	1.100	0.510	0.150	0.130	0.255	0.255	0.390	0.220	0.300	0.470	0.575
JTB-2	Nabitende	3.540	3.410	2.800	2.400	2.500	2.500	2.410	2.550	2.550	2.635	2.820	2.895
JTB-3	Ikumbya	15.910	15.870	15.895	15.615	15.320	15.170	15.065	14.935	14.910	14.895	14.905	14.905
JTB-4	Ikumbya	13.240	13.275	13.330	12.845	12.475	12.340	12.270	12.185	12.210	12.255	12.340	12.390
JTB-5	Naigobya	1.840	1.450	0.770	0.480	0.660	0.880	0.940	1.030	0.895	0.985	1.205	1.425
JTB-6	Naigobya	7.140	7.045	6.660	6.230	6.330	6.505	6.580	6.505	6.700	6.740	6.845	6.980
JTB-7	Lambaala	7.010	6.770	6.530	5.795	6.030	6.200	6.355	6.350	6.345	6.460	6.640	6.810
JTB-8	Lambaala	3.530	3.440	3.385	3.200	3.240	3.215	3.300	3.320	3.370	3.430	3.540	3.620
JTB-9	Kibale	7.200	7.140	6.230	6.405	6.730	6.620	6.480	6.785	6.850	6.960	7.065	7.140
JTB-10	Kibale	7.600	7.600	6.365	6.140	6.585	6.270	6.150	6.840	6.890	7.235	7.400	7.480
JTB-11	Kameke	3.060	2.550	1.970	2.000	2.270	2.050	1.785	1.885	2.090	2.280	2.430	2.530
JTB-12	Kameke	3.600	3.125	2.655	2.630	2.895	2.730	2.390	2.230	2.830	2.900	3.020	3.115
JTB-13	Kadama	3.220	2.840	2.610	2.230	1.910	1.775	1.790	1.810	1.770	1.810	1.880	1.930
JTB-14	Kadama	2.050	1.820	1.460	1.090	0.990	0.975	1.090	1.145	1.180	1.290	1.500	1.645
JTB-15	Kabweri	4.660	4.625	4.575	3.895	4.065	4.220	4.320	4.350	4.350	4.410	4.460	4.495
JTB-16	Kabweri	5.100	5.110	5.030	4.905	3.520	3.790	4.035	4.180	4.220	4.400	4.540	4.700
JTB-17	Kidetok	8.880	8.660	7.755	6.480	7.245	7.520	7.800	7.455	7.475	7.685	7.990	8.265
JTB-18	Kidetok	13.420	13.590	13.020	10.235	10.730	11.615	11.910	11.580	11.720	11.510	11.935	12.325
JTB-19	Kidetok	12.695	13.110	11.800	7.860	7.115	10.565	9.250	8.940	8.375	9.220	10.945	12.000
JTB-20	Acuna	5.710	4.980	4.875	3.565	3.820	4.250	4.270	3.610	3.400	4.325	3.750	3.910

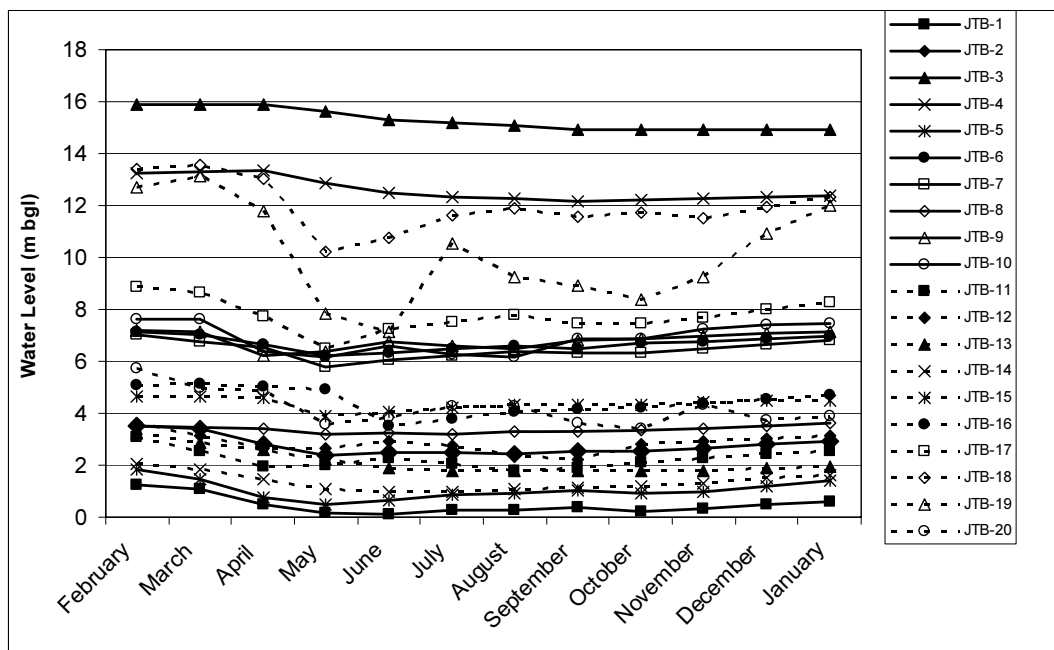


Figure 16-22 Result of Groundwater Level Monitoring at Test Borehole

## 16.4 Rural Water Supply Master Plan

### 16.4.1 Present Situation of Rural Water Supply

#### (1) Administrative Units and Study Area

The Iganga, the Pallisa and the Soroti districts were selected as the priority districts for rural water supply master plan as discussed in Section 7.1, but the these selected districts were split up at the beginning of July 2010 as shown in Figure 7-7. The rural water supply master plan is to be prepared for the rural areas of sub-counties situated in the former district areas of the selected priority districts, but the new administrative boundaries and units are not considered.

#### (2) Rural Water Supply

##### 1) Water Source

The source of rural water supply in the priority districts is mainly groundwater, and deep and shallow wells with hand pump unit are applied in the most of the village areas. In some areas

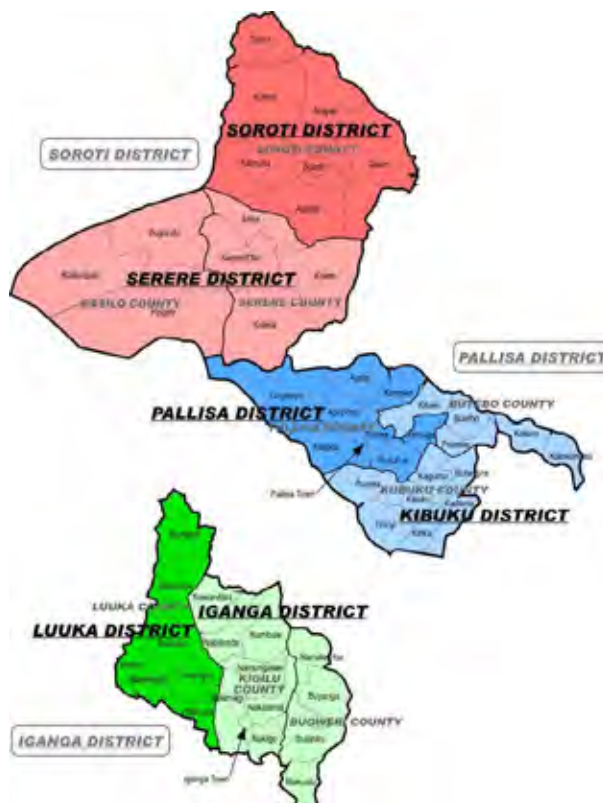


Figure 16-21 Former and Present Administrative Units

water supply systems are connected to the transmissions of NWSC, and such systems are managed and maintained by NWSC though those areas are categorized in the rural areas. Such areas are excluded from

the areas for this master plan study.

As shown in Table 16-28, there are 1,324, 927 and 1,143 point water sources such as deep and shallow wells and protected springs in the rural areas of the Iganga, the Pallisa and the Soroti districts, respectively according to the WATSUP data. The following Table presents the ratio of water sources in each priority district.

**Table 16-28 Ratio of Water Sources in Priority Districts**

(Unit: %)				
District	Deep Groundwater	Spring Water	Shallow Groundwater	Rain Water
Iganga	62.0	11.2	26.7	0.1
Pallisa	70.6	18.6	10.7	0.1
Soroti	67.8	6.4	25.6	0.1

Dependence of water source on the groundwater in these districts such as deep and shallow wells and springs is considered to be as high as 99 % as shown in the above table.

## 2) Population and Water Demand

The population of rural areas of each sub-county is tabulated below based on the population setting presented in SIP.

**Table 16-29 Present Population of Rural Areas in Priority Districts (2010)**

1. Iganga District		2. Pallisa District		3. Soroti District	
Sub-county	Population	Sub-county	Population	Sub-county	Population
Ikumbya	29,764	Gogonyo	22,640	Tuburu	21,743
Bukooma	37,626	Agule	27,599	Katine	26,658
Bulongo	29,532	Kameke	26,932	Arapai	38,195
Irongo	31,765	Apopong	23,590	Kamuda	34,556
Nawampiti	23,863	Kasodo	27,515	Soroti	17,649
Bukanga	43,530	Pallisa	13,809	Gweri	48,131
Waibuga	31,276	Putiputi	21,624	Asuret	37,310
Nawandala	29,707	Kamuge	19,036	Atiira	20,516
Nambale	40,701	Kibale	28,021	Olio	31,920
Nabitende	30,573	Butebo	24,527	Kyere	46,969
Namungalwe	36,414	Kakoro	17,936	Kateta	52,709
Nakalama	33,428	Kabuwangasi	19,328	Bugondo	34,026
Bulamagi	45,093	Petete	22,269	Kadungulu	25,839
Nakigo	22,919	Buseta	31,926	Pingire	48,895
Namalemba	19,250	Kibuku	14,911	Whole District	485,116
Buyanga	35,827	Tirinyi	16,786		
Ibulanku	49,567	Kirika	18,885		
Makuutu	27,022	Kadama	28,717		
Whole District	597,855	Kagumu	22,814		
		Bulangira	21,853		
		Whole District	450,719		

The present population to be covered by rural water supply are calculated to be 597,855, 450,719 and 485,116 for the whole district of the Iganga, the Pallisa and the Soroti districts, respectively. The present water demands are calculated as shown in Table 7-8 for each sub-county considering the present water consumption of 15 liter/day/capita applied in the estimates in SIP, and the annual water demands of the whole districts are 3.27 MCM, 2.47 MCM and 2.66 MCM for the Iganga, the Pallisa



and the Soroti districts, respectively.

**Table 16-30 Present Water Demand of Rural Areas in Priority Districts (2010)**

(Unit: MCM)

1. Iganga District		2. Pallisa District		3. Soroti District	
Sub-county	Population	Sub-county	Population	Sub-county	Population
Ikumbya	0.16	Gogonyo	0.12	Tuburu	0.12
Bukooma	0.21	Agule	0.15	Katine	0.15
Bulongo	0.16	Kameke	0.15	Arapai	0.21
Irongo	0.17	Apopong	0.13	Kamuda	0.19
Nawampiti	0.13	Kasodo	0.15	Soroti	0.10
Bukanga	0.24	Pallisa	0.08	Gweri	0.26
Waibuga	0.17	Putiputi	0.12	Asuret	0.20
Nawandala	0.16	Kamuge	0.10	Atiira	0.11
Nambale	0.22	Kibale	0.15	Olio	0.17
Nabitende	0.17	Butebo	0.13	Kyere	0.26
Namungalwe	0.20	Kakoro	0.10	Kateta	0.29
Nakalama	0.18	Kabuwangasi	0.11	Bugondo	0.19
Bulamagi	0.25	Petete	0.12	Kadungulu	0.14
Nakigo	0.13	Buseta	0.17	Pingire	0.27
Namalembe	0.11	Kibuku	0.08	Whole District	2.66
Buyanga	0.20	Tirinyi	0.09		
Ibulanku	0.27	Kirika	0.10		
Makuutu	0.15	Kadama	0.16		
Whole District	3.27	Kagumu	0.12		
		Bulangira	0.12		
		Whole District	2.47		

### 3) RGC and Other Rural Areas

#### a) RGCs

As shown in Table 16-31, there are 61 RGCs identified in the priority districts; 29, 17 and 15 numbers in the Iganga, the Pallisa and the Soroti districts, respectively, excluding the two(2) RGCs of which water supply facilities are provided and managed by NWSC; Trinyi and Kibuku. Out of these RGCs, four (4) RGCs in the Soroti district (Ocapa, Kyere, Kamod and Kadungulu) will have existing piped water supply systems as stated below, and then the remaining 57 RGCs considered to require water supply facilities.

- Ocapa: The Ocapa water supply scheme was constructed in 2010 and its private operator is under selection. The Ocapa RGC extends over three (3) sub-counties; Olio, Kyere and Kateta sub-counties covering the total population of about 4,500. Its water source is groundwater and there are two (2) boreholes constructed.
- Kyere: The Kyere water supply scheme is under construction of which completion is scheduled for 2010. Water source is groundwater and two (2) boreholes were drilled. A private operator is planned to be hired for the operation and maintenance of the piped water supply facilities. The Kyere RGC is located in the Kyere sub-county and its population is about 4,000.
- Kamod: The Kamod water supply scheme is under construction and will be completed in 2011. The Kamod RGC is located in the Bugondo sub-county and its population is about 3,000. Water source is groundwater and two (2) boreholes have been drilled. A private operator is planned to be hired for operation and maintenance of the facilities.
- Kadungulu: A point water source operated by solar power system was provided by NGO

utilizing the existing borehole. The Kadungulu RGC is located in the Kadungulu sub-county.

**Table 16-31 List RGCs for Master Planning**

1. Iganga District				2. Pallisa District		3. Soroti District	
No.	RGC	No.	RGC	No.	RGC	No.	RGC
1	Namungalwe	18	Lambala	1	Kasasira	1	Acuna
2	Nambale	19	Nawampiti	2	Kameke	2	Kidetok
3	Nabitende B.	20	Ikonia	3	Kagumu	3	Pingire Etem
4	Nawandala	21	Busiuro	4	Kapala	4	Kadungulu*
5	Bugono	22	Nabitende K.	5	Kamuge	5	Kagwara Port
6	Nakalama	23	Busalamu	6	Buseta	6	Mugarema
7	Bumanya	24	Kabira	7	Kabole	7	Kasilo Corner
8	Kiwanyi	25	Nakigo	8	Petete	8	Pingire Corner
9	Nakivumbi	26	Wailama	9	Butebo	9	Gweri
10	Busesa	27	Ibulanku TC	10	Gogonyo	10	Mulondo
11	Nondwe	28	Buwologoma	11	Kadama	11	Iningo
12	Ikumbya	29	Waibuga	12	Nabiswa	12	Ocapa*
13	Naigobya			13	Bulangira	13	Kyere*
14	Bukoova			14	Kibuku	14	Kamod*
15	Namusisi			15	Agule	15	Tubur
16	Nakabugu			16	Kabweri		
17	Kyanvuma			17	Boliso I TC		

Note: The RGCs with "\*" are those having the existing schemes, and then only the future extension of the schemes is considered in the master plan.

There are protected springs and deep and shallow boreholes with hand pump scattered in the rural areas of the priority districts, but in the RGC areas the population is increasing rapidly due to population inflow from the surrounding rural areas, worsening water supply situations in RGCs. The coverage of RGCs in the priority districts calculated based on the data collected through the WATSUP survey and RGC survey are presented in Figure 16-22, and the coverage of the whole RGCs in the priority districts are 27.1 %, 36.5 % and 60.1 % for the Iganga, the Pallisa and the Soroti districts, respectively. The coverage of the Soroti district is rather higher than the others because the coverage of the RGCs for which water supply systems are either on going or has determined to implement the construction are set at 100 %, but those for the other RGCs in the Soroti district is considered on almost same level as the Iganga and the Pallisa districts. The facilities available in each RGC and the coverage are tablated in Table 16-32.

#### **b) Rural Areas Other than RGCs**

The coverage of the rural areas other than the RGC areas are 69.1 %, 58.7 % and 71.2 % for the Iganga, the Pallisa and the Soroti districts as presented in Figure 16-23, and the coverage of RGCs are found to be quite lower comparing with these values. The sub-county-wise coverage vary widely from 38.1 % of Apopong sub-county of the Pallisa district to 100 % of the Tubur and the Soroti sub-counties of the Soroti district. However, the coverage of such areas that the population densities are so low as Tubur sub-county may not reflect the actual situations, and they may face the difficulties in fetching water due to long access distances, etc. Since it is difficult to grasp such situations from the processed data, these matters are not considered in master planning. The facilities available in rural areas other than RGCs and the coverage are tablated in Table 16-33.

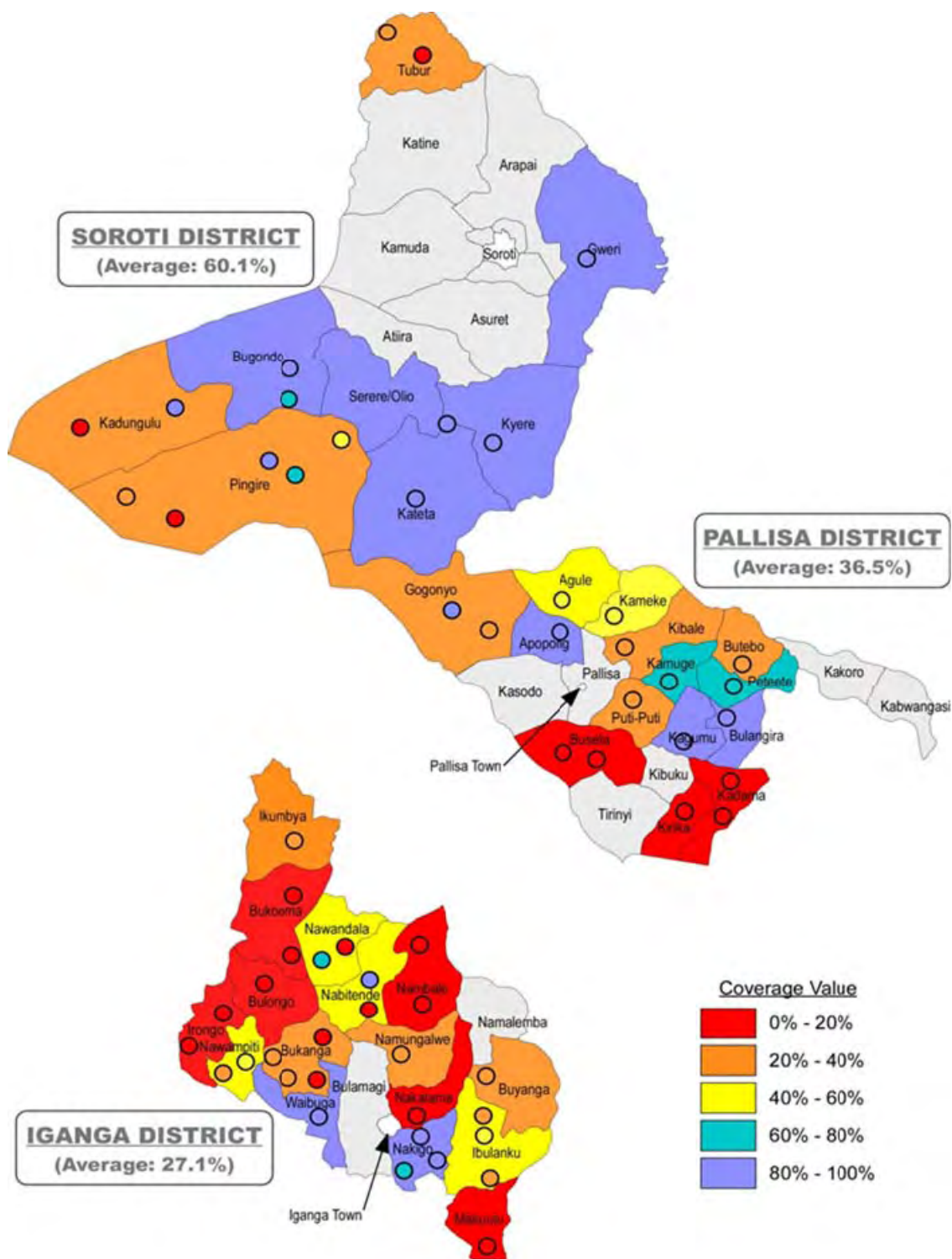


Figure 16-22 Coverage of RGCs in Priority Districts



Table 16-32 Present Situation of Water Supply in RGCs

Sub-county	RGC	No. of Facilities			Served Population				Population	Coverage (%)
		Deep Borehole	Shallow Well	Protected Spring	Deep Borehole	Shallow Well	Protect- ed Spring	Total		
<b>1. Iganga District</b>										
Ikumbya	Ikumbya	1	0	0	300	0	0	300	1,275	23.5
Bukooma	Bukooma	1	0	0	300	0	0	300	2,142	14.0
	Naigobya	1	0	0	300	0	0	300	1,642	18.3
	Sub-total	2	0	0	600	0	0	600	3,784	15.9
Bulongo	Nakabugu	1	1	0	300	300	0	600	4,916	12.2
Irongo	Kyanvuma	0	1	0	0	300	0	300	1,734	17.3
	Lambala	0	0	0	0	0	0	0	2,127	0.0
	Sub-total	0	1	0	0	300	0	300	3,861	7.8
Nawampiti	Ikonja	1	1	2	300	300	400	1,000	1,811	55.2
	Nawampiti	2	0	1	600	0	200	800	2,101	38.1
	Sub-total	3	1	3	900	300	600	1,800	3,912	46.0
Bukanga	Buwologoma	0	1	0	0	300	0	300	1,913	15.7
	Bumanya	1	0	2	300	0	400	700	1,928	36.3
	Busiuro	2	0	0	600	0	0	600	1,887	31.8
	Busalamu	1	0	0	300	0	0	300	1,668	18.0
	Sub-total	4	1	2	1,200	300	400	1,900	7,395	25.7
Waibuga	Waibuga	1	2	0	300	600	0	900	474	100.0
Nawandala	Namusisi	1	0	0	300	0	0	300	1,658	18.1
	Nawandala	3	0	0	900	0	0	900	1,295	69.5
	Sub-total	4	0	0	1,200	0	0	1,200	2,953	40.6
Nambale	Nambale	1	0	0	300	0	0	300	4,835	6.2
	Nabitende Banada	1	7	0	300	2,100	0	2,400	14,765	16.3
	Sub-total	2	7	0	600	2,100	0	2,700	19,599	13.8
Nabitende	Bugono	6	0	0	1,800	0	0	1,800	1,158	100.0
	Nabitende Kalungami	1	0	0	300	0	0	300	2,387	12.6
	Sub-total	7	0	0	2,100	0	0	2,100	3,545	59.2
Namalemba	nil	0	0	0	0	0	0	0	-	
Namungalwe	Namungalwe	3	5	2	900	1,500	400	2,800	12,240	22.9
Buyanga	Kiwanyi	3	0	0	900	0	0	900	2,565	35.1
Nakalama	Nakalama	2	0	2	600	0	400	1,000	5,840	17.1
Bulamagi	nil	0	0	0	0	0	0	0	0	
Nakigo	Nakigo	5	1	0	1,500	300	0	1,800	2,040	88.2
	Kabira	1	2	0	300	600	0	900	1,397	64.4
	Wailama	0	2	0	0	600	0	600	443	100.0
	Sub-total	6	5	0	1,800	1,500	0	3,300	3,880	85.0
Ibulanku	Busesa	4	1	0	1,200	300	0	1,500	4,080	36.8
	Ibulanku T/C	3	2	0	900	600	0	1,500	2,616	57.3
	Nakivumbi	0	2	1	0	600	200	800	2,326	34.4
	Sub-total	7	5	1	2,100	1,500	200	3,800	9,022	42.1
Makuutu	Nondwe	1	0	0	300	0	0	300	3,606	8.3
<b>Whole District</b>		<b>47</b>	<b>28</b>	<b>10</b>	<b>14,100</b>	<b>8,400</b>	<b>2,000</b>	<b>24,074</b>	<b>88,867</b>	<b>27.1</b>
<b>2. Pallisa District</b>										
Gogonyo	Gogonyo	1	0	0	300	0	0	300	317	94.6
	Kapala	2	0	0	600	0	0	600	2,168	27.7
	Sub-total	3	0	0	900	0	0	900	2,486	36.2
Agule	Agule	4	0	1	1,200	0	200	1,400	2,517	55.6
Kameke	Kameke	3	1	0	900	300	0	1,200	2,600	46.2
Kibale	Kibale Pallisa	3	0	0	900	0	0	900	2,387	37.7
Butebo	Butebo	1	0	0	300	0	0	300	1,144	26.2
Kakoro	nil	0	0	0	0	0	0	0	0	
Kabwangashi	nil	0	0	0	0	0	0	0	0	
Apopong	Kabole	3	0	1	900	0	200	1,100	1,248	88.1
Kasodo	nil	0	0	0	0	0	0	0	0	
Pallisa	nil	0	0	0	0	0	0	0	0	
Puti-Puti	Boliso ITC	1	0	0	300	0	0	300	1,056	28.4
Kamuge	Kamuge	5	0	0	1,500	0	0	1,500	2,210	67.9
Petete	Petete	9	0	1	2,700	0	200	2,900	3,744	77.5
Buseta	Kasassira	2	0	0	600	0	0	600	5,616	10.7
	Buseta	1	0	0	300	0	0	300	2,392	12.5
	Sub-total	3	0	0	900	0	0	900	8,008	11.2
Kibuku	nil	0	0	0	0	0	0	0	0	
Tirinyi	nil	0	0	0	0	0	0	0	0	

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Sub-county	RGC	No. of Facilities			Served Population				Population	Coverage (%)
		Deep Borehole	Shallow Well	Protected Spring	Deep Borehole	Shallow Well	Protect- ed Spring	Total		
Kirika	Nabisuwa	1	0	0	300	0	0	300	1,747	17.2
Kadama	Kabweri	0	0	0	0	0	0	0	1,316	0.0
	Kadama	3	0	0	900	0	0	900	10,858	8.3
	Sub-total	3	0	0	900	0	0	900	12,173	7.4
Kagumu	Kigumu	6	0	1	1,800	0	200	2,000	2,345	85.3
Bulangira	Bulangira	5	1	2	1,500	300	400	2,200	2,080	100.0
Whole District		50	2	6	15,000	600	1,200	16,680	45,744	36.5
<b>3. Soroti District</b>										
Tubur	Acuna	0	2	0	0	600	0	600	1,700	35.3
	Tubur	1	0	0	300	0	0	300	2,000	15.0
	Sub-total	1	2	0	300	600	0	900	3,700	24.3
Katine	nil	0	0	0	0	0	0	0	0	-
Arapai	nil	0	0	0	0	0	0	0	0	-
Kamuda	nil	0	0	0	0	0	0	0	0	-
Soroti	nil	0	0	0	0	0	0	0	0	-
Gweri	Gweri	5	0	1	1,500	0	200	1,700	1,820	93.4
Asuret	nil	0	0	0	0	0	0	0	0	-
Atiira	nil	0	0	0	0	0	0	0	0	-
Olio	Ocapa	Piped Water Supply System						500	500	100.0
Kyere	Kyere	Piped Water Supply System						4,000	4,000	100.0
	Ocapa	Piped Water Supply System						2,000	2,000	100.0
	Sub-total	0	0	0	0	0	0	6,000	6,000	100.0
Kateta	Iningo	3	0	0	900	0	0	900	1,118	80.5
	Ocapa	Piped Water Supply System						2,000	2,000	100.0
	Sub-total	3	0	0	900	0	0	2,900	3,118	93.0
Bugondo	Kasilo	1	0	0	300	0	0	300	156	100.0
	Kamod	Piped Water Supply System						3,000	3,000	100.0
	Sub-total	1	0	0	300	0	0	3,300	3,156	100.0
Kadungulu	Kadungulu	Piped Water Supply System						1,388	1,388	100.0
	Kagwara	Piped Water Supply System						300	3,120	9.6
	Port	1	0	0	300	0	0	300	3,120	9.6
Pingire	Sub-total	1	0	0	300	0	0	1,688	4,508	37.5
	Kidetok	2	0	0	600	0	0	600	1,040	57.7
	Pingire Etem	1	0	0	300	0	0	300	1,300	23.1
	Pingire	Piped Water Supply System						900	837	100.0
	Corner	2	1	0	600	300	0	900	837	100.0
	Mulondo	1	1	0	300	300	0	600	1,820	33.0
	Mugarema	0	0	0	0	0	0	0	4,212	0.0
Sub-total	6	2	0	1,800	600	0	2,400	9,209	26.1	
Whole District		20	4	1	6,000	1,200	200	19,244	32,012	66.3

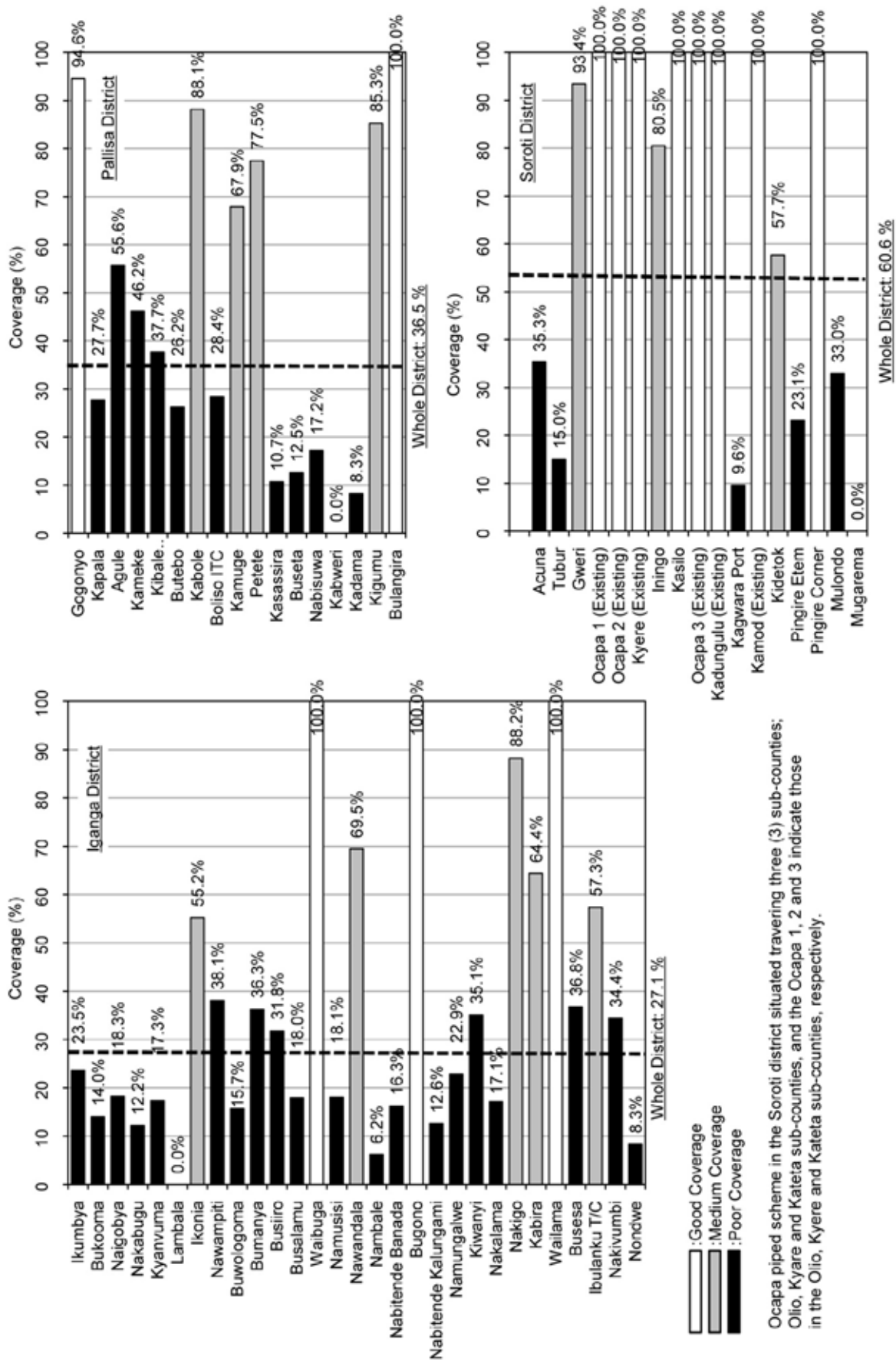


Figure 16-23 Present Coverage of Existing RGCs in Priority Districts



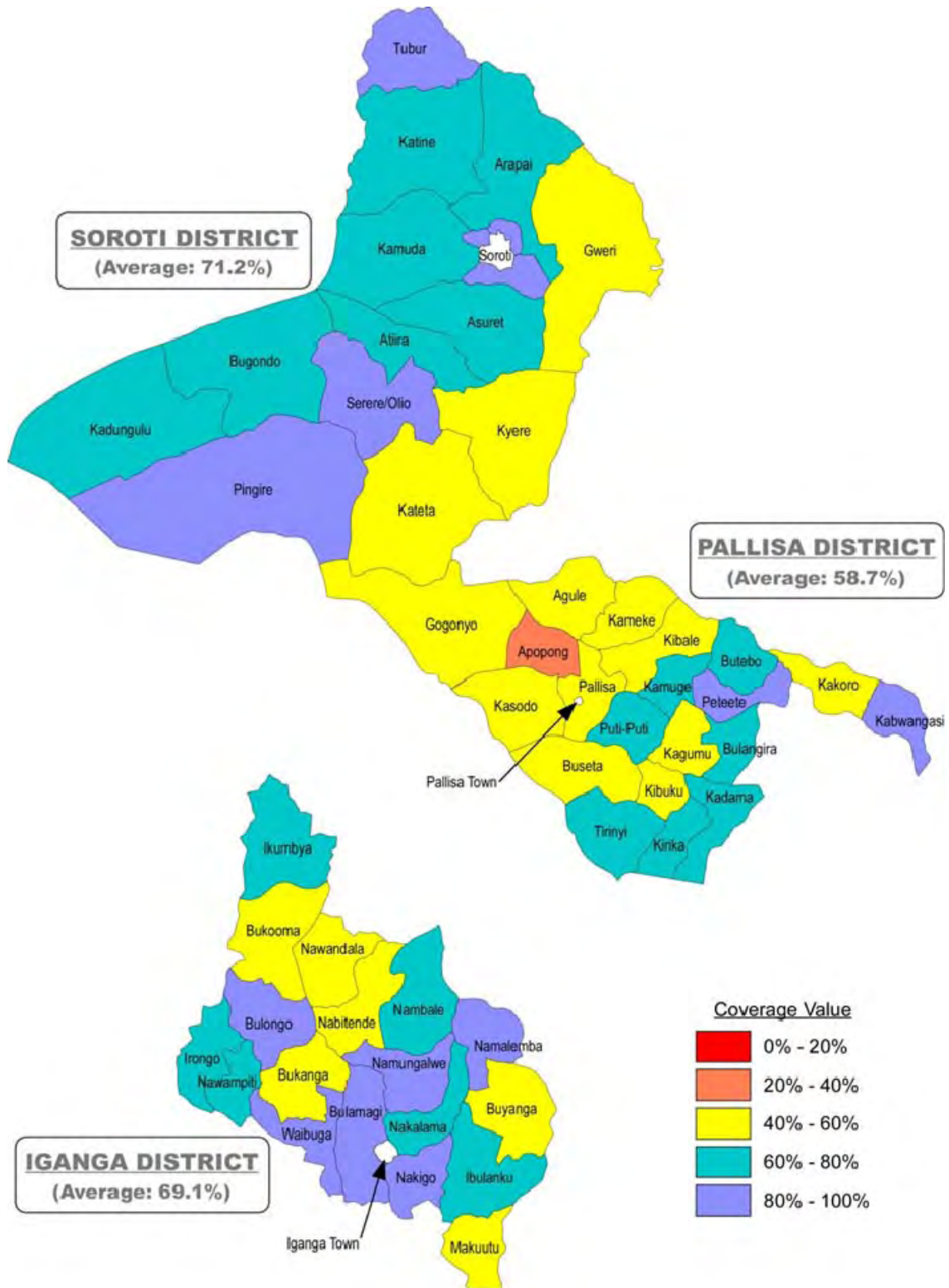


Figure 16-24 Coverage of RGCs in Priority Districts

**Table 16-33 Present Situation of Water Supply in Rural Areas Other than RGCs**

Sub-county	No. of Facilities				Served Population					Population	Coverage (%)
	Deep Borehole	Shallow Well	Protected Spring	Rain Water Harvesting	Deep Borehole	Shallow Well	Protect- ed Spring	Rain Water Harvesting	Total		
<b>1. Iganga District</b>											
Ikumbya	53	5	0	5	15,900	1,500	0	30	17,430	28,489	61.2
Bukooma	62	4	0	0	18,600	1,200	0	0	19,800	33,841	58.5
Bulongo	38	19	18	0	11,400	5,700	3,600	0	20,700	24,615	84.1
Irongo	35	13	18	4	10,500	3,900	3,600	24	18,024	27,904	64.6
Nawampiti	15	21	18	0	4,500	6,300	3,600	0	14,400	19,951	72.2
Bukanga	36	21	20	2	10,800	6,300	4,000	12	21,112	36,135	58.4
Waibuga	29	27	41	0	8,700	8,100	8,200	0	25,000	30,802	81.2
Nawandala	35	5	7	8	10,500	1,500	1,400	48	13,448	26,754	50.3
Nambale	52	2	0	1	15,600	600	0	6	16,206	21,102	76.8
Nabitende	36	7	4	6	10,800	2,100	800	36	13,736	27,028	50.8
Namalemba	43	19	2	4	12,900	5,700	400	24	19,024	19,250	98.8
Namungalwe	45	19	4	3	13,500	5,700	800	18	20,018	24,174	82.8
Buyanga	38	18	0	8	11,400	5,400	0	48	16,848	33,261	50.7
Nakalama	40	20	18	3	12,000	6,000	3,600	18	21,618	27,588	78.4
Bulamagi	55	55	19	6	16,500	16,500	3,800	36	36,836	45,093	81.7
Nakigo	33	18	8	2	9,900	5,400	1,600	12	16,912	19,039	88.8
Ibulanku	55	29	18	3	16,500	8,700	3,600	18	28,818	40,545	71.1
Makuutu	31	5	6	3	9,300	1,500	1,200	18	12,018	23,417	51.3
Whole District	731	307	201	58	219,300	92,100	40,200	348	351,948	508,988	69.1
<b>2. Pallisa District</b>											
Gogonyo	16	14	0	0	4,800	4,200	0	0	9,000	20,154	44.7
Agule	28	5	3	7	8,400	1,500	600	42	10,542	25,082	42.0
Kameke	19	6	18	1	5,700	1,800	3,600	6	11,106	24,332	45.6
Kibale	25	3	16	5	7,500	900	3,200	30	11,630	25,634	45.4
Butebo	36	2	28	11	10,800	600	5,600	66	17,066	23,383	73.0
Kakoro	18	2	22	0	5,400	600	4,400	0	10,400	17,936	58.0
Kabwagashi	32	1	46	3	9,600	300	9,200	18	19,118	19,328	98.9
Apopong	23	6	0	1	6,900	1,800	0	6	8,506	22,342	38.1
Kasodo	43	4	0	2	12,900	1,200	0	12	14,112	27,515	51.3
Pallisa	20	3	6	0	6,000	900	1,200	0	8,100	13,809	58.7
Puti-Puti	31	2	15	4	9,300	600	3,000	24	12,924	20,569	62.8
Kamuge	23	5	20	2	6,900	1,500	4,000	12	12,412	16,826	73.8
Petete	23	6	36	4	6,900	1,800	7,200	24	15,924	18,525	86.0
Buseta	33	9	0	0	9,900	2,700	0	0	12,600	23,918	52.7
Kibuku	17	3	0	0	5,100	900	0	0	6,000	14,911	40.2
Tirinyi	38	6	0	4	11,400	1,800	0	24	13,224	16,786	78.8
Kirika	33	4	0	3	9,900	1,200	0	18	11,118	17,138	64.9
Kadama	40	1	0	2	12,000	300	0	12	12,312	16,544	74.4
Kagumu	21	4	8	1	6,300	1,200	1,600	6	9,106	20,469	44.5
Bulangira	30	3	14	0	9,000	900	2,800	0	12,700	19,773	64.2
Whole District	549	89	231	50	164,700	26,700	46,200	300	237,900	404,975	58.7
<b>3. Soroti District</b>											
Tubur	48	2	18	7	14,400	600	3,600	42	18,642	18,042	100.0
Katine	51	8	4	5	15,300	2,400	800	30	18,530	26,658	69.5
Arapai	57	17	18	6	17,100	5,100	3,600	36	25,836	38,195	67.6
Kamuda	57	21	7	7	17,100	6,300	1,400	42	24,842	34,556	71.9
Soroti	34	19	22	4	10,200	5,700	4,400	24	20,324	17,649	100.0
Gweri	53	13	2	14	15,900	3,900	400	84	20,284	46,311	43.8
Asuret	54	32	14	11	16,200	9,600	2,800	66	28,666	37,310	76.8
Atiira	41	10	1	0	12,300	3,000	200	0	15,500	20,516	75.6
Olio	76	16	2	1	22,800	4,800	400	6	28,006	31,420	89.1
Kyere	48	18	14	3	14,400	5,400	2,800	18	22,618	40,969	55.2
Kateta	58	30	2	0	17,400	9,000	400	0	26,800	49,591	54.0
Bugondo	43	32	2	7	12,900	9,600	400	42	22,942	30,870	74.3
Kadungulu	33	17	0	5	9,900	5,100	0	30	15,030	21,331	70.5
Pingire	68	55	4	4	20,400	16,500	800	24	37,724	39,685	95.1
Whole District	721	290	110	74	216,300	87,000	22,000	444	322,469	453,104	71.2

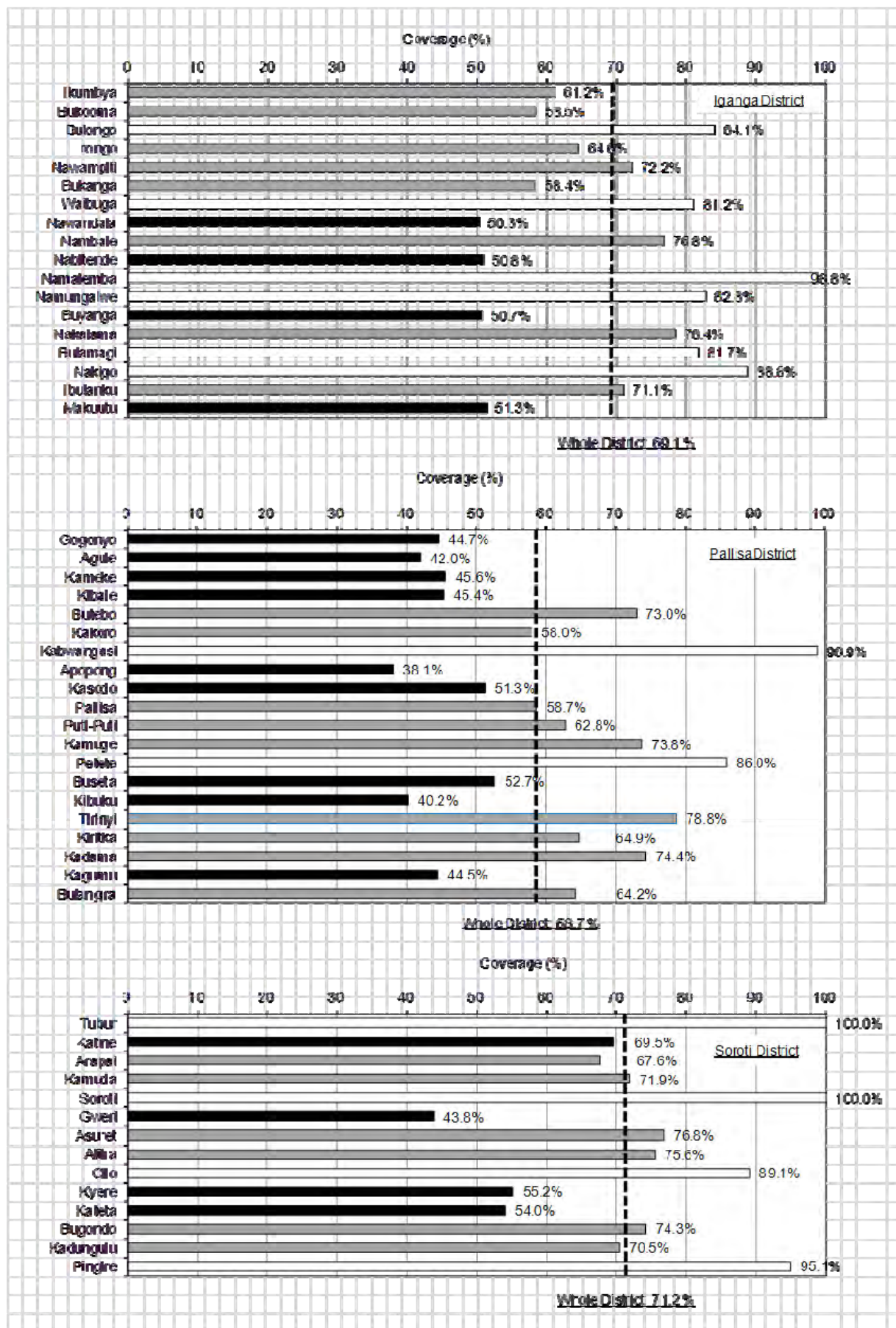


Figure 16-25 Coverage of Rural Areas Other than RGCs in Priority Districts

#### **16.4.2 Objectives of the Plan**

The master plan is to be prepared to improve the access to safe water and the living standards of the peoples in the priority districts by furnishing required water supply facilities as planned in National Development Plan (2010/11 - 2014/15) (NDP).

#### **16.4.3 Basic Condition of Master Plan**

##### **(1) Target Years**

The master plan is prepared based on the results of the WATSUP survey conducted by DWD in 2010 and the RGC survey conducted by the study team in 2010. The basic year is, therefore, set for 2010 and the target year is set for 2035 with the reference milestone years of 2015 and 2020. The short, medium and long term plans are prepared for the terms from 2010 to 2015, from 2015 to 2020 and from 2020 to 2035, respectively.

##### **(2) Target of Master Plan**

The target value of access to safe water in 2015 is set for 77 % in accordance with NDP and SIP. SIP further state the targets of safe water access 83 % and 100 % for 2020 and 2035, respectively. The target value of coverage is set as follows in the master plan.

- Target Year:	2015	2020	2035
- Target Value of Coverage for each District:	77 %	83 %	100 %

##### **(3) Components of Master Plan**

To improve the access to safe water, the water supply facilities have to be provided. The water supply facilities are planned for the RGC areas and the rural areas other than RGCs in this master plan as shown bellow.

Piped water supply systems are provided to RGC areas, and their extension plans are also considered according to the population growth of the respective RGCs.

-The deep boreholes with hand pump are applied for the villages in rural areas other than RGCs, and it is necessary to repair non-functional water supply facilities as soon as possible. This repairing scheme is also considered as one of the master plan components. Since it is considered difficult for the village people to reserve the costs for depreciation of their borehole with hand pump in their management, the replacement of such facilities are required to be made by the government. The replacement of the existing water supply facilities is, therefore, considered in the master plan in order to keep the proper safe water access in rural areas.

##### **(4) Water Sources**

The groundwater is basically applied for the rural water supply because the surface water source is not used predominantly in the priority districts. However, in some villages located near the NWSC



transmissions, water supply systems are connected to the transmission pipelines of NWSC. It is then considered in the master plan to adopt such connection to the NWSC transmissions as an alternative source in case that the groundwater potential is judged to be limited and there is no other groundwater sources even if it is considered to transmit water from nearby areas in the same district. As for the groundwater, it include shallow aquifer and spring water, too, but in this master plan only the deep groundwater is considered because the shallow aquifer and spring water is not considered as the stable safe water even if protected.

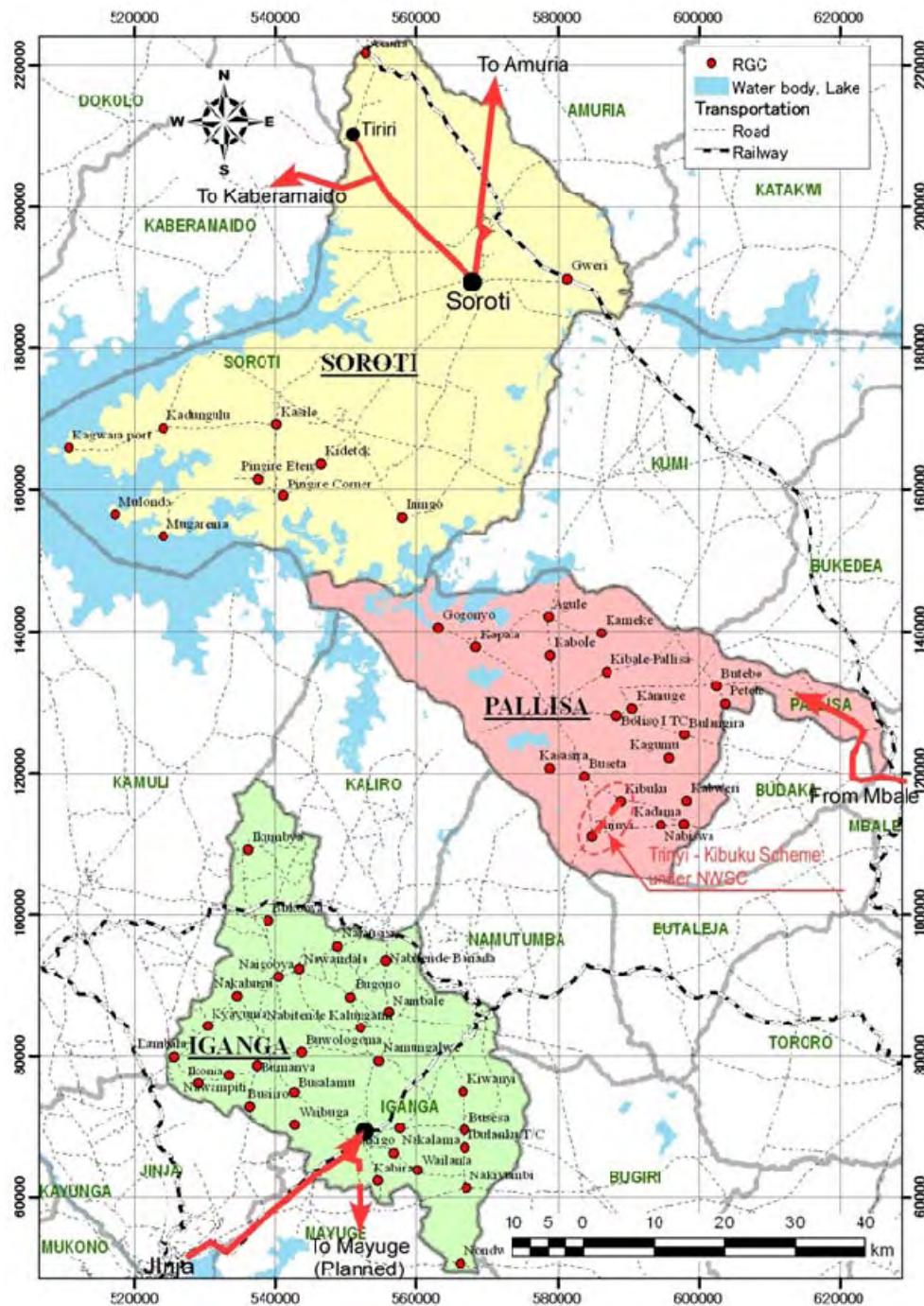


Figure 16-26 NWSC Systems in Priority Districts