

16.4.4 Water Demand

(1) Population Frame

The future population is worked out in SIP until 2035 based on the census data of UBOS. The rural population under the rural water supply controlled by DWD is calculated applying these SIP population data. The population of RGCs and village other than RGCs in each sub-county is calculated as shown in Figure 16-77 for the target years of 2015, 2020 and 2035, and the population of the whole district is summarized below.

Table 16-34 Rural Population of Priority Districts

District	2010	2015	2020	2035
Iganga	597,855	706,957	835,968	1,382,230
Pallisa	450,719	536,127	635,069	1,062,167
Soroti	485,116	590,218	718,090	1,293,240

The population of RGCs occupy 15 %, 10 % and 7 % of the whole population of the Iganga, the Pallisa and the Soroti districts, respectively. The population of these RGCs will increase as they grow by population concentration, and some of them will be transferred to urban water supply as the township in the future. In the other hand, new RGCs may be born by the population concentration to any new trading centers, etc. However, it is difficult to predict such future transformation of the rural population. Therefore, in this master plan, any new birth of RGC is not considered, and instead it is assumed that the present RGCs grow as they are even after the population thereof becoming over 5,000.

(2) Water Demand

1) Consumption per Capita

Since the objective to the master plan is to improve the access to safe water in the rural areas, the water consumption of drinking water is considered in estimating water demand and other demand for rural industries, etc is not considered. The consumption per capita for the rural water supply is set as follows considering those applied in SIP.

<u>Target Years</u>	<u>2010</u>	<u>2015</u>	<u>2020</u>	<u>2035</u>
Consumption:	15 liter/day/capita	20 liter/day/capita	25 liter/day/capita	30 liter/day/capita

2) Future Water Demand

Based on the above consumption per capita and the projected future population, the water future water demand is calculated as shown in Table 16-35 for each sub-county, and those for the priority districts are summarized below.

Table 16-35 Future Rural Water Demands of Priority Districts

Priority District (Consumption)	(m ³ /day)			
	2010 (15 lit./d./capita)	2015 (20 lit./d./capita)	2020 (25 lit./d./capita)	2035 (30 lit./d./capita)
Iganga District	8,968	14,139	20,899	41,467
Pallisa District	6,761	10,723	15,877	31,865
Soroti District	7,277	11,804	17,952	38,797

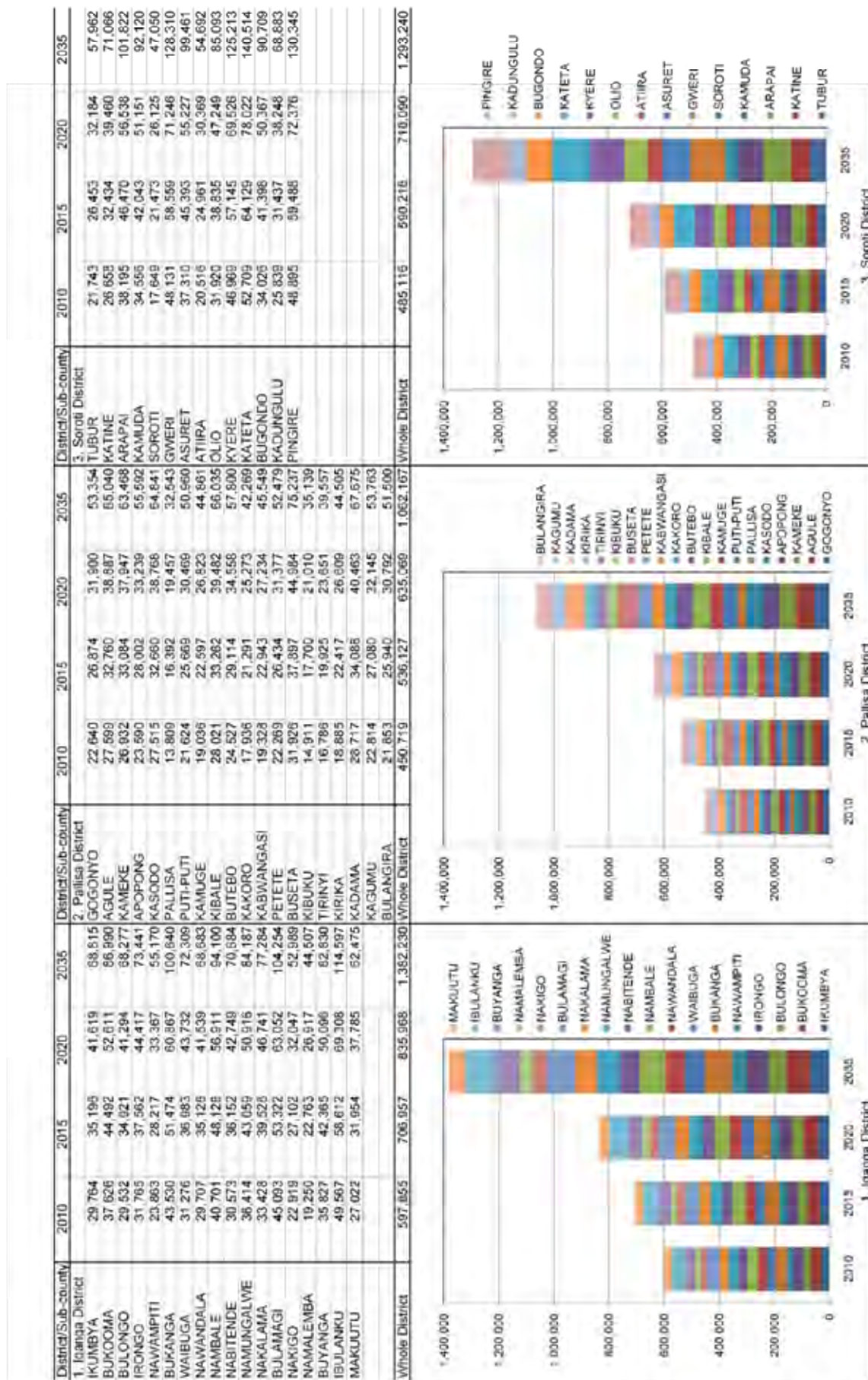


Figure 16-27 Present and Future Rural Population of Priority Districts

Table 16-36 Present and Future Population of Rural Areas in Priority Districts

Sub-county	2010			2015			2020			2035		
	Total	RGC	Out of RGC	Total	RGC	Out of RGC	Total	RGC	Out of RGC	Total	RGC	Out of RGC
1. Iganga District												
Ikumbya	29,764	1,275	28,489	35,196	1,508	33,688	41,619	1,783	39,836	68,815	2,948	65,867
Bukooma	37,626	3,784	33,841	44,492	4,475	40,017	52,611	5,291	47,320	86,990	8,749	78,241
Bulongo	29,532	4,916	24,615	34,921	5,814	29,107	41,294	6,874	34,419	68,277	11,367	56,910
Irongo	31,765	3,861	27,904	37,562	4,566	32,997	44,417	5,399	39,018	73,441	8,927	64,514
Nawampiti	23,863	3,912	19,951	28,217	4,626	23,592	33,367	5,470	27,897	55,170	9,044	46,126
Bukanga	43,530	7,395	36,135	51,474	8,745	42,729	60,867	10,340	50,527	100,640	17,097	83,543
Waibuga	31,276	474	30,802	36,983	560	36,423	43,732	663	43,070	72,309	1,096	71,213
Nawandala	29,707	2,953	26,754	35,128	3,492	31,637	41,539	4,129	37,410	68,683	6,827	61,856
Nambale	40,701	19,599	21,102	48,128	23,176	24,952	56,911	27,405	29,506	94,100	45,313	48,787
Nabitende	30,573	3,545	27,028	36,152	4,191	31,961	42,749	4,956	37,793	70,684	8,195	62,489
Namungalwe	36,414	12,240	24,174	43,059	14,474	28,585	50,916	17,115	33,801	84,187	28,299	55,889
Nakalama	33,428	5,840	27,588	39,528	6,905	32,623	46,741	8,165	38,576	77,284	13,501	63,783
Bulamagi	45,093	0	45,093	53,322	0	53,322	63,052	0	63,052	104,254	0	104,254
Nakigo	22,919	3,880	19,039	27,102	4,589	22,513	32,047	5,426	26,621	52,989	8,971	44,017
Namalemba	19,250	0	19,250	22,763	0	22,763	26,917	0	26,917	44,507	0	44,507
Buyanga	35,827	2,565	33,261	42,365	3,033	39,331	50,096	3,587	46,509	82,830	5,931	76,900
Ibulanku	49,567	9,022	40,545	58,612	10,668	47,944	69,308	12,615	56,693	114,597	20,858	93,738
Makuutu	27,022	3,606	23,417	31,954	4,264	27,690	37,785	5,042	32,743	62,475	8,336	54,139
Whole District	597,855	88,867	508,988	706,957	105,084	601,873	835,968	124,261	711,707	1,382,230	205,458	1,176,772
2. Pallisa District												
Gogonyo	22,640	2,486	20,154	26,874	2,950	23,924	31,900	3,502	28,398	53,354	5,858	47,496
Agule	27,599	2,517	25,082	32,760	2,988	29,773	38,887	3,546	35,341	65,040	5,932	59,108
Kameke	26,932	2,600	24,332	33,084	3,194	29,890	37,947	3,663	34,284	63,468	6,127	57,340
Apopong	23,590	1,248	22,342	28,002	1,481	26,520	33,239	1,758	31,480	55,592	2,941	52,651
Kasodo	27,515	0	27,515	32,660	0	32,660	38,768	0	38,768	64,841	0	64,841
Pallisa	13,809	0	13,809	16,392	0	16,392	19,457	0	19,457	32,543	0	32,543
Puti-Puti	21,624	1,056	20,569	25,669	1,253	24,416	30,469	1,487	28,982	50,960	2,488	48,472
Kamuge	19,036	2,210	16,826	22,597	2,623	19,973	26,823	3,114	23,709	44,861	5,208	39,653
Kibale	28,021	2,387	25,634	33,262	2,833	30,428	39,482	3,363	36,119	66,035	5,625	60,410
Butebo	24,527	1,144	23,383	29,114	1,358	27,756	34,558	1,612	32,947	57,800	2,696	55,104
Kakoro	17,936	0	17,936	21,291	0	21,291	25,273	0	25,273	42,269	0	42,269
Kabwangasi	19,328	0	19,328	22,943	0	22,943	27,234	0	27,234	45,549	0	45,549
Petete	22,269	3,744	18,525	26,434	4,444	21,990	31,377	5,275	26,102	52,479	8,823	43,656
Buseta	31,926	8,008	23,918	37,897	9,506	28,391	44,984	11,283	33,701	75,237	18,872	56,365
Kibuku	14,911	0	14,911	17,700	0	17,700	21,010	0	21,010	35,139	0	35,139
Tirinyi	16,786	0	16,786	19,925	0	19,925	23,651	0	23,651	39,557	0	39,557
Kirika	18,885	1,747	17,138	22,417	2,074	20,343	26,609	2,462	24,148	44,505	4,117	40,387
Kadama	28,717	12,173	16,544	34,088	14,450	19,638	40,463	17,152	23,311	67,675	28,687	38,988
Kagumu	22,814	2,345	20,469	27,080	2,784	24,297	32,145	3,304	28,841	53,763	5,526	48,237
Bulangira	21,853	2,080	19,773	25,940	2,469	23,471	30,792	2,931	27,861	51,500	4,902	46,598
Whole District	450,719	45,744	404,975	536,127	54,407	481,720	635,069	64,454	570,614	1,062,167	107,801	954,365
3. Soroti District												
Tubur	21,743	3,700	18,042	26,453	4,502	21,951	32,184	5,477	26,707	57,962	9,865	48,098
Katine	26,658	0	26,658	32,434	0	32,434	39,460	0	39,460	71,066	0	71,066
Arapai	38,195	0	38,195	46,470	0	46,470	56,538	0	56,538	101,822	0	101,822
Kamuda	34,556	0	34,556	42,043	0	42,043	51,151	0	51,151	92,120	0	92,120
Soroti	17,649	0	17,649	21,473	0	21,473	26,125	0	26,125	47,050	0	47,050
Gweri	48,131	1,820	46,311	58,559	2,214	56,345	71,246	2,694	68,552	128,310	4,852	123,458
Asuret	37,310	0	37,310	45,393	0	45,393	55,227	0	55,227	99,461	0	99,461
Atiira	20,516	0	20,516	24,961	0	24,961	30,369	0	30,369	54,692	0	54,692
Olio	31,920	500	31,420	38,835	608	38,227	47,249	740	46,509	85,093	1,333	83,760
Kyere	46,969	6,000	40,969	57,145	7,300	49,845	69,526	8,881	60,645	125,213	15,995	109,218
Kateta	52,709	3,118	49,591	64,129	3,794	60,335	78,022	4,615	73,407	140,514	8,312	132,202
Bugondo	34,026	3,156	30,870	41,398	3,840	37,558	50,367	4,672	45,696	90,709	8,413	82,295
Kadungulu	25,839	4,508	21,331	31,437	5,485	25,952	38,248	6,674	31,575	68,883	12,019	56,865
Pingire	48,895	9,209	39,685	59,488	11,204	48,283	72,376	13,632	58,744	130,345	24,550	105,795
Whole District	485,116	32,012	453,104	590,218	38,947	551,270	718,090	47,386	670,705	1,293,240	85,339	1,207,901

Table 16-37 Future Water Demand of Rural Areas in Priority Districts

Sub-county (Consumption)	2010		2015		2020		2035	
	Population (15 liter/day/capita)	Water Demand (m ³ /day)	Population (20 liter/day/capita)	Water Demand (m ³ /day)	Population (25 liter/day/capita)	Water Demand (m ³ /day)	Population (30 liter/day/capita)	Water Demand (m ³ /day)
1. Iganga District								
Ikumbya	29,764	446	35,196	704	41,619	1,040	68,815	2,064
Bukooma	37,626	564	44,492	890	52,611	1,315	86,990	2,610
Bulongo	29,532	443	34,921	698	41,294	1,032	68,277	2,048
Irongo	31,765	476	37,562	751	44,417	1,110	73,441	2,203
Nawampiti	23,863	358	28,217	564	33,367	834	55,170	1,655
Bukanga	43,530	653	51,474	1,029	60,867	1,522	100,640	3,019
Waibuga	31,276	469	36,983	740	43,732	1,093	72,309	2,169
Nawandala	29,707	446	35,128	703	41,539	1,038	68,683	2,060
Nambale	40,701	611	48,128	963	56,911	1,423	94,100	2,823
Nabitende	30,573	459	36,152	723	42,749	1,069	70,684	2,121
Namungalwe	36,414	546	43,059	861	50,916	1,273	84,187	2,526
Nakalama	33,428	501	39,528	791	46,741	1,169	77,284	2,319
Bulamagi	45,093	676	53,322	1,066	63,052	1,576	104,254	3,128
Nakigo	22,919	344	27,102	542	32,047	801	52,989	1,590
Namalemba	19,250	289	22,763	455	26,917	673	44,507	1,335
Buyanga	35,827	537	42,365	847	50,096	1,252	82,830	2,485
Ibulanku	49,567	743	58,612	1,172	69,308	1,733	114,597	3,438
Makuutu	27,022	405	31,954	639	37,785	945	62,475	1,874
Whole District	597,855	8,968	706,957	14,139	835,968	20,899	1,382,230	41,467
2. Pallisa District								
Gogonyo	22,640	340	26,874	537	31,900	798	53,354	1,601
Agule	27,599	414	32,760	655	38,887	972	65,040	1,951
Kameke	26,932	404	33,084	662	37,947	949	63,468	1,904
Apopong	23,590	354	28,002	560	33,239	831	55,592	1,668
Kasodo	27,515	413	32,660	653	38,768	969	64,841	1,945
Pallisa	13,809	207	16,392	328	19,457	486	32,543	976
Puti-Puti	21,624	324	25,669	513	30,469	762	50,960	1,529
Kamuge	19,036	286	22,597	452	26,823	671	44,861	1,346
Kibale	28,021	420	33,262	665	39,482	987	66,035	1,981
Butebo	24,527	368	29,114	582	34,558	864	57,800	1,734
Kakoro	17,936	269	21,291	426	25,273	632	42,269	1,268
Kabwangasi	19,328	290	22,943	459	27,234	681	45,549	1,366
Petete	22,269	334	26,434	529	31,377	784	52,479	1,574
Buseta	31,926	479	37,897	758	44,984	1,125	75,237	2,257
Kibuku	14,911	224	17,700	354	21,010	525	35,139	1,054
Tirinyi	16,786	252	19,925	398	23,651	591	39,557	1,187
Kirika	18,885	283	22,417	448	26,609	665	44,505	1,335
Kadama	28,717	431	34,088	682	40,463	1,012	67,675	2,030
Kagumu	22,814	342	27,080	542	32,145	804	53,763	1,613
Bulangira	21,853	328	25,940	519	30,792	770	51,500	1,545
Whole District	450,719	6,761	536,127	10,723	635,069	15,877	1,062,167	31,865
3. Soroti District								
Tubur	21,743	326	26,453	529	32,184	805	57,962	1,739
Katine	26,658	400	32,434	649	39,460	987	71,066	2,132
Arapai	38,195	573	46,470	929	56,538	1,413	101,822	3,055
Kamuda	34,556	518	42,043	841	51,151	1,279	92,120	2,764
Soroti	17,649	265	21,473	429	26,125	653	47,050	1,411
Gweri	48,131	722	58,559	1,171	71,246	1,781	128,310	3,849
Asuret	37,310	560	45,393	908	55,227	1,381	99,461	2,984
Atiira	20,516	308	24,961	499	30,369	759	54,692	1,641
Olio	31,920	479	38,835	777	47,249	1,181	85,093	2,553
Kyere	46,969	705	57,145	1,143	69,526	1,738	125,213	3,756
Kateta	52,709	791	64,129	1,283	78,022	1,951	140,514	4,215
Bugondo	34,026	510	41,398	828	50,367	1,259	90,709	2,721
Kadungulu	25,839	388	31,437	629	38,248	956	68,883	2,066
Pingire	48,895	733	59,488	1,190	72,376	1,809	130,345	3,910
Whole District	485,116	7,277	590,218	11,804	718,090	17,952	1,293,240	38,797

16.4.5 Water Supply Plan

The water supply plan for the master plan consists of i) the provision of new water supply facilities to improve the access to safe water, ii) the repairing of existing water supply facilities to recover the access to safe water, and iii) the replacement of water supply facilities to keep the access to safe water properly.

The water supply facilities required for each term are planned for each sub-county considering the followings.

Since the coverage of RGCs is found to be low comparing with the village areas other than RGCs, the water supply facilities are provided for RGCs with higher priority than the other areas and complete substantially in the short and the middle term plans. However, the RGCs having existing piped water supply facilities are put lower priority and their implementations are planned for the middle and the long term plans.

Second priority is given to the village areas of which coverage values are lower, and much gains of coverage is considered. The population covered by one (1) borehole is set at 300 as applied in SIP in the calculation of coverage by boreholes with hand pump.

The provision of water supply facilities are so determined that the coverage of the whole district achieves the target coverage set for each term.

The repair of the non-functional facilities is planned to be conducted in the short and the middle terms.

The replacement of the existing water supply facilities is planned considering the life period of 25 years in accordance with the setting in SIP; actually four (4) % of the existing boreholes have to be replaced every year.

(1) Construction of New Water Supply Facilities

1) Water Supply Facilities for RGC Areas

It is necessary to improve the coverage values in the RGCs urgently. RGCs are divided into three (3) groups in terms of the present coverage as shown in Figure 16-23; RGCs of good, medium and poor coverage have low, medium and high priorities in implementation of required schemes. The schemes for furnishing required water supply systems are proposed to be implemented for those of high, medium and low priorities in the short, the medium and the long term plans, respectively.

The implementation term of water supply facilities for RGCs is tabulated in Table 16-38, and the locations and the implementation terms of such RGC facilities are illustrated in Figure 16-28. There are 57 RGCs in the priority districts excluding those having the existing facilities, and the water supply facilities of 39 RGCs which are given higher priorities due to lower coverage in each district are planned be provided in the short term (2015). The 39 RGCs for the short term plan consist of 21 RGCs for the Iganga district, 11 RGCs for the Pallisa district and 7 RGCs for the Soroti district. Since in some RGCs 100 % of coverage has been achieved by the existing facilities, 100 % of coverage is

substantially achieved for RGCs by the end of middle term plan. Then, the extension word of such RGC facilities and the construction of deep boreholes with hand pump are considered to be main work in the middle term plan.

Table 16-38 RGCs and Implementation Term

Short Term Plan (2015)	Middle Term Plan (2020)	Long Term Plan (2035)	Short Term Plan (2015)	Middle Term Plan (2020)	Long Term Plan (2035)
1. Iganga District (29 sites)			2. Pallisa District (17 site)		
Ikumbya	Ikonja	Waibuga	Kapala	Gogonyo	
Bukooma	Nawandala	Bugono	Agule	Kabole	
Naigobya	Nakigo	Wailama	Kameke	Kamuge	
Nakabugu	Kabira		Kibale Pallisa	Petete	
Kyanvuma	Ibulanku T/C		Butebo	Kigumu	
Lambala			Boliso ITC	Bulangira	
Nawampiti			Kasassira		
Buwologoma			Buseta		
Bumanya			Nabisuwa		
Busiuro			Kabweri		
Busalamu			Kadama		
Namusisi			11 sites	6 sites	-
Nambale			3. Soroti District (11 sites)		
Nabitende B.			Acuna	Gweri	Kasilo
Nabitende K.			Tubur	Iningo	
Namungalwe			Kagwara Port	Pingire Corner	
Kiwanyi			Kidetok		
Nakalama			Pingire Etem		
Busesa			Mulondo		
Nakivumbi			Mugarema		
Nondwe			7 sites	3 sites	1 site
21 sites	5 sites	3 sites	39 sites	14 sites	4 sites

The constructed piped water supply facilities are extended as the population of the respective RGC grows up. The number of water kiosks and the distance of distribution pipelines are required to be increased as the population and the water supply areas are increased and expanded, and the necessary extension of water supply facilities are also considered in the master plan.

2) Water Supply Facilities for Rural Areas Other than RGCs

The water supply facilities are also provided to the villages in the rural areas other than RGCs. The boreholes with hand pump are considered for these areas. The hand pump wells are considered to serve 300 people in the village areas as set in SIP, and the coverage of water supply facilities is calculated based on this value in Uganda.

The average of coverage values are 69.1 %, 64.2 % and 71.9 % for the Iganga, the Pallisa and the Soroti districts, respectively, and these values are considered rather better than the national average value of 63 %, which are rather better than the national average of 63 %. To achieve the targets of 77 %, 83 % and 100 % for the district average in the short, the middle and the long term plans, numbers of boreholes are required to be constructed in these areas.

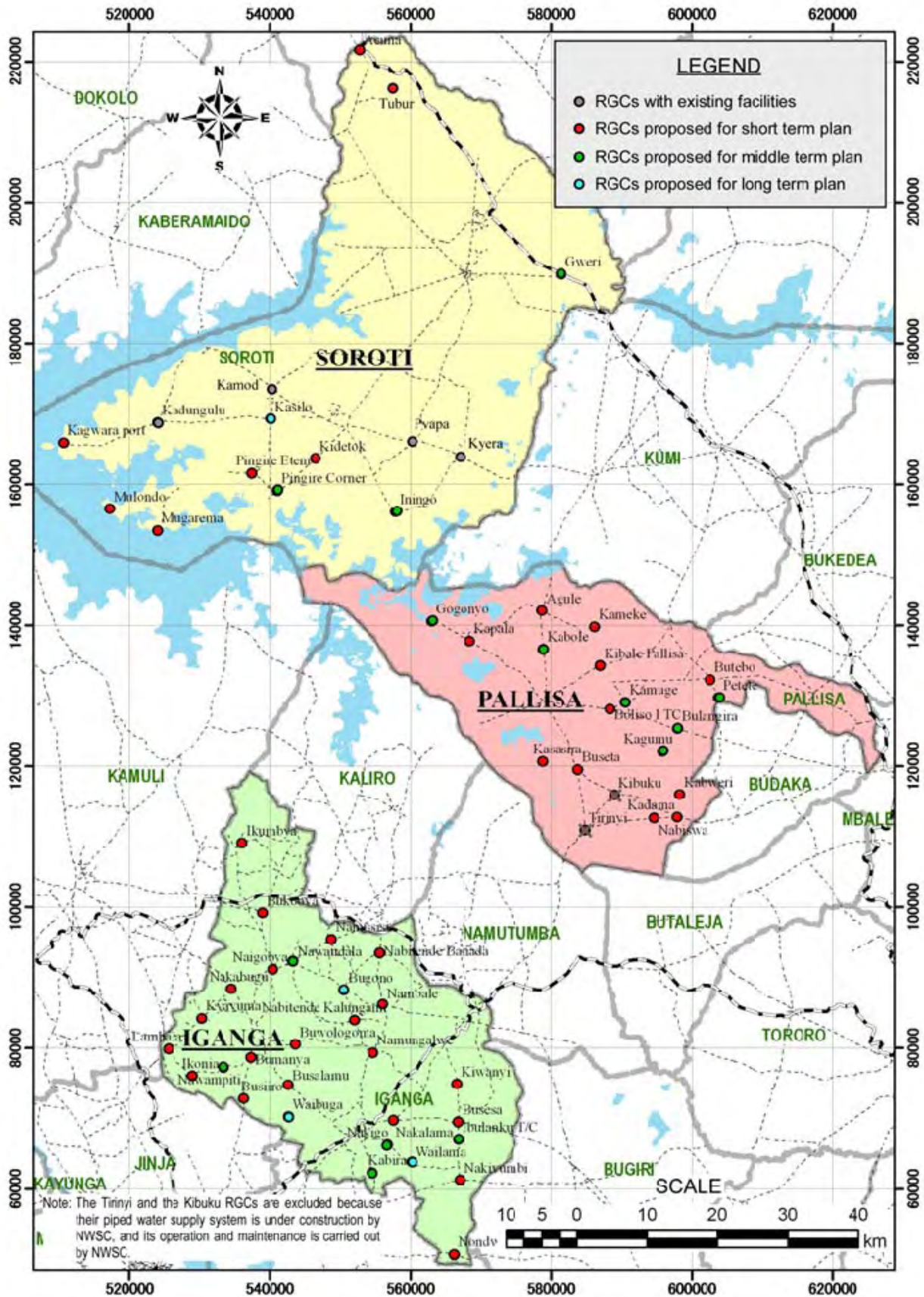


Figure 16-28 Location and Implementation Term of RGC

As shown in Figure 16-24, sub-counties in the priority districts are divided into three (3) groups in terms of their coverage values; sub-counties of good, medium and poor coverage have low, medium and high priorities in implementation of required schemes. High gain of coverage values is proposed for the sub-counties of high priority, while low gain of coverage values is for those of low priority. The number of deep boreholes to be constructed for each sub-county in each implementation term is tabulated in Table 16-41.

(2) Repair of Non-functional Water Supply Facilities

As summarized in Table 16-42, the about 10 to 15 % of the existing water supply facilities are not functioning, and it is urgently necessary to repair such non-functional facilities. Total number of the facilities required to be repaired reaches about 400. It is proposed to repair such non-functional facilities by 2020 considering its urgency as tabulated below.

Table 16-39 Number of Non-functional Water Supply Facilities to be Repaired

District	2015	2020	Total
Iganga	70	69	139
Pallisa	47	47	94
Soroti	84	84	168

(3) Replacement of Water Supply Facilities

Replacement of the constructed facilities is also considered important in order to keep the water supply situation in rural areas. The life of borehole facilities is set at 25 years in SIP, which is considered that four (4) % of the existing boreholes have to be replaced every year. Number of boreholes to be constructed for replacement of the existing ones is tabulated for each sub-county in Table 16-41, and summarized for each priority district as follows:

Table 16-40 Number of Boreholes to be Replaced in Priority Districts

District	2015	2020	2035	Total
Iganga	180	252	1,491	1,923
Pallisa	160	233	1,297	1,698
Soroti	169	244	1,532	1,945

(4) Water Supply Facilities Proposed to be Furnished

The achievement of improving coverage of each priority district is set to fulfill the target of each term. The present coverage of the Iganga, the Pallisa and the Soroti districts are 63.0 %, 56.5 % and 70.4 %, respectively, and the master plan is so prepared that these coverage values of each district are set to reach 77 %, 83 % and 100 % in 2015 for the short term, 2020 for the middle term and 2035 for the long term, respectively.

Table 16-41 Number of Water Supply Facilities to be Constructed and Replaced in Priority Districts

Sub-county	Existing Facilities in 2010	Facilities to be Constructed in Short Term Plan (2015)	Total Facilities in 2015	Facilities to be Replaced in Short Term Plan (2015)	Facilities to be Constructed in Middle Term P(2020)	Total Facilities in 2020	Facilities to be Replaced in Middle Term Plan (2020)	Repaired Non-functional Facilities	Facilities to be Constructed in Long Term Plan (2035)	Total Facilities in 2035	Facilities to be Replaced in Long Term Plan (2035)
1. Iganga District											
Ikumbya	50	15	65	12	27	92	16	4	120	216	93
Bukooma	51	16	67	12	31	98	17	13	148	259	108
Bulongo	37	13	50	9	15	65	12	2	93	160	68
Irongo	31	14	45	8	27	72	12	4	114	190	79
Nawampiti	15	11	26	5	15	41	7	3	79	123	50
Bukanga	39	17	56	10	33	89	15	1	158	248	102
Waibuga	25	15	40	7	18	58	10	5	121	184	73
Nawandala	34	24	58	10	25	83	15	5	112	200	85
Nambale	49	12	61	12	17	78	14	5	79	162	73
Nabitende	41	24	65	11	25	90	16	2	113	205	89
Namalemba	41	12	53	10	14	67	13	2	60	129	59
Namungalwe	47	12	59	11	14	73	14	1	93	167	73
Buyanga	37	30	67	11	31	98	17	4	139	241	102
Nakalama	39	16	55	10	23	78	14	3	102	183	79
Bulamagi	48	22	70	12	26	96	17	7	176	279	113
Nakigo	32	10	42	8	12	54	10	7	68	129	55
Ibulanku	58	22	80	14	31	111	20	4	163	278	117
Makuutu	28	21	49	8	22	71	13	4	97	172	73
Whole District	702	306	1,008	180	406	1,414	252	76	2,035	3,525	1,491
2. Pallisa District											
Gogonyo	18	22	40	6	21	61	11	1	86	148	63
Agule	26	26	52	8	26	78	14	6	110	194	82
Kameke	19	28	47	7	23	70	12	3	102	175	74
Kibale	24	28	52	8	27	79	14	4	108	191	82
Butebo	30	15	45	8	19	64	11	7	93	164	69
Kakoro	18	10	28	5	13	41	7	0	84	125	50
Kabwangasi	30	12	42	8	14	56	10	2	62	120	53
Apopong	26	27	53	8	23	76	13	0	97	173	75
Kasodo	42	36	78	13	31	109	19	1	102	212	97
Pallisa	19	11	30	5	10	40	8	1	61	102	43
Puti-Puti	32	16	48	9	16	64	12	0	86	150	65
Kamuge	23	14	37	7	10	47	9	5	66	118	50
Petete	28	10	38	7	12	50	9	4	71	125	53
Buseta	34	32	66	11	27	93	16	2	87	182	83
Kibuku	17	18	35	6	16	51	9	0	63	114	50
Tirinyi	33	15	48	9	11	59	11	5	62	126	56
Kirika	34	14	48	9	14	62	12	0	70	132	59
Kadama	39	14	53	10	10	63	12	4	64	131	59
Kagumu	26	26	52	8	22	74	13	1	82	157	70
Bulangira	30	16	46	8	16	62	11	5	82	149	64
Whole District	548	390	938	160	361	1,299	233	51	1,638	2,988	1,297
3. Soroti District											
Tubur	35	0	35	8	13	48	9	14	85	147	59
Katine	47	24	71	12	25	96	17	4	126	226	97
Arapai	49	25	74	13	43	117	20	8	186	311	129
Kamuda	52	24	76	13	32	108	19	5	169	282	118
Soroti	29	0	29	6	15	44	8	5	74	123	51
Gweri	52	33	85	14	45	130	22	6	266	402	160
Asuret	48	27	75	13	36	111	19	6	174	291	121
Atiira	41	15	56	10	19	75	14	0	97	172	75
Olio	73	20	93	17	25	118	22	3	141	262	115
Kyere	47	33	80	13	44	124	21	1	212	337	139
Kateta	51	39	90	15	52	142	24	10	259	411	166
Bugondo	44	22	66	12	36	102	17	0	140	242	104
Kadungulu	30	14	44	8	19	63	11	4	106	173	71
Pingire	60	27	87	15	33	120	21	14	167	301	127
Whole District	658	303	961	169	437	1,398	244	80	2,202	3,680	1,532

Table 16-42 Functional and Non-functional Water Supply Facilities in Priority Districts

*The Development Study on Water Resources Development and Management for Lake Kyoga Basin
Final Report -Supporting- Chapter 16 Master Plan of Rural Water Supply*

Sub-county	Deep Borehole				Shallow Well				Protected Spring				Total			
	Functional	Non-functional	Total	Functionality (%)	Functional	Non-functional	Total	Functionality (%)	Functional	Non-functional	Total	Functionality (%)	Functional	Non-functional	Total	Functionality (%)
1. Iganga District																
Ikumbya	50	4	54	92.6	5	0	5	100.0	0	0	0	-	55	4	59	93.2
Bukooma	51	13	64	79.7	2	2	4	50.0	0	0	0	-	53	15	68	77.9
Bulongo	37	2	39	94.9	19	1	20	95.0	17	1	18	94.4	73	4	77	94.8
Irongo	31	4	35	88.6	12	2	14	85.7	18	0	18	100.0	61	6	67	91.0
Nawampiti	15	3	18	83.3	14	8	22	63.6	21	0	21	100.0	50	11	61	82.0
Bukanga	39	1	40	97.5	20	2	22	90.9	22	0	22	100.0	81	3	84	96.4
Waibuga	25	5	30	83.3	25	4	29	86.2	41	0	41	100.0	91	9	100	91.0
Nawandala	34	5	39	87.2	5	0	5	100.0	5	2	7	71.4	44	7	51	86.3
Nambale	49	5	54	90.7	7	2	9	77.8	0	0	0	-	56	7	63	88.9
Nabitende	41	2	43	95.3	6	1	7	85.7	3	1	4	75.0	50	4	54	92.6
Namalemba	41	2	43	95.3	16	3	19	84.2	1	1	2	50.0	58	6	64	90.6
Namungalwe	47	1	48	97.9	22	2	24	91.7	6	0	6	100.0	75	3	78	96.2
Buyanga	37	4	41	90.2	18	0	18	100.0	0	0	0	-	55	4	59	93.2
Nakalama	39	3	42	92.9	18	2	20	90.0	19	1	20	95.0	76	6	82	92.7
Bulamagi	48	7	55	87.3	42	13	55	76.4	19	0	19	100.0	109	20	129	84.5
Nakigo	32	7	39	82.1	20	3	23	87.0	7	1	8	87.5	59	11	70	84.3
Ibulanku	58	4	62	93.5	27	7	34	79.4	15	4	19	78.9	100	15	115	87.0
Makuutu	28	4	32	87.5	5	0	5	100.0	6	0	6	100.0	39	4	43	90.7
Whole District	702	76	778	90.2	283	52	335	84.5	200	11	211	94.8	1,185	139	1,324	89.5
2. Pallisa District																
Gogonyo	18	1	19	94.7	10	4	14	71.4	0	0	0	-	28	5	33	84.8
Agule	26	6	32	81.3	4	1	5	80.0	4	0	4	100.0	34	7	41	82.9
Kameke	19	3	22	86.4	4	3	7	57.1	16	2	18	88.9	39	8	47	83.0
Kibale	24	4	28	85.7	2	1	3	66.7	15	1	16	93.8	41	6	47	87.2
Butebo	30	7	37	81.1	1	1	2	50.0	19	9	28	67.9	50	17	67	74.6
Kakoro	18	0	18	100.0	2	0	2	100.0	22	0	22	100.0	42	0	42	100.0
Kabwangasi	30	2	32	93.8	1	0	1	100.0	44	2	46	95.7	75	4	79	94.9
Apopong	26	0	26	100.0	6	0	6	100.0	0	0	0	-	32	0	32	100.0
Kasodo	42	1	43	97.7	4	0	4	100.0	0	0	0	-	46	1	47	97.9
Pallisa	19	1	20	95.0	2	1	3	66.7	6	0	6	100.0	27	2	29	93.1
Puti-Puti	32	0	32	100.0	2	0	2	100.0	13	2	15	86.7	47	2	49	95.9
Kamuge	23	5	28	82.1	5	0	5	100.0	19	1	20	95.0	47	6	53	88.7
Petete	28	4	32	87.5	4	2	6	66.7	32	5	37	86.5	64	11	75	85.3
Buseta	34	2	36	94.4	8	1	9	88.9	0	0	0	-	42	3	45	93.3
Kibuku	17	0	17	100.0	3	0	3	100.0	0	0	0	-	20	0	20	100.0
Tirinyi	33	5	38	86.8	5	1	6	83.3	0	0	0	-	38	6	44	86.4
Kirika	34	0	34	100.0	4	0	4	100.0	0	0	0	-	38	0	38	100.0
Kadama	39	4	43	90.7	1	0	1	100.0	0	0	0	-	40	4	44	90.9
Kagumu	26	1	27	96.3	3	1	4	75.0	7	2	9	77.8	36	4	40	90.0
Bulangira	30	5	35	85.7	2	2	4	50.0	15	1	16	93.8	47	8	55	85.5
Whole District	548	51	599	91.5	73	18	91	80.2	212	25	237	89.5	833	94	927	89.9
3. Soroti District																
Tubur	35	14	49	71.4	4	0	4	100.0	10	8	18	55.6	49	22	71	69.0
Katine	47	4	51	92.2	6	2	8	75.0	4	0	4	100.0	57	6	63	90.5
Arapai	49	8	57	86.0	10	7	17	58.8	15	3	18	83.3	74	18	92	80.4
Kamuda	52	5	57	91.2	12	9	21	57.1	5	2	7	71.4	69	16	85	81.2
Soroti	29	5	34	85.3	11	8	19	57.9	20	2	22	90.9	60	15	75	80.0
Gweri	52	6	58	89.7	10	3	13	76.9	1	2	3	33.3	63	11	74	85.1
Asuret	48	6	54	88.9	29	3	32	90.6	14	0	14	100.0	91	9	100	91.0
Atiira	41	0	41	100.0	9	1	10	90.0	1	0	1	100.0	51	1	52	98.1
Olio	73	3	76	96.1	15	1	16	93.8	2	0	2	100.0	90	4	94	95.7
Kyere	47	1	48	97.9	14	4	18	77.8	12	2	14	85.7	73	7	80	91.3
Kateta	51	10	61	83.6	22	8	30	73.3	1	1	2	50.0	74	19	93	79.6
Bugondo	44	0	44	100.0	27	5	32	84.4	2	0	2	100.0	73	5	78	93.6
Kadungulu	30	4	34	88.2	8	9	17	47.1	0	0	0	-	38	13	51	74.5
Pingire	60	14	74	81.1	50	7	57	87.7	3	1	4	75.0	113	22	135	83.7
Whole District	658	80	738	89.2	227	67	294	77.2	90	21	111	81.1	975	168	1,143	85.3

The numbers of water supply facilities and the coverage values calculated for each term are summarized in Table 16-43, and the improvement of coverage in each sub-county is illustrated in Figure 16-29.

Table 16-43 Summary of Water Supply Facilities Proposed for Master Plan

Descriptions		2010 (Present)	2015 (Short Term Plan)	2020 (Middle Term Plan)	2035 (Long Term Plan)	Total
1. Iganga District						
(Coverage)						
RGC		27.1 %	95.6 %	100.0 %	100.0 %	-
Out of RGC		69.1 %	73.8 %	79.6 %	100.0 %	-
Whole District		63.0 %	77.1 %	82.6 %	100.0 %	-
(Required Water Supply Facilities)						
RGCs Areas	Construction	-	21 RGCs	5 RGCs	3 RGCs	29 RGCs
	Extension	-	-	21 RGCs	26 RGCs	-
Other Areas	Boreholes	-	306 nos.	406 nos.	2,035 nos.	2,747 nos.
	Repair	-	70 nos.	69 nos.	-	139 nos.
	Replace	-	180 nos.	252 nos.	1,491 nos.	1,923 nos.
2. Pallisa District						
(Coverage)						
RGC		36.5 %	91.8 %	100.0 %	100.0 %	-
Out of RGC		58.7 %	75.2 %	81.1 %	100.0 %	-
Whole District		56.5 %	76.9 %	83.1 %	100.0 %	-
(Required Water Supply Facilities)						
RGCs Areas	Construction	-	11 RGCs	6 RGCs	-	17 RGCs
	Extension	-	-	11 RGCs	17 RGCs	-
Other Areas	Boreholes	-	390 nos.	361 nos.	1,638 nos.	2,389 nos.
	Repair	-	47 nos.	47 nos.	-	94 nos.
	Replace	-	160 nos.	233 nos.	1,297 nos.	1,690 nos.
3. Soroti District						
(Coverage)						
RGC		60.1 %	97.2 %	100.0 %	100.0 %	-
Out of RGC		71.2 %	75.6 %	81.7 %	100.0 %	-
Whole District		70.4 %	77.0 %	82.9 %	100.0 %	-
(Required Water Supply Facilities)						
RGCs Areas	Construction	-	7 RGCs	3 RGCs	1 RGC	11 RGCs
	Extension	-	-4 RGCs	11 RGCs	14 RGCs	-
Other Areas	Boreholes	-	303 nos.	437 nos.	2,202 nos.	2,947 nos.
	Repair	-	84 nos.	84 nos.	-	168 nos.
	Replace	-	169 nos.	244 nos.	1,532 nos.	1,945 nos.

The sub-county-wise details such as population, population served, coverages, etc. are summarized in Table 16-44, Table 16-45 and Table 16-46 for the Iganga, the Pallisa and the Soroti districts, respectively.

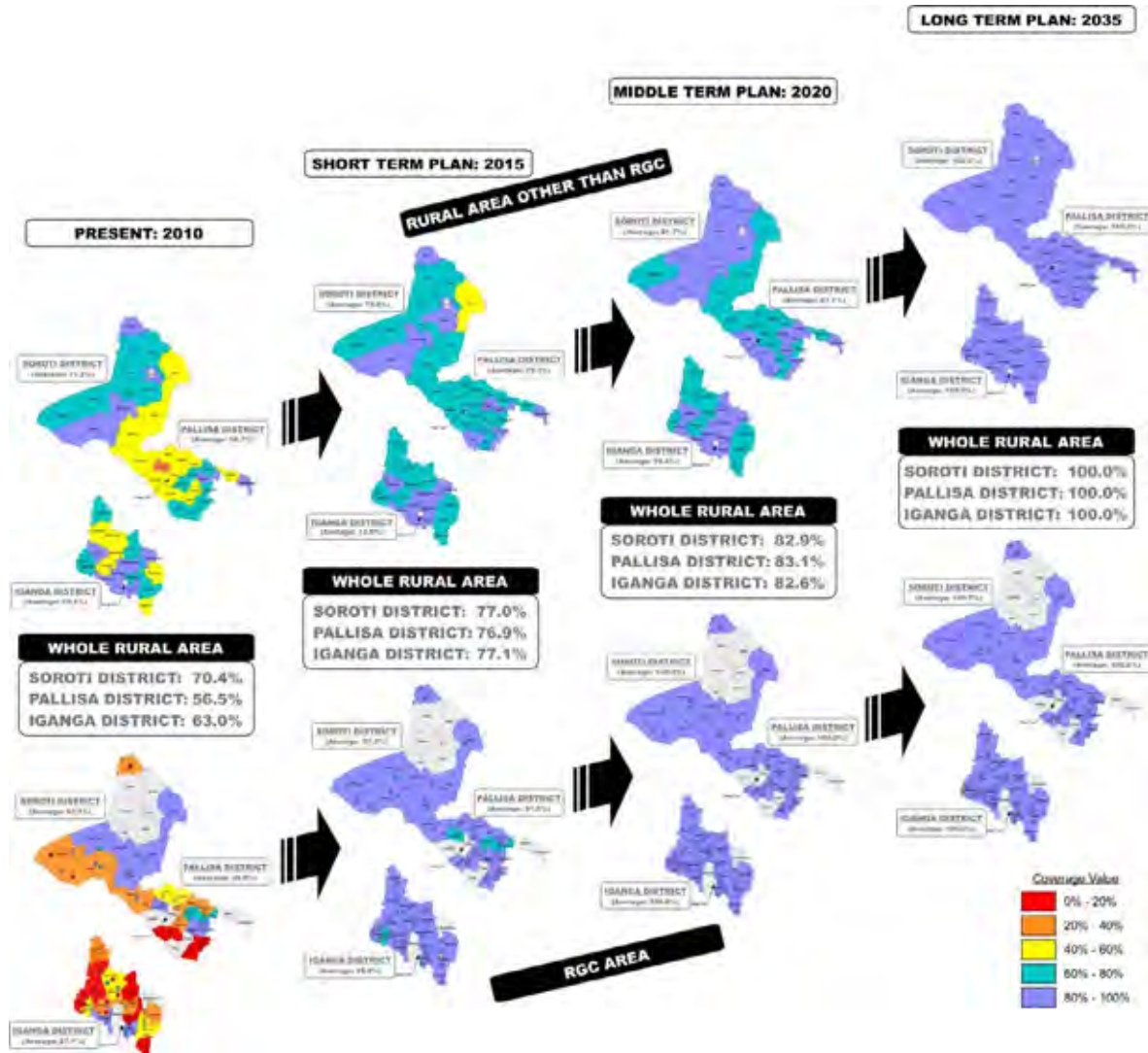


Figure 16-29 Improvement of Sub-county-wise Coverage in Priority Districts

Table 16-44 Water Supply Facilities to be Provided in Each Term for Iganga District

Sub-county	2010 (Present)			2015 (Short Term Plan)			2020 (Middle Term Plan)			2035 (Long Term Plan)						
	Pop.	Served Pop.	Coverage (%)	Water Supply Facilities	Pop.	Served Pop.	Coverage (%)	Water Supply Facilities	Pop.	Served Pop.	Coverage (%)	Water Supply Facilities	Pop.	Served Pop.	Coverage (%)	
Ikumbya	RGC	1,275	300	23.5	Ikumbya	1,508	1,508	100.0	Ikumbya (Extension)	1,783	1,783	100.0	Ikumbya (Extension)	2,948	2,948	100.0
	Out of RGC	28,489	17,430	61.2	Borehole	33,688	21,948	65.2	Borehole	39,836	29,948	75.2	Borehole	65,867	65,867	100.0
	Total	29,764	17,730	59.6		35,196	23,466	66.7		41,619	31,732	76.2		68,815	68,815	100.0
Bukooma	RGC	3,784	600	15.9	Bukooma, Nsigobya	4,075	4,075	100.0	Bukooma (Extension), Nsigobya (Extension)	5,291	5,291	100.0	Bukooma (Extension), Nsigobya (Extension)	8,749	8,749	100.0
	Out of RGC	33,841	19,800	58.5	Borehole	40,017	24,614	61.5	Borehole	47,320	33,837	71.5	Borehole	78,241	78,241	100.0
	Total	37,626	20,400	54.2		44,092	29,089	65.4		52,611	39,129	74.4		86,990	86,990	100.0
Bulongo	RGC	4,916	600	12.2	Nakabugur	5,814	5,814	100.0	Nakabugur (Extension)	6,874	6,874	100.0	Nakabugur (Extension)	11,367	11,367	100.0
	Out of RGC	24,615	20,700	84.1	Borehole	29,107	24,478	84.1	Borehole	34,419	28,944	84.1	Borehole	56,910	56,910	100.0
	Total	29,532	21,300	72.1		34,921	30,292	86.7		41,294	35,819	86.7		68,277	68,277	100.0
Irongo	RGC	3,861	300	7.8	Kyanvuma, Lambala	4,566	4,566	100.0	Kyanvuma (Extension), Lambala (Extension)	5,399	5,399	100.0	Kyanvuma (Extension), Lambala (Extension)	8,927	8,927	100.0
	Out of RGC	27,904	18,024	64.6	Borehole	32,997	22,303	67.6	Borehole	39,018	30,275	77.6	Borehole	64,514	64,514	100.0
	Total	31,765	18,324	57.7		37,563	26,869	71.5		44,417	35,674	80.3		73,441	73,441	100.0
Navampiti	RGC	3,912	1,800	46.0	Navampiti	4,626	3,485	75.3	Ikonia, Navampiti (Extension)	5,470	5,470	100.0	Ikonia (Extension), Navampiti (Extension)	9,044	9,044	100.0
	Out of RGC	19,951	14,400	72.2	Borehole	23,592	17,736	75.2	Borehole	27,897	22,367	80.2	Borehole	46,126	46,126	100.0
	Total	23,863	16,200	67.9		28,217	21,220	75.2		33,367	27,837	83.4		55,170	55,170	100.0
Bukanga	RGC	7,395	1,900	25.7	Buwologoma, Bumanya, Busilamu	8,745	8,745	100.0	Buwologoma (Extension), Bumanya (Extension), Busilamu (Extension)	10,340	10,340	100.0	Buwologoma (Extension), Bumanya (Extension), Busilamu (Extension)	17,097	17,097	100.0
	Out of RGC	36,135	21,112	58.4	Borehole	42,729	26,247	61.4	Borehole	50,527	36,089	71.4	Borehole	83,543	83,543	100.0
	Total	43,530	23,012	52.9		51,474	34,991	68.0		60,867	46,429	76.3		100,640	100,640	100.0
Waibuga	RGC	474	900	100.0	Borehole	560	900	100.0	Borehole	663	900	100.0	Waibuga	1,096	1,096	100.0
	Out of RGC	30,802	25,000	81.2	Borehole	36,423	29,562	81.2	Borehole	43,070	34,957	81.2	Borehole	71,213	71,213	100.0
	Total	31,276	25,900	82.8		36,983	30,462	82.4		43,732	35,857	82.0		72,309	72,309	100.0
Nawandala	RGC	2,953	1,200	40.6	Namusi	3,492	2,860	81.9	Namusi (Extension), Nawandala	4,129	4,129	100.0	Namusi (Extension), Nawandala (Extension)	6,827	6,827	100.0
	Out of RGC	26,754	13,448	50.3	Borehole	31,637	20,648	65.3	Borehole	37,410	28,157	75.3	Borehole	61,856	61,856	100.0
	Total	29,707	14,648	49.3		35,128	23,508	66.9		41,539	32,286	77.7		68,683	68,683	100.0
Nambale	RGC	19,599	2,700	13.8	Nabitende Banada, Nambale	23,176	23,176	100.0	Nabitende Banada (Extension), Nambale (Extension)	27,405	27,405	100.0	Nabitende Banada (Extension), Nambale (Extension)	45,313	45,313	100.0
	Out of RGC	21,102	16,206	76.8	Borehole	24,952	19,912	79.8	Borehole	29,506	25,021	84.8	Borehole	48,787	48,787	100.0
	Total	40,701	18,906	46.5		48,128	43,088	89.5		56,911	52,426	92.1		94,100	94,100	100.0
Nabitende	RGC	3,545	2,100	59.2	Nabitende Kalungami	4,191	4,622	100.0	Nabitende Kalungami (Extension)	4,956	5,137	100.0	Bugoma (Extension), Nabitende Kalungami (Extension)	8,195	8,195	100.0
	Out of RGC	27,028	13,736	50.8	Borehole	31,961	21,037	65.8	Borehole	37,793	28,655	75.8	Borehole	62,489	62,489	100.0
	Total	30,573	15,836	51.8		36,152	25,659	71.0		42,749	33,792	79.0		70,684	70,684	100.0
Namalembe	RGC	0	0	0.0	Borehole	0	0	0.0	Borehole	0	0	0.0	Borehole	0	0	0.0
	Out of RGC	19,250	19,024	98.8	Borehole	22,763	22,495	98.8	Borehole	26,917	26,601	98.8	Borehole	44,507	44,507	100.0
	Total	19,250	19,024	98.8		22,763	22,495	98.8		26,917	26,601	98.8		44,507	44,507	100.0
Namung'ale	RGC	12,240	2,800	22.9	Namung'ale	14,474	14,474	100.0	Namung'ale (Extension)	17,115	17,115	100.0	Namung'ale (Extension)	28,299	28,299	100.0
	Out of RGC	24,174	20,018	82.8	Borehole	28,585	23,671	82.8	Borehole	33,801	27,991	82.8	Borehole	55,889	55,889	100.0
	Total	36,414	22,818	62.7		43,059	38,145	88.6		50,916	45,106	88.6		84,187	84,187	100.0
Buyanga	RGC	2,565	900	35.1	Kivanyi	3,033	3,033	100.0	Kivanyi (Extension)	3,587	3,587	100.0	Kivanyi (Extension)	5,931	5,931	100.0
	Out of RGC	33,261	16,848	50.7	Borehole	39,331	25,822	65.7	Borehole	46,509	35,185	75.7	Borehole	76,900	76,900	100.0
	Total	35,827	17,748	49.5		42,365	28,856	68.1		50,096	38,772	77.4		82,830	82,830	100.0
Nakalama	RGC	5,840	1,000	17.1	Nakalama	6,905	6,905	100.0	Nakalama (Extension)	8,165	8,165	100.0	Nakalama (Extension)	13,501	13,501	100.0
	Out of RGC	27,588	21,618	78.4	Borehole	32,623	26,542	81.4	Borehole	38,576	33,314	86.4	Borehole	63,783	63,783	100.0
	Total	33,428	22,618	67.7		39,528	33,447	84.6		46,741	41,479	88.7		77,284	77,284	100.0
Bulamagi	RGC	0	0	0.0	Borehole	0	0	0.0	Borehole	0	0	0.0	Borehole	0	0	0.0
	Out of RGC	45,093	36,836	81.7	Borehole	53,322	43,558	81.7	Borehole	63,052	51,507	81.7	Borehole	104,254	104,254	100.0
	Total	45,093	36,836	81.7		53,322	43,558	81.7		63,052	51,507	81.7		104,254	104,254	100.0
Nakigo	RGC	3,880	3,300	85.0	Nakigo, Kabira	4,589	3,300	71.9	Nakigo, Kabira	5,426	5,406	99.6	Nakigo (Extension), Kabira (Extension)	8,971	8,971	100.0
	Out of RGC	19,039	16,912	88.8	Borehole	22,513	19,998	88.8	Borehole	26,621	23,648	88.8	Borehole	44,017	44,017	100.0
	Total	22,919	20,212	88.2		27,102	23,298	86.0		32,047	29,054	90.7		52,989	52,989	100.0
Ibulanku	RGC	9,022	3,800	42.1	Busesa, Nakiyumbi	10,668	9,075	85.1	Busesa (Extension), Ibulanku T/C, Nakiyumbi (Extension)	12,615	12,615	100.0	Busesa (Extension), Ibulanku T/C (Extension), Nakiyumbi (Extension)	20,858	20,858	100.0
	Out of RGC	40,545	28,818	71.1	Borehole	47,944	35,515	74.1	Borehole	56,693	44,831	79.1	Borehole	93,738	93,738	100.0
	Total	49,567	32,618	65.8		58,612	44,590	76.1		69,308	57,446	82.9		114,597	114,597	100.0
Makuntu	RGC	3,606	300	8.3	Nontwe	4,264	4,264	100.0	Nontwe (Extension)	5,042	5,042	100.0	Nontwe (Extension)	8,336	8,336	100.0
	Out of RGC	23,417	12,018	51.3	Borehole	27,690	18,365	66.3	Borehole	32,743	24,990	76.3	Borehole	54,139	54,139	100.0
	Total	27,022	12,318	45.6		31,954	22,628	70.8		37,785	30,032	79.5		62,475	62,475	100.0
Whole District	RGC	88,867	24,074	27.1	RGC	105,084	100,429	95.6	RGC	124,261	124,241	100.0	RGC	205,458	205,458	100.0
	Out of RGC	508,988	351,948	69.1	Borehole	601,873	444,460	73.8	Borehole	711,707	566,318	79.6	Borehole	1,176,772	1,176,772	100.0
	Total	597,855	376,448	63.0		706,957	544,889	77.1		835,968	690,559	82.6		1,382,230	1,382,230	100.0

Table 16-45 Water Supply Facilities to be Provided in Each Term for Pallisa District

Sub-county	2010 (Present)			2015 (Short Term Plan)			2020 (Middle Term Plan)			2035 (Long Term Plan)						
	Pop.	Served Pop.	Coverage(%)	Water Supply Facilities	Pop.	Served Pop.	Coverage(%)	Water Supply Facilities	Pop.	Served Pop.	Coverage(%)	Water Supply Facilities	Pop.	Served Pop.	Coverage(%)	
Gogonyo	RGC	2,486	900	36.2	Kapala	2,950	2,574	87.2	Gogonyo (Extension)	2,950	3,502	100.0	Gogonyo (Extension), Kapala (Extension)	5,858	5,858	100.0
	Out of RGC	20,154	9,000	44.7	Borehole	23,924	15,468	64.7	Borehole	28,398	21,768	76.7	Borehole	47,496	47,496	100.0
	Total	22,640	9,900	43.7		26,874	18,042	67.1		31,900	25,271	79.2		53,354	53,354	100.0
Agule	RGC	2,517	1,400	55.6	Agule	2,988	2,988	100.0	Agule (Extension)	3,546	3,546	100.0	Agule (Extension)	5,932	5,932	100.0
	Out of RGC	25,082	10,542	42.0	Borehole	29,773	18,468	62.0	Borehole	35,341	26,163	74.0	Borehole	59,108	59,108	100.0
	Total	27,599	11,942	43.3		32,760	21,456	65.5		38,887	29,709	76.4		65,040	65,040	100.0
Kameke	RGC	2,600	1,200	46.2	Kameke	3,194	3,194	100.0	Kameke (Extension)	3,663	3,663	100.0	Kameke (Extension)	6,127	6,127	100.0
	Out of RGC	24,332	11,106	45.6	Borehole	29,890	19,621	65.6	Borehole	34,284	26,619	77.6	Borehole	57,340	57,340	100.0
	Total	26,932	12,306	45.7		33,084	22,815	69.0		37,947	30,283	79.8		63,468	63,468	100.0
Kibale	RGC	2,387	900	37.7	Kibale Pallisa	2,833	2,833	100.0	Kibale Pallisa (Extension)	3,363	3,363	100.0	Kibale Pallisa (Extension)	5,625	5,625	100.0
	Out of RGC	25,634	11,630	45.4	Borehole	30,428	19,891	65.4	Borehole	36,119	27,945	77.4	Borehole	60,410	60,410	100.0
	Total	28,021	12,530	44.7		33,262	22,724	68.3		39,482	31,308	79.3		66,035	66,035	100.0
Butebe	RGC	1,144	300	26.2	Butebe	1,358	1,358	100.0	Butebe (Extension)	1,612	1,612	100.0	Butebe (Extension)	2,696	2,696	100.0
	Out of RGC	23,383	17,066	73.0	Borehole	27,756	21,645	78.0	Borehole	32,947	27,341	83.0	Borehole	55,104	55,104	100.0
	Total	24,527	17,366	70.8		29,114	23,003	79.0		34,558	28,953	83.8		57,800	57,800	100.0
Kakoro	RGC	0	0	0.0		0	0	0.0		0	0	0.0		0	0	0.0
	Out of RGC	17,936	10,400	58.0	Borehole	21,291	13,410	63.0	Borehole	25,273	17,181	68.0	Borehole	42,269	42,269	100.0
	Total	17,936	10,400	58.0		21,291	13,410	63.0		25,273	17,181	68.0		42,269	42,269	100.0
Kabwagashi	RGC	0	0	0.0		0	0	0.0		0	0	0.0		0	0	0.0
	Out of RGC	19,328	19,118	98.9	Borehole	22,943	22,693	98.9	Borehole	27,234	26,937	98.9	Borehole	45,549	45,549	100.0
	Total	19,328	19,118	98.9		22,943	22,693	98.9		27,234	26,937	98.9		45,549	45,549	100.0
Apopong	RGC	1,248	1,100	88.1		1,481	1,100	74.3	Kabele	1,758	1,758	100.0	Kabele (Extension)	2,941	2,941	100.0
	Out of RGC	22,342	8,506	38.1	Borehole	26,520	16,727	63.1	Borehole	31,480	23,633	75.1	Borehole	52,651	52,651	100.0
	Total	23,590	9,606	40.7		28,002	17,827	63.7		33,239	25,391	76.4		55,592	55,592	100.0
Kasodo	RGC	0	0	0.0		0	0	0.0		0	0	0.0		0	0	0.0
	Out of RGC	27,515	14,112	51.3	Borehole	32,660	24,916	76.3	Borehole	38,768	34,228	88.3	Borehole	64,841	64,841	100.0
	Total	27,515	14,112	51.3		32,660	24,916	76.3		38,768	34,228	88.3		64,841	64,841	100.0
Pallisa	RGC	0	0	0.0		0	0	0.0		0	0	0.0		0	0	0.0
	Out of RGC	13,809	8,100	58.7	Borehole	16,392	11,254	68.7	Borehole	19,457	14,332	73.7	Borehole	32,543	32,543	100.0
	Total	13,809	8,100	58.7		16,392	11,254	68.7		19,457	14,332	73.7		32,543	32,543	100.0
Puti-Puti	RGC	1,056	300	28.4	Boliso TIC	1,253	1,253	100.0	Boliso TIC (Extension)	1,487	1,487	100.0	Boliso TIC (Extension)	2,488	2,488	100.0
	Out of RGC	20,569	12,924	62.8	Borehole	24,416	17,783	72.8	Borehole	28,982	22,557	77.8	Borehole	48,472	48,472	100.0
	Total	21,624	13,224	61.2		25,669	19,036	74.2		30,469	24,045	78.9		50,960	50,960	100.0
Kamuge	RGC	2,210	1,500	67.9		2,623	1,500	57.2	Kamuge	3,114	3,114	100.0	Kamuge (Extension)	5,208	5,208	100.0
	Out of RGC	16,826	12,412	73.8	Borehole	19,973	16,731	83.8	Borehole	23,709	19,860	83.8	Borehole	39,653	39,653	100.0
	Total	19,036	13,912	73.1		22,597	18,231	80.7		26,823	22,973	85.6		44,861	44,861	100.0
Petete	RGC	3,744	2,900	77.5	Petete	4,444	2,900	65.3	Petete	5,275	5,275	100.0	Petete (Extension)	8,823	8,823	100.0
	Out of RGC	18,525	15,924	86.0	Borehole	21,990	18,902	86.0	Borehole	26,102	22,437	86.0	Borehole	43,656	43,656	100.0
	Total	22,269	18,824	84.5		26,434	21,802	82.5		31,377	27,712	88.3		52,479	52,479	100.0
Buseta	RGC	8,008	900	11.2	Kasassira, Buseta	9,506	9,506	100.0	Kasassira (Extension), Buseta (Extension)	11,283	11,283	100.0	Kasassira (Extension), Buseta (Extension)	18,872	18,872	100.0
	Out of RGC	23,918	12,600	52.7	Borehole	28,391	22,054	77.7	Borehole	33,701	30,223	89.7	Borehole	56,365	56,365	100.0
	Total	31,926	13,500	42.3		37,897	31,560	83.3		44,984	41,506	92.3		75,237	75,237	100.0
Kibuku	RGC	0	0	0.0		0	0	0.0		0	0	0.0		0	0	0.0
	Out of RGC	14,911	6,000	40.2	Borehole	17,700	11,547	65.2	Borehole	21,010	16,228	77.2	Borehole	35,139	35,139	100.0
	Total	14,911	6,000	40.2		17,700	11,547	65.2		21,010	16,228	77.2		35,139	35,139	100.0
Tirinyi	RGC	0	0	0.0		0	0	0.0		0	0	0.0		0	0	0.0
	Out of RGC	16,786	13,224	78.8	Borehole	19,925	17,690	88.8	Borehole	23,651	20,998	88.8	Borehole	39,557	39,557	100.0
	Total	16,786	13,224	78.8		19,925	17,690	88.8		23,651	20,998	88.8		39,557	39,557	100.0
Kiririka	RGC	1,747	300	17.2	Nabisawa	2,074	2,074	100.0	Nabisawa (Extension)	2,462	2,462	100.0	Nabisawa (Extension)	4,117	4,117	100.0
	Out of RGC	17,138	11,118	64.9	Borehole	20,343	15,232	74.9	Borehole	24,148	19,288	79.9	Borehole	40,387	40,387	100.0
	Total	18,885	11,418	60.5		22,417	17,306	77.2		26,609	21,749	81.7		44,505	44,505	100.0
Kadama	RGC	12,173	900	7.4	Kabweti, Kadama	14,450	14,450	100.0	Kadama (Extension), Kabweti (Extension)	17,152	17,152	100.0	Kadama (Extension), Kabweti (Extension)	28,687	28,687	100.0
	Out of RGC	16,544	13,312	74.4	Borehole	19,638	16,578	84.4	Borehole	23,311	19,679	84.4	Borehole	38,988	38,988	100.0
	Total	28,717	13,212	46.0		34,088	31,028	91.0		40,463	36,831	91.0		67,675	67,675	100.0
Kagumu	RGC	2,345	2,000	85.3		2,784	2,000	71.9	Kigumu	3,304	3,304	100.0	Kigumu (Extension)	5,526	5,526	100.0
	Out of RGC	20,469	9,106	44.5	Borehole	24,297	16,883	69.5	Borehole	28,841	23,502	81.5	Borehole	48,237	48,237	100.0
	Total	22,814	11,106	48.7		27,080	18,883	69.7		32,145	26,806	83.4		53,763	53,763	100.0
Bulungira	RGC	2,080	2,200	100.0		2,469	2,200	89.1	Bulungira	2,931	2,931	100.0	Bulungira (Extension)	4,902	4,902	100.0
	Out of RGC	19,773	12,700	64.2	Borehole	23,471	17,422	74.2	Borehole	27,861	22,074	79.2	Borehole	46,598	46,598	100.0
	Total	21,853	14,900	68.2		25,940	19,622	75.6		30,792	25,004	81.2		51,500	51,500	100.0
Whole District	RGC	45,744	16,680	36.5	RGC	54,700	49,929	91.8	RGC	64,454	64,454	100.0	RGC	107,801	107,801	100.0
	Out of RGC	404,975	237,900	58.7	Borehole	481,720	362,328	75.2	Borehole	570,614	462,991	81.1	Borehole	954,365	954,365	100.0
	Total	450,719	254,700	56.5		536,127	412,257	76.9		635,069	527,446	83.1		1,062,167	1,062,167	100.0

Table 16-46 Water Supply Facilities to be Provided in Each Term for Soroti District

Sub-county	2010 (Present)			2015 (Short Term Plan)			2020 (Middle Term Plan)			2035 (Long Term Plan)						
	Pop.	Served Pop.	Coverage (%)	Water Supply Facilities	Pop.	Served Pop.	Coverage (%)	Water Supply Facilities	Pop.	Served Pop.	Coverage (%)	Water Supply Facilities	Pop.	Served Pop.	Coverage (%)	
Tubur	RGC	3,700	900	24.3	Water Supply Facilities	4,502	4,502	100.0	Water Supply Facilities	5,477	5,477	100.0	Water Supply Facilities	9,865	9,865	100.0
	Out of RGC	18,042	18,642	100.0	Aenna, Tubur	21,951	18,642	84.9	Aenna (Extension), Tubur (Extension)	26,707	22,681	84.9	Aenna (Extension), Tubur (Extension)	48,098	48,098	100.0
	Total	21,742	19,542	89.9	Borehole	26,453	23,144	87.5	Borehole	32,184	28,158	87.5	Borehole	57,962	57,962	100.0
Katine	Out of RGC	0	0	0.0	-	0	0	0.0	-	0	0	0.0	-	0	0	0.0
	Total	26,658	18,530	69.5	Borehole	32,434	25,788	79.5	Borehole	39,460	33,348	84.5	Borehole	71,066	71,066	100.0
	Out of RGC	0	0	0.0	-	0	0	0.0	-	0	0	0.0	-	0	0	0.0
Arapai	Out of RGC	0	0	0.0	-	0	0	0.0	-	0	0	0.0	-	0	0	0.0
	Total	38,195	25,836	67.6	Borehole	46,470	33,292	71.6	Borehole	56,538	46,159	81.6	Borehole	101,822	101,822	100.0
	Out of RGC	0	0	0.0	-	0	0	0.0	-	0	0	0.0	-	0	0	0.0
Kamuda	Out of RGC	34,556	24,842	71.9	Borehole	42,043	31,906	75.9	Borehole	51,151	41,376	80.9	Borehole	92,120	92,120	100.0
	Total	34,556	24,842	71.9	Borehole	42,043	31,906	75.9	Borehole	51,151	41,376	80.9	Borehole	92,120	92,120	100.0
	Out of RGC	0	0	0.0	-	0	0	0.0	-	0	0	0.0	-	0	0	0.0
Soroti	Out of RGC	17,649	20,324	100.0	Borehole	21,473	20,324	94.6	Borehole	26,125	24,727	94.6	Borehole	47,050	47,050	100.0
	Total	17,649	20,324	100.0	Borehole	21,473	20,324	94.6	Borehole	26,125	24,727	94.6	Borehole	47,050	47,050	100.0
	Out of RGC	1,820	1,700	93.4	Gweri	2,214	1,700	76.8	Gweri	2,694	2,694	100.0	Gweri (Extension)	4,852	4,852	100.0
Gweri	Out of RGC	46,311	20,284	43.8	Borehole	56,345	30,313	53.8	Borehole	68,552	43,736	63.8	Borehole	123,458	123,458	100.0
	Total	48,131	21,984	45.7	Borehole	58,559	32,013	54.7	Borehole	71,246	46,430	65.2	Borehole	128,310	128,310	100.0
	Out of RGC	0	0	0.0	-	0	0	0.0	-	0	0	0.0	-	0	0	0.0
Asuret	Out of RGC	37,310	28,666	76.8	Borehole	45,393	36,692	80.8	Borehole	55,227	47,403	85.8	Borehole	99,461	99,461	100.0
	Total	37,310	28,666	76.8	Borehole	45,393	36,692	80.8	Borehole	55,227	47,403	85.8	Borehole	99,461	99,461	100.0
	Out of RGC	0	0	0.0	-	0	0	0.0	-	0	0	0.0	-	0	0	0.0
Atitra	Out of RGC	20,516	15,500	75.6	Borehole	24,961	19,857	79.6	Borehole	30,369	25,677	84.6	Borehole	54,692	54,692	100.0
	Total	20,516	15,500	75.6	Borehole	24,961	19,857	79.6	Borehole	30,369	25,677	84.6	Borehole	54,692	54,692	100.0
	Out of RGC	500	500	100.0	Ocapa (Existing)	608	608	100.0	Ocapa (Existing, Extension)	740	740	100.0	Ocapa (Existing, Extension)	1,333	1,333	100.0
Olio	Out of RGC	31,420	28,006	89.1	Borehole	38,227	34,074	89.1	Borehole	46,509	41,456	89.1	Borehole	83,760	83,760	100.0
	Total	31,920	28,506	89.3	Borehole	38,835	34,682	89.3	Borehole	47,249	42,196	89.3	Borehole	85,093	85,093	100.0
	Out of RGC	6,000	6,000	100.0	Kyere (Existing), Ocapa (Existing)	7,300	7,300	100.0	Kyere (Existing, Extension), Ocapa (Existing, Extension)	8,881	8,881	100.0	Kyere (Existing, Extension), Ocapa (Existing, Extension)	15,995	15,995	100.0
Kyere	Out of RGC	40,969	22,618	55.2	Borehole	49,845	32,503	65.2	Borehole	60,645	45,609	75.2	Borehole	109,218	109,218	100.0
	Total	46,969	28,618	60.9	Borehole	57,145	39,803	69.7	Borehole	69,526	54,491	78.4	Borehole	125,213	125,213	100.0
	Out of RGC	3,118	2,900	93.0	Ocapa (Existing)	3,794	3,333	87.9	Inging, Ocapa (Existing, Extension)	4,615	4,615	100.0	Inging (Extension), Ocapa (Existing, Extension)	8,312	8,312	100.0
Kateta	Out of RGC	49,591	26,800	54.0	Borehole	60,335	38,640	64.0	Borehole	73,407	54,352	74.0	Borehole	132,202	132,202	100.0
	Total	52,709	29,700	56.3	Borehole	64,129	41,973	65.5	Borehole	78,022	58,967	75.6	Borehole	140,514	140,514	100.0
	Out of RGC	3,156	3,300	100.0	Kamodo (Existing)	3,840	3,920	100.0	Kamodo (Existing, Extension)	4,672	4,741	100.0	Kasilo, Kamodo (Existing, Extension)	8,413	8,413	100.0
Bugondo	Out of RGC	30,870	22,942	74.3	Borehole	37,558	29,415	78.3	Borehole	45,696	40,357	88.3	Borehole	82,295	82,295	100.0
	Total	34,026	26,242	77.1	Borehole	41,398	33,365	80.6	Borehole	50,367	45,098	89.5	Borehole	90,709	90,709	100.0
	Out of RGC	4,508	1,688	37.4	Kadungulu (Existing), Kagwara Port	5,485	5,485	100.0	Kadungulu (Existing, Extension), Kagwara Port (Extension)	6,674	6,674	100.0	Kadungulu (Existing, Extension), Kagwara Port (Extension)	12,019	12,019	100.0
Kadungulu	Out of RGC	21,331	15,030	70.5	Borehole	25,952	19,324	74.5	Borehole	31,575	25,090	79.5	Borehole	56,865	56,865	100.0
	Total	25,839	16,718	64.7	Borehole	31,437	24,810	78.9	Borehole	38,248	31,763	83.0	Borehole	68,883	68,883	100.0
	Out of RGC	9,209	2,400	26.1	Kidnok, Pingire Etem, Mulondo, Mugarama	11,204	11,086	98.9	Kidnok (Extension), Pingire Etem (Extension), Pingire Corner, Mulondo (Extension), Mugarama (Extension)	13,632	13,632	100.0	Kidnok (Extension), Pingire Etem (Extension), Pingire Corner (Extension), Mulondo (Extension), Mugarama (Extension)	24,550	24,550	100.0
Pingire	Out of RGC	39,685	37,724	95.1	Borehole	48,283	45,897	95.1	Borehole	58,744	55,841	95.1	Borehole	105,795	105,795	100.0
	Total	48,895	40,124	82.1	Borehole	59,448	56,983	95.8	Borehole	72,376	69,473	96.0	Borehole	130,345	130,345	100.0
	Out of RGC	32,012	19,244	60.1	RGC	38,947	37,854	97.2	RGC	47,386	47,386	100.0	RGC	85,339	85,339	100.0
Whole District	Out of RGC	453,104	322,469	71.2	Borehole	551,270	416,666	75.6	Borehole	670,705	547,811	81.7	Borehole	1,207,901	1,207,901	100.0
	Total	485,116	341,713	70.4	Borehole	590,218	454,521	77.0	Borehole	718,090	595,197	82.9	Borehole	1,293,240	1,293,240	100.0

16.4.6 Water Supply System

The rural areas consist of the population-dense areas of RGCs and those other than RGCs, and the water supply facilities to be applied are accordingly different each other; the piped water supply systems for RGC areas and the deep boreholes with hand pump for the other rural areas.

(1) Water Supply Facilities for Rural Areas Other than RGCs

The deep boreholes with hand pump are predominantly applied in the rural areas in the priority districts, since the groundwater resources are considered the most promising source for safe water supply in the districts. In the master plan, therefore, the deep boreholes with hand pump as shown in Figure 16-30 are proposed to be applied for the rural areas other than RGCs.

The boreholes of PVC casing and strainer with 5 in. diameter are drilled by the drilling diameters of 12 in. in the top soil, 10 in. in the weathered zone, and 7.5 in. in the fractured hard rock. The depths of drilled boreholes vary depending on the geological conditions. The expected depths of boreholes are estimated and presented together with the yields and success rates for each sub-county in Table 16-47.

The hand pump units are installed on top of the boreholes with a concrete apron and a soak pit. The U2/3 pumps are most predominantly used for the hand pumps for rural water supply in Uganda.

(2) Water Supply Facilities for RGC Areas

1) Categories of RGCs

The RGCs are divided into four (4) categories in terms of population scale as follows:

<u>Category</u>	<u>Population</u>
- Category I:	<1,000
- Category II:	1,000 - 3,000
- Category III:	3,000 - 5,000
- Category IV:	5,000<

RGCs are defined as villages having a population between 500 and 5,000, but those villages of which population is out of this range are often called as RGCs due to their administration and commercial functions.

Preliminary design and cost estimate will be conducted for the RGCs selected for representing each category of RGC, and the construction costs for the other RGCs will be estimated based on the cost per capita calculated for each category of RGC. The selected nine (9) RGCs are listed in Table 16-48.

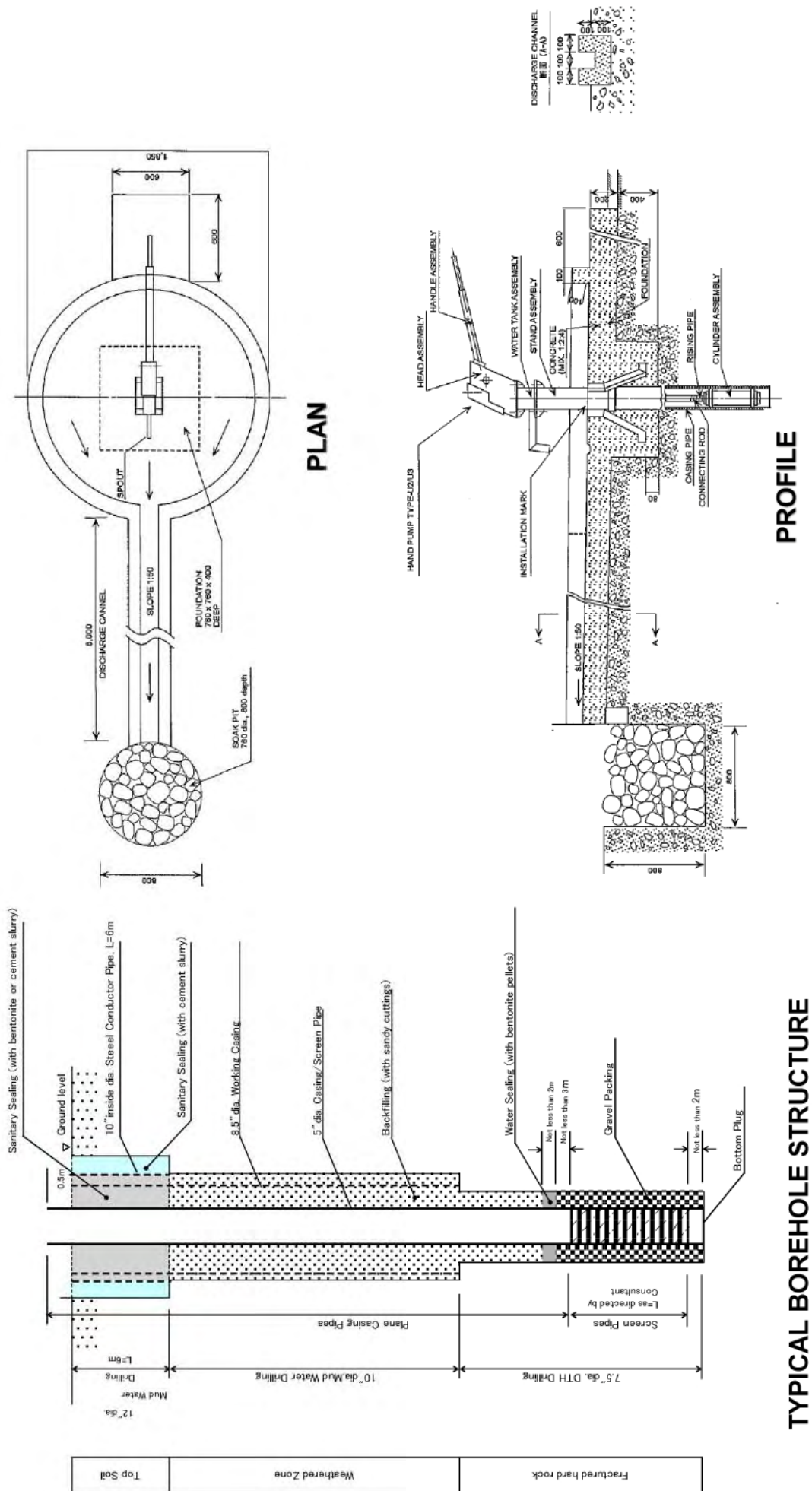


Figure 16-30 Typical Borehole Structure with Hand Pump for Rural Water Supply

Table 16-47 Number of Boreholes to be Constructed in Rural Areas of Priority Districts

Sub-county	Drilling Depth (m)	Static Water Level (m)	Average Yield (m ³ /h)	Success Rate (%)	Number of Boreholes to be Constructed in Each Term			
					2015	2020	2035	Total
1. Iganga District								
Buyanga	70.0	11.0	1.27	57.7	30	31	139	200
Ibulanku	67.0	13.0	3.38	72.5	22	31	163	216
Makuutu	63.0	14.0	1.46	59.3	21	22	97	140
Namalembe	62.0	10.0	4.58	75.9	12	14	60	86
Bulamagi	59.0	15.0	2.01	66.1	22	26	176	224
Nabitende	74.0	19.0	3.27	83.7	24	25	113	162
Nakalama	54.0	12.0	2.14	66.5	16	23	102	141
Nakigo	58.0	12.0	2.20	69.2	10	12	68	90
Nambale	63.0	16.0	4.79	80.3	12	17	79	108
Namungalwe	60.0	12.0	2.81	67.3	12	14	93	119
Nawandala	62.0	12.0	1.26	57.5	24	25	112	161
Bukanga	63.0	14.0	1.63	59.3	17	33	158	208
Bukooma	77.0	24.0	1.74	61.3	16	31	148	195
Bulongo	69.0	14.0	1.83	58.9	13	15	93	121
Ikumbya	65.0	18.0	2.33	68.9	15	27	120	162
Irongo	70.0	12.0	2.52	58.6	14	27	114	155
Nawampiti	71.0	15.0	2.23	68.3	11	15	79	105
Waibuga	65.0	14.0	1.04	51.0	15	18	121	154
2. Pallisa District								
Agule	66.0	10.0	1.23	57.2	26	26	110	162
Apopong	59.0	10.0	2.43	63.2	27	23	97	147
Gogonyo	64.0	8.0	2.04	63.8	22	21	86	129
Kameke	78.0	11.0	2.01	64.9	28	23	102	153
Kamuge	55.0	10.0	1.38	61.4	14	10	66	90
Kasodo	67.0	13.0	2.73	64.2	36	31	102	169
Pallisa	58.0	12.0	1.41	60.1	11	10	61	82
Puti-Puti	64.0	11.0	1.73	67.5	16	16	86	118
Butebo	67.0	9.0	1.23	56.7	15	19	93	127
Kabwangasi	74.0	11.0	1.65	61.0	12	14	62	88
Kakoro	64.0	9.0	3.44	76.1	10	13	84	107
Kibale	71.0	9.0	1.50	64.6	28	27	108	163
Petete	55.0	9.0	1.51	73.1	10	12	71	93
Bulangira	60.0	8.0	1.14	53.3	16	16	82	114
Buseta	60.0	11.0	1.77	64.7	32	27	87	146
Kadama	73.0	10.0	1.49	59.9	14	10	64	88
Kagumu	66.0	11.0	1.34	54.0	26	22	82	130
Kibuku	60.0	11.0	1.52	61.7	18	16	63	97
Kirika	66.0	10.0	1.56	59.1	14	14	70	98
Tirinyi	73.0	7.0	3.50	59.1	15	11	62	88
3. Soroti District								
Arapai	68.0	8.0	2.12	80.9	25	43	186	254
Asuret	63.0	9.0	2.05	73.5	27	36	174	237
Gweri	68.0	7.0	2.06	59.8	33	45	266	344
Kamuda	75.0	11.0	2.44	69.8	24	32	169	225
Katine	65.0	7.0	1.70	67.0	24	25	126	175
Soroti	69.0	7.0	3.03	69.9	0	15	74	89
Tubur	73.0	8.0	1.21	56.5	0	13	85	98
Bugondo	62.0	9.0	2.67	85.7	22	36	140	198
Kadungulu	82.0	8.0	6.69	87.6	14	19	106	139
Pingire	74.0	12.0	5.84	92.7	27	33	167	227
Atiira	70.0	8.0	1.77	81.5	15	19	97	131
Kateta	65.0	12.0	3.95	73.3	39	52	259	350
Kyere	68.0	9.0	3.67	77.9	33	44	212	289
Olio	66.0	13.0	1.55	56.0	20	25	141	186

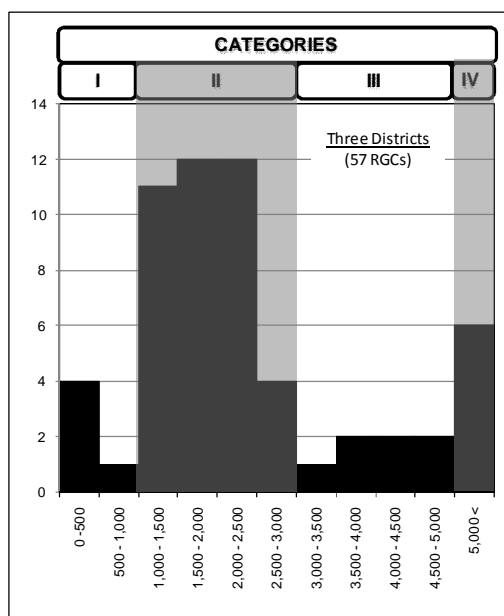


Figure 16-31 Distribution by Population Scale of RGCs

Table 16-48 RGCs Selected for Representing Categories

District and Sub-county	RGC	Population	Representing Category
Iganga District	1 Ikumbya	1,275	II-1
	2 Bukooma	1,642	II-1
	3 Nambale	4,835	III
	4 Namungalwe	12,240	IV
Pallisa District	5 Kameke	2,600	II-2
	6 Buseta	2,392	II-2
	7 Kadama	10,858	IV
Soroti District	8 Pingire	1,040	II-1
	9 Kadungulu	3,120	III

Note: RGC Categories: II-1: Population 1,000 - 2,000

II-2: Population 2,000 - 3,000

III: Population 3,000 - 5,000

IV: Population 5,000 <

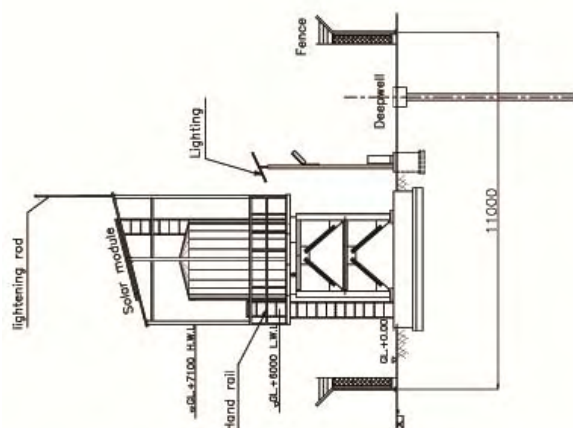
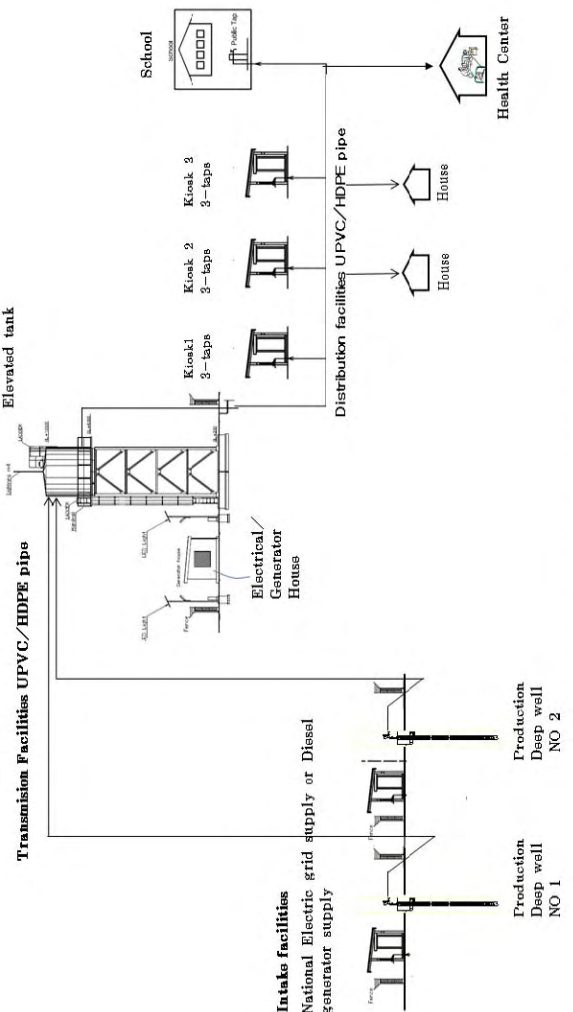
Category I is not considered since it is planned to be furnished point water source only for water supply.

Since as shown in Figure 7-15, the number of RGCs categorized into Category II is the most, this category is sub-categorised into two (2) categories; Category II-1 and II-2. As the areas and topography of each RGC is different from RGC to RGC even in the same category, the RGCs representing the category are selected at least two (2) in each category. Considering the number of existing RGCs in each district, four (4), three (3) and two (2) representative RGCs are allocated for the Iganga, the Pallisa and the Soroti districts, respectively. The selection of representative RGCs are conducted so that the population of the selected RGCs lean neither to larger nor to smaller side in the population range of each category. Since the RGCs of Category I is furnished with the point-water-source type of facility as mentioned later and the the project cost of this type of facility is considered almost same, the RGCs representing Category I is not selected.

2) Types and Service Levels of Water Supply Facilities to be Applied

According to “Long-term Strategy for Investment Planning, Implementation and Operation & Maintenance of Water Supply and Sanitation in Rural Growth Centers (2005)” published by Directorate of Water Development, Ministry of Water, Land and Environment, the point water sources of boreholes are to be applied for the RGCs of Category I of which population is not more than 1,000, and the piped water supply facilities are for the RGCs of Categories II, III and IV of which population is more than 1,000 as shown in Table 16-49.

Table 16-49 Categories of RGCs and Water Supply Facilities to be Applied

	Category I 500 - 1,000	Category II 1,000 - 3,000	Category III 3,000 - 5,000	Category IV 5,000 -
1. Population				
2. Consumption (liter/day/capita)		20 (2015), 25 (2020), 30 (2035)		
3. Type of Facilities	<p>Point Water Source Power Source: Solar power</p> 	<p>Piped Water Supply Facilities</p> <p>Electricity or diesel-generated power if commercial supply is not available. In case that NWS transmission is available near the RGC and its groundwater potential is judged to be poor comparing with the estimated demand, the system may be proposed to be connected such transmission.</p> 		
4. Operation Hours	12 hr. (Operation hours of solar-powered pump: 6 hr)	12 hr.	12 hr.	18 hr.
5. Distribution	On site taps	Water Kiosks 1 water kiosk covers 450 persons. No house connection is considered.	Water kiosks and house connections (yard taps) 1 water kiosk covers 450 persons House connections are considered for 10 % of RGC population with 6 persons/connection	

This system consists of a borehole, a motorized pumping unit, an on-site overhead storage tank and a water kiosk. The power system of the facilities for RGCs of Category I of which population are less than 1,000 are considered small comparing with those for the other categories, since their demands are also smaller. Though the construction and operation and maintenance costs of the power system is more expensive than the others, its difference is considered negligible even if the solar power system is adopted for the facilities of RGCs of Category I. Further, such small demand of RGCs of Category I is able to be supplied by the facilities of solar power generation even if its operational hour is as short as six (6) hours only. Therefore, the solar power generation system is applied for the power system of the water supply facilities for RGCs of Category I taking into account of advantages in operation and maintenance. Since the size and number of solar power modules are small, it is possible to set the modules on the elevated tank, resulting in advantages in security and light-harvesting. For the safety measures in the operation and maintenance works on the elevated tank a redder will be provided to climbing up and down. The water is sold at the water kiosk constructed beside the borehole. Size of the overhead tank is determined by the population served by this facility.

The piped water supply facilities applied for the RGCs of Categories II, III and IV of which population is more than 1,000 consist of the following components.

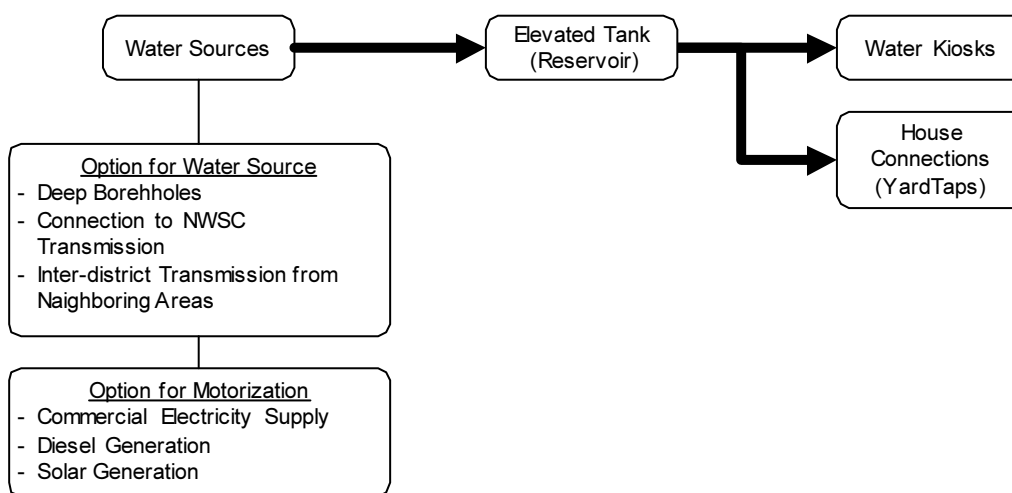


Figure 16-32 Flow Chart of Piped Water Supply System

The deep boreholes with submersible motor pump are mainly applied at the water source, and the water is conveyed by the raw water transmission to the elevated water tank (reservoir). The water is distributed by the distribution pipelines to the water kiosks constructed in the service areas, and sold to the peoples in the area. House connections by yard taps are also considered to a certain extent. In the RGCs of Category IV having the population more than 5,000, 10 % of the served population is proposed to receive the water by the yard taps which covers six (6) persons per tap. The water kiosks are provided to cover 450 persons per kiosk in the RGCs of Categories II, III and IV.

Since the groundwater is used mainly for water supply and any parameter of water quality is not found to be

treated, any treatment facility is not provided. Disinfection facility is not furnished because the water supply facilities are proposed to be disinfected in the course of the operation and maintenance by the operators of the facilities periodically.

a) Alternative Water Sources

Although the groundwater is used for the water supply for RGCs, there are some alternative water sources to be considered; the connection to NWSC transmission and the inter-district transmission from neighboring areas. These options are considered in only case that the groundwater potential is judged to be so limited in and around the RGC areas that it seems to be difficult to explore the required yields of boreholes to meet the water demand.

In the master plan, the water sources of the following RGCs are considered to be changed from groundwater to either NWSC transmission or neighboring areas transmitting the water to the said RGCs (Ref. Figure 16-32).

Iganga District

- Busiuro RGC: Five (5) numbers of deep boreholes are required to satisfy the water demand set for the long term plan for 2035. The potential yield is estimated at 2.2 m³/hr with a success rate of 20 %, and it is considered difficult to explore five (5) numbers of boreholes in the said RGC area. Therefore, it is proposed to take the water of Nawanpiti RGC area where 4.2 m³/hr of potential yield is expected with 2.5 % of success rate. The distance from the Nawanpiti RGC to Busiuro RGC is measured to be about eight (8) km.

Pallisa District

- Kibale Pallisa RGC: Four (4) numbers of deep boreholes are required to satisfy the water demand set for the long term plan for 2035. The potential yield is estimated at only 2.4 m³/hr with a success rate of 26 %, and more exploitation of the groundwater in the said RGC area seems to be quite difficult, and it is proposed to convey the water from the Kameke RGC to Kibale Pallisa RGC to fulfill the increased demand of the said RGC.
- Petete RGC: Six (6) deep boreholes are required to satisfy the water demand estimated for the long term plan for 2035, but 2.5 m³/hr of potential yield with 20 % success rate is expected resulting in the difficulty of more groundwater exploitation in the said RGC area. It is, therefore, proposed to connect the water supply system of this RGC to the NWSC transmission which has reached to the Kakoro town from the Mbale town. The distance from the Kakoro town to the Petete RGC is measured to be about 18 km.
- Kamuge RGC: Four (4) numbers of deep boreholes are required for this RGC in the long term plan for 2035, but potential yield is estimated only at 2.2 m³/hr with 28 % success rate. It is, therefore, proposed to connect the water supply system of this

RGC to the NWSC transmission which is proposed to be extended to Petete RGC. The distance of the pipeline for the connection from this RGC to the Petete RGC is measured to be 16 km.

- Kasassira RGC: Six (6) deep boreholes are required to fulfill the water demand of this RGC in 2035, but the expected yield is estimated to be 3.7 m³/hr with the success rate of 20 %. Therefore, it is proposed to convey the groundwater of the areas expanding south of the Pallisa town area where the yield better than this RGC area is expected. The distance between this RGC to the said area is measured to be about 12 km.
- Kadama RGC: This RGC is one of the largest ones in the Pallisa district, of which population grows over 25,000 in 2035, and requires 11 numbers of deep boreholes in the long term plan though its potential yield is estimated 3.9 m³/hr with 20 % of success rate. Therefore, in the long term plan it is proposed to convey the water from the neighboring Trinyi RGC area, where the potential yield better than this RGC is expectable. The distance from the Trinyi RGC to this RGC is measured about 14 km.

Soroti District

- Acuna RGC: The potential yield of this RGC area is estimated as low as 1.9 m³/hr with the success rate of 20 %, and situated in the so-called “water scares area” in the Soroti district. It is considered quite difficult to get the successful boreholes even having the yield for hand pump capacity. Two (2) boreholes are required to satisfy the demand for the short term plan for 2015 and six (6) boreholes are required in the long term plan. It is proposed to connect the water supply system of this RGC to the existing piped water system of the Tiriri RGC located about 12 km away from this RGC in the short term plan.
- Tubur RGC: The area of this RGC is also considered to be situated in the water scares area also, and it is judged to be quite difficult in exploiting the groundwater in this area. Therefore, it is proposed to connect the water supply system of this RGC to that of the Tiriri RGC in the short term plan. The transmission to this RGC is proposed to be branched out from that for the above Acuna RGC at about four (4) km point from the Tiriri RGC. The distance from the branch to this RGC is measured to be about six (6) km.

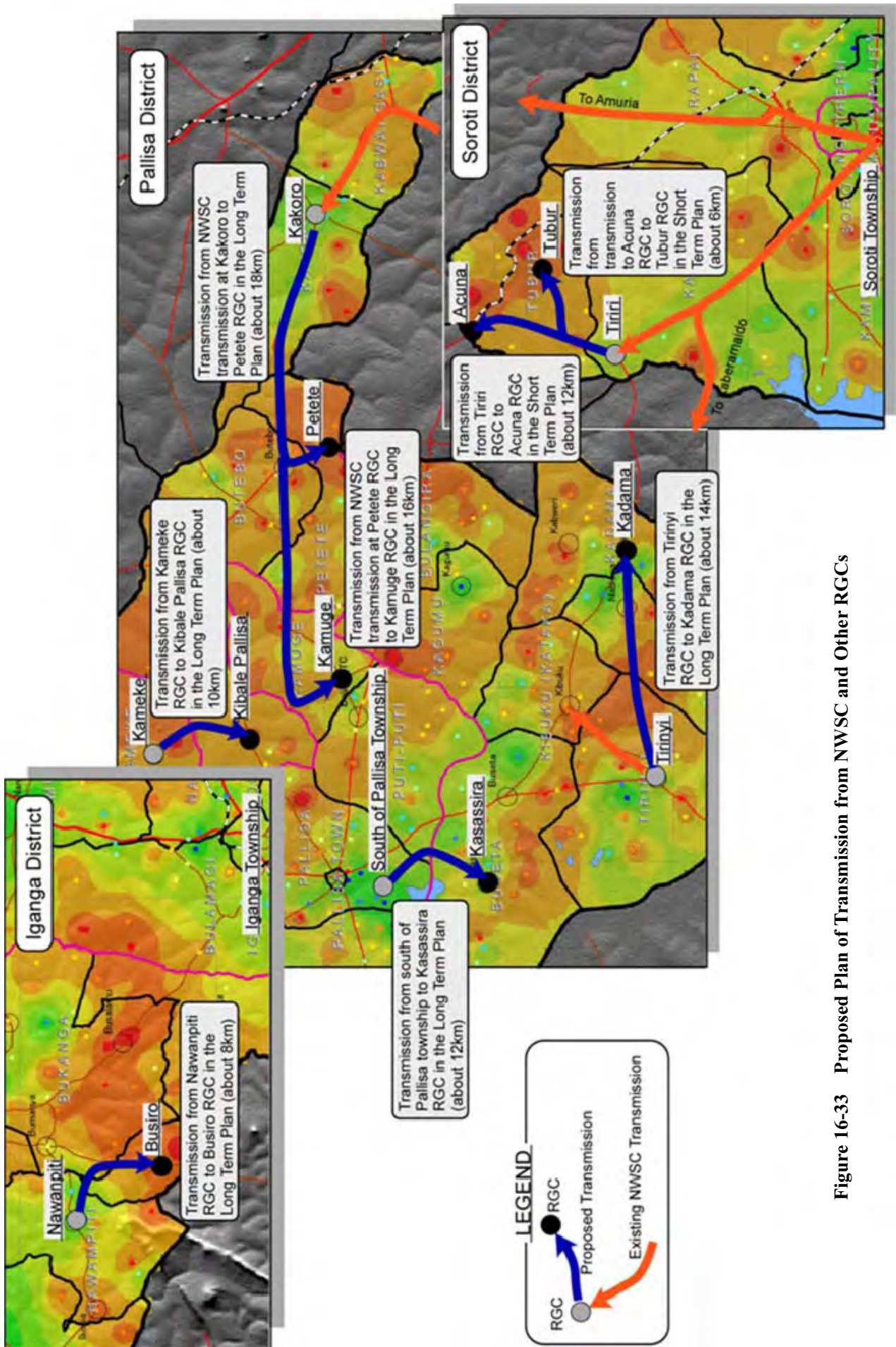


Figure 16-33 Proposed Plan of Transmission from NWSC and Other RGCs

b) Alternatives for Power Source of Submersible Motor Pump of Boreholes

As for the power source of the submersible motor pumps of boreholes, there are three (3) alternatives such as commercial electricity supply, diesel generation and solar generation are considered. As shown in Table 7-18, where the commercial electricity supply is available, it is proposed to use it as much as possible from view of economic efficiency. However, where such electricity supply is not available, either diesel or solar generation has to be applied. The construction and the replacement costs for the solar power generation are higher than the other power systems. However, the operation and maintenance cost is considered lower than the diesel generation though it is higher than the commercial electricity supply. It does not need the payment for the power source such as electricity fees and fuel charge requiring only the regular inspection and maintenance, and then it is considered attractive to apply. As a result of fair and integrated evaluation in this project taking into account that the construction and the replacement of the water supply facilities are one of the obligation of the government the diesel generation system is seemed to be the most effective for the piped water supply system for RGCs because its construction and replacement costs are lower than that of the diesel power generation. In addition, the operation hours of the solar generation is limited only in day time; the operation of six (6) hours is recommended in design the solar power generation in Uganda, which results in increasing the number of boreholes to be drilled in the areas where the groundwater potential is quite limited. Therefore, it is proposed to apply the diesel generation for the submersible motor pump of deep boreholes of piped water supply system considering the technical and economical view points discussed above. However, it is necessary to examine on the most appropriate power source to be applied before the implementation, since the price down of solar module due to recent rapid engineering innovation, necessity of environmental consideration, and rapid price escalation of fuel.

Table 16-50 Comparison of Power Sources for Piped Water Supply Systems

	Commercial Electricity Supply	Diesel Generation	Solar Generation
Descriptions	The piped water supply system serving population of 2,000 and the daily water demand of 40 m ³ /day is considered for the comparison. The comparison is made for the costs relating to the intake facilities and elevated tank.		
Outline of Applied Facility	<ul style="list-style-type: none"> - Operation hour: 12 hr. - Submersible motor pump: 2 nos. - Transmission pipelines: 1,000 m - Elevated tank: 40 m³, H=12 m - Life period: 30 years 		<ul style="list-style-type: none"> - Operation hour: 6 hr. - Submersible motor pump: 4 nos. - Transmission pipelines: 2,000 m - Elevated tank: 40 m³, H=12 m - Life period: 30 years
1. Construction	Construction cost for intake facility and elevated tank: 606,507,820 UGX	Construction cost for intake facility and elevated tank: 618,442,820 UGX	Construction cost for intake facility and elevated tank: 1,077,018,332 UGX
	A	B	C
2. Operation and Maintenance	Operation and Maintenance cost: 8,556,396 UGX Electricity fee is charged according to electricity consumption.	Operation and Maintenance cost: 16,373,500 UGX Fuel cost is expensive and spare parts are required for generator.	Operation and Maintenance cost: 12,250,600 UGX No energy cost is required. Only regular maintenance is needed.
	A	C	B
3. Replacement	Replacement cost: 57,833,000 UGX No cost for replacement of power supply facility is required except pumping equipment (2 nos.).	Replacement cost: 93,638,000 UGX Diesel generator has to be replaced as well as pumping equipment (2 nos.).	Replacement cost: 226,514,000 UGX Solar modules and pumping equipment have to be replaced. Six (6) units of pumping equipment are

Table 16-50 Comparison of Power Sources for Piped Water Supply Systems

	Commercial Electricity Supply	Diesel Generation	Solar Generation
Descriptions	The piped water supply system serving population of 2,000 and the daily water demand of 40 m ³ /day is considered for the comparison. The comparison is made for the costs relating to the intake facilities and elevated tank.		
	A	B	required to be replaced. C
4. Overall Judgement	A	B	C

3) Term-wise Development of Water supply Facilities for RGCs

In the master plan, there are three (3) target years are set; the short term plan for 2015, the middle term plan for 2020 and the long term plan for 2035. The scales and capacities of the water supply facilities are planned so as to meet the demand of each target year. The term to the first target year of 2015 is five (5) years, and that to the second target year of 2020 is five years after the first target year. The period from the second target year to the final target of 2035 is 15 years. The capacity of the elevated tank and the size of main distribution pipelines are considered difficult to expand to meet the demand of second target year after the construction in the short term plan. Therefore, these parts of the facilities are to be planned to meet the demand of the second target year of 2020 when they are constructed in the short term plan. The other parts of facilities such as water source facilities (deep boreholes), transmission pipelines to elevated tanks, water kiosks and yard taps are planned to be provided to meet to the demands of each target year. The sizes and capacities of the elevated tanks and the main distribution pipelines are planned to meet the demand of 2020, even when they are constructed in the short term plan. The project period from the initial year of 2010 to the last year of 2035 is 25 years, and the population gains about twice of the initial year and the consumption per capita is also set 30 liter/day/capita equivalent to 1.5 times of 15 liter/day/capita for the short term plan. Therefore, all the facilities from the water source to the water kiosks are planned additionally to be constructed to meet the demand of the long term plan (2035).

4) Future Demand and Water Capacity

The present and the future daily water demands of RGCs are shown in Table 16-51. The following manners and methods are applied in the preliminary design of the water supply facilities for the selected RGCs.

a) Deep Boreholes

The deep boreholes with 5 in. diameter of PVC casings and strainers are constructed the depth of drilled borehole varies depending upon the hydrogeological conditions of source area. The number of boreholes to be required is determined with dividing the daily demand by the operation hours and potential yield.



Intake Borehole for RGC

Table 16-51 Water Supply Facilities for RGCs in Priority Districts

Sub-county	RGC	Term of Imple.	Population					Category of RGC			Water Demand (m ³ /day)*			Electricity Availability	Power Source			Operation Hours			Groundwater			Req. No. of Borehole	Transmission (m)	Remarks						
			2015	2020	2035	2015	2020	2035	2015	2020	2035	2015	2020		2035	2015	2020	2035	2015	2020	2035	2015	2020				2035					
																												2015	2020	2035	2015	2020
I. Iganga District																																
1	Kumbaya	ST	1,508	1,783	2,948	II	II	II	30.2	44.6	88.4	NA	DG	DG	DG	12	12	12	12	12	12	4.2	20	90	1	1	2	1,000				
		ST	2,533	2,995	4,952	II	II	III	50.7	74.9	148.6	A	EP	EP	EP	EP	12	12	12	12	12	12	3.3	20	60	2	2	3	3,400			
		ST	1,942	2,296	3,797	II	II	III	38.8	57.4	113.9	A	EP	EP	EP	EP	12	12	12	12	12	12	4.8	35	70	1	1	2	1,650			
		3	Bulongo	ST	5,814	6,874	11,367	IV	IV	IV	116.3	171.9	341.0	A	EP	EP	EP	EP	18	18	18	18	18	3.8	29	50	2	3	5	3,200		
				ST	2,050	2,425	4,009	II	II	III	41.0	60.6	120.3	A	EP	EP	EP	EP	12	12	12	12	12	5.1	34	50	1	1	2	500		
		4	Irongo	ST	2,515	2,974	4,918	II	II	III	50.3	74.4	147.5	A	EP	EP	EP	EP	12	12	12	12	12	6.2	31	120	1	1	2	2,000		
				MT	2,141	2,532	4,186	-	II	III	-	63.3	125.6	NA	DG	DG	DG	-	12	12	12	12	12	4.0	20	130	-	2	3	3,200		
		6	Bukanga	ST	2,485	2,938	4,858	II	II	III	49.7	73.5	145.7	NA	DG	DG	DG	12	12	12	12	12	12	4.2	25	60	1	2	3	700		
				ST	2,262	2,674	4,422	II	II	III	45.2	66.9	132.6	NA	DG	DG	DG	12	12	12	12	12	12	3.7	22	80	2	2	3	4,200		
				ST	2,280	2,696	4,457	II	II	III	45.6	67.4	133.7	NA	DG	DG	DG	12	12	12	12	12	12	2.9	29	120	2	2	3	3,000		
				ST	2,231	2,639	4,363	II	II	III	44.6	66.0	130.9	A	EP	EP	EP	EP	12	12	12	12	12	2.2	20	50	2	2	3	3,200	Transmit from Nawampiti in LT Plan	
				ST	1,972	2,332	3,856	II	II	III	39.4	58.3	115.7	NA	DG	DG	DG	12	12	12	12	12	12	3.3	26	80	1	2	3	1,700		
		7	Waibuga	LT	560	663	1,096	-	II	III	-	0.0	0.0	NA	-	DG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,400	
				ST	1,960	2,318	3,832	II	II	III	39.2	57.9	115.0	A	EP	EP	EP	EP	12	12	12	12	12	3.2	20	70	2	2	3	3,400		
				MT	1,532	1,811	2,995	-	II	III	-	45.3	89.8	A	-	EP	-	-	-	-	-	-	-	1.6	19	34	70	-	2	3	3,000	
		9	Nambale	ST	5,717	6,760	11,178	IV	IV	IV	114.3	169.0	335.3	A	EP	EP	EP	EP	18	18	18	18	18	4.7	56	50	2	2	4	1,600		
				ST	17,459	20,645	34,135	IV	IV	IV	349.2	516.1	1,024.1	A	EP	EP	EP	EP	18	18	18	18	18	7.2	42	60	3	4	8	3,500		
		10	Nabintende	LT	1,369	1,619	2,677	-	II	III	-	80.3	165.5	A	-	EP	-	-	-	-	-	-	-	3.4	56	60	-	-	2	4,400		
ST	2,822			3,337	5,518	II	II	III	56.4	83.4	165.5	A	EP	EP	EP	EP	12	12	12	12	12	18	3.5	56	90	2	2	3	2,000			
12	Nawungatwe	ST	14,474	17,115	28,299	IV	IV	IV	289.5	427.9	849.0	A	EP	EP	EP	EP	18	18	18	18	18	8.0	25	60	3	3	6	2,250				
		ST	3,033	3,587	5,931	III	III	III	60.7	89.7	177.9	A	EP	EP	EP	EP	12	12	12	12	12	2.3	20	31	50	3	4	4,500				
14	Nakalama	ST	6,905	8,165	13,501	IV	IV	IV	138.1	204.1	405.0	A	EP	EP	EP	EP	18	18	18	18	18	3.9	30	50	2	3	6	3,240				
		MT	-	-	-	-	II	III	-	0.0	0.0	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
16	Nakigo	MT	2,412	2,852	4,716	-	II	III	-	71.3	141.5	A	-	EP	-	-	-	-	-	-	-	4.1	26	70	-	-	2	2,000				
		MT	1,652	1,954	3,231	-	II	III	-	48.8	96.9	A	-	EP	-	-	-	-	-	-	-	12	12	2.8	42	60	-	2	3	2,000		
17	Ibulanku	LT	524	619	1,024	-	II	III	-	-	30.7	A	-	-	-	-	-	-	-	-	-	3.2	30	70	-	-	1	1,500				
		ST	4,825	5,705	9,433	III	III	IV	96.5	142.6	283.0	A	EP	EP	EP	EP	12	12	12	12	12	5.2	30	50	2	2	4	2,800				
18	Makutu	MT	3,004	3,658	6,049	-	III	IV	-	91.5	181.5	A	-	EP	-	-	-	-	-	-	-	18	5.2	37	60	-	2	2	1,000			
		ST	2,750	3,252	5,377	II	II	III	55.0	81.3	161.3	A	EP	EP	EP	EP	12	12	12	12	12	18	4.2	40	70	2	2	3	3,900			
II. Pallisa District	Gogonyo	MT	377	447	748	-	I	II	-	11.2	22.4	A	-	SP	-	-	-	-	-	-	-	6	6	3.8	29	70	-	1	1	-		
		ST	2,574	3,055	5,110	II	III	IV	51.5	76.4	153.3	A	EP	EP	EP	EP	12	12	12	12	12	18	3.2	30	80	2	2	3	1,480			
		ST	2,988	3,546	5,932	II	III	IV	59.8	88.7	177.9	A	EP	EP	EP	EP	12	12	12	12	12	18	3.3	28	70	2	3	3	3,000			
		3	Kameke	ST	3,194	3,663	6,127	III	III	IV	63.9	91.6	183.8	A	EP	EP	EP	EP	12	12	12	12	12	3.9	27	80	2	2	3	2,960		
				ST	2,833	3,363	5,625	II	III	IV	56.7	84.1	168.7	A	EP	EP	EP	EP	12	12	12	12	12	18	2.4	26	60	2	3	3+1	7,000	Transmit from Kamekie in LT Plan
		5	Butebo	ST	1,358	1,612	2,696	II	II	III	27.2	40.3	80.9	A	EP	EP	EP	EP	12	12	12	12	12	2.3	20	110	1	2	3	1,200		
				MT	1,481	1,758	2,941	-	II	III	-	44.0	88.2	A	-	EP	-	-	-	-	-	-	-	12	2.5	23	70	-	2	3	3,860	
		7	Puti-Puti	ST	1,253	1,487	2,488	II	II	III	25.1	37.2	74.6	A	EP	EP	EP	EP	12	12	12	12	12	2.4	30	70	1	2	3	1,200		
				MT	2,623	3,114	5,208	-	III	IV	-	77.8	156.2	A	-	EP	-	-	-	-	-	-	-	18	2.2	28	70	-	3	3+NW	33,890	Connected to NWSC Transmission in LT Plan
		9	Petete	MT	4,444	5,275	8,823	-	IV	IV	-	131.9	264.7	A	-	EP	-	-	-	-	-	-	-	18	2.5	20	50	-	3	3+NW	18,500	Connected to NWSC Transmission in LT Plan
				ST	6,666	7,913	13,235	IV	IV	IV	133.3	197.8	397.0	A	EP	EP	EP	EP	18	18	18	18	18	3.7	20	60	3	3	5	3,555		
		11	Kirika	ST	2,839	3,370	5,637	II	III	IV	56.8	84.3	169.1	A	EP	EP	EP	EP	12	12	12	12	12	18	3.6	20	60	2	2	3	3,240	
				ST	2,074	2,462	4,117	II	II	III	31.2	46.3	93.0	A	EP	EP	EP	EP	12	12	12	12	12	3.5	20	80	1	2	3	1,650		
		13	Kadama	ST	1,562	1,854	3,100	II	II	III	41.2	60.6	121.2	A	EP	EP	EP	EP	12	12	12	12	12	2.6	26	90	2	2	3	2,360		
				ST	12,888	15,298	25,587	IV	IV	IV	257.8	382.5	767.6	A	EP	EP	EP	EP	18	18	18	18	18	2.3	3.9	20	70	4	6+2	14,500	Transmit from Trinyi in LT Plan	
		14	Bulungira	MT	2,784	3,304	5,526	-	III	IV	-	82.6	165.8	NA	-	DG	-	-	-	-	-	-	-	2.4	31	90	-	3	3	600		
				MT	2,469	2,931	4,902	-	II	III	-	73.3	147.1	A	-	EP	-	-	-	-	-	-	-	4.1	25	60	-	2	3	3,560		
		III. Soroti District	1 Tubur	ST	2,069	2,517	4,533	II	II	III	41.4	62.9	136.0	A	EP	EP	EP	EP	12	12	12	12	12	1.9	20	-	-	NW	NW	NW	10,495	Connected to NWSC Transmission of Trinyi in ST Plan
ST	2,433			2,960	5,332	II	II	IV	48.7	74.0	160.0	A	EP	EP	EP	EP	12	12	12	12												

Sub-county	RGC	Term of Imple. Existing Existing MT Existing	Population			Category of RGC	Water Demand (m ³ /day)*			Electricity Availability	Power Source			Operation Hours			Groundwater			Req. No. of Borehole	Transmission (m)	Remarks		
			2015	2020	2035		2015	2020	2035		2015	2020	2035	2015	2020	2035	2015	2020	2035				Potential Yield (m ³ /hr)	Success Rate (%)
4 Kyere	Owapa	Existing	2,433	2,960	5,332	IV	109.5	166.5	359.9	A	EP	EP	EP	18	18	18	4.2	-	60	5	1,500			
	Kyere	Existing	4,867	5,921	10,663	IV	97.3	148.0	319.9	A	EP	EP	EP	12	18	18	4.2	-	60	5	1,000			
	Iningo	MT	1,360	1,655	2,980	II	-	41.4	89.4	NA	-	DG	DG	-	12	12	7.5	30	60	1	300			
6 Bugondo	Owapa	Existing	2,433	2,960	5,332	-	-	-	A	-	-	-	-	-	-	-	4.9	-	-	-	-	-		
	Kasilo	LT	190	231	416	I	-	-	12.5	NA	-	SP	SP	-	-	-	2.1	72	70	1	-	-		
	Kamod	Existing	3,650	4,441	7,998	III	73.0	111.0	239.9	A	EP	EP	EP	12	12	18	2.7	-	60	3	3,000			
7 Kadungulu	Kadungulu	Existing	1,689	2,055	3,701	I	33.8	51.4	111.0	A	SP	EP	EP	6	12	12	5.7	67	60	1	1	2		
	Kagwara Port	ST	3,796	4,618	8,317	III	75.9	115.5	249.5	NA	DG	DG	DG	12	12	18	7.0	60	60	1	2	5,000		
	Kiditok	ST	1,265	1,539	2,772	II	25.3	38.5	83.2	A	EP	EP	EP	12	12	12	7.0	56	90	1	1	1,050		
8 Pingire	Pingire Etem	ST	1,582	1,924	3,466	II	31.6	48.1	104.0	NA	DG	DG	DG	12	12	12	2.9	86	70	1	2	3	1,040	
	Pingire Corner	MT	1,019	1,239	2,232	-	-	31.0	67.0	NA	-	DG	DG	-	12	12	2.8	86	60	-	1	2	1,800	
	Mulondo	ST	2,214	2,694	4,852	II	44.3	67.4	145.6	NA	DG	DG	DG	12	12	12	4.1	80	60	1	2	3	8,000	
	Mugarema	ST	5,125	6,235	11,229	IV	102.5	155.9	336.9	NA	DG	DG	DG	18	18	18	6.6	40	60	1	2	3	2,200	

Note: The following consumptions are applied for calculating the water demands of RGCs:
20 liter/day/capita for 2015, 25 liter/day/capita for 2020 and 30 liter/day/capita for 2035 considering those applied for SIP.

The preliminary design of boreholes is provided for all the RGCs, because its size and required number are different from RGC to RGC. A submersible motor pump is installed in each borehole to lift up groundwater to the elevated tank. The power source of the submersible motor pump are either commercial electricity supply or diesel generation where the electricity supply is not available. The depth, expected yield of borehole and required number of boreholes, and the approximate distances of transmission pipelines from borehole to elevated tank considered in the preliminary design are presented for each RGC in Table 16-51.

b) Transmission Pipelines

The transmission pipelines are provided to convey the groundwater from the boreholes to the elevated tank. Its size is determined by the Hazen-Williams formula. The pipeline is made of uPVC or HDPE pipes.

c) Elevated Tank

The capacity of elevated tank is determined to store 50 % of the daily demand, and the minimum height of the low water level in the tank is so set that the water pressures at the water kiosks and yard taps are more than 5.0 m. The tank is made of steel with steel supports. The capacity of the elevated tank is so designed that the supply of 50 % of daily demand is assured.



Elevated Tank

d) Distribution Pipelines

The distribution pipelines from the elevated tank to water kiosks and yard taps are of uPVC or HDPE pipes and their flow capacities are calculated with the Hazen-Williams formula based on the peak hour demand which is calculated as twice of the average hour demand. The average hour demand is calculated with dividing the daily demand by 24.



Water Kiosk

e) Water Kiosks

The water kiosks are provided to cover 450 persons by one (1) kiosk, and each kiosk has three (3) taps. The kiosks consist of block masonry wall and corrugated galvanized steel (CGS) roofing.



Yard Tap Connection

f) Yard Taps

Yard taps consist of a water meter, a water tap and connection pipes, and used for the customers who need direct connection.

5) Results of Preliminary Design

The results of the preliminary design of the selected RGCs are presented in Figures from 16-34 to Figure 16-42.

16.5 Management Plan

16.5.1 O&M in Uganda

(1) Present situation of the Sector and O&M

1) Organization of Water and Environmental Section in Uganda

Organization structure of National Level, District Level and Community Level for the water and environmental sector in Uganda is shown in Figure 8-1 in Chapter 8. The roles relating to the operation and maintenance of water supply system in each level are as follows.

a) National Level

The Ministry of Water and Environment (MWE) has the responsibility for setting national policies and standards, managing and regulating water resources and determining priorities for water development and management. It also monitors and evaluates sector development programs to keep track of their performance, efficiency and effectiveness in service delivery. The other ministries such as the Ministry of Health (MOH) and the Ministry of Education and Sports (MOES), etc., are engaged in the water and environment administration in their own fields.

b) District Level

Local Governments (Districts, Town Councils, sub-Counties) are empowered by the Local Governments Act (2000) to provide water services and manage the Environment and Natural Resource base. The District Water Offices manage water and sanitation development and oversee the operation and maintenance of existing water supplies in the District.

Outline of Water Supply Facilities

RGC: Namungalwa
 Sub-Country: Namungalwa
 District: Itangga

Years	Population	Category	Consumption per capita l/day/capita	Water Demand m ³ /day
2015	14,474	IV	20	289.5
2020	17,115	IV	25	427.0
2035	28,299	IV	30	849.0

Work Quantities

No	Item	Description	Unit	Quantity	Remark
1	Intake Facility				
	Deep Borehole Facility	Dia 125mm, l=700	pls	3	
	Power source	National Electric Grid Supply	L/S	1	
		Diesel Generator	L/S	0	
		Solar Power System	L/S	0	
2	Transmission Facility				
	Transmission Pipeline	OD575mm, uPVC/HDPE	m	2,250	
		OD900mm, uPVC/HDPE	m	1	
		OD1100mm, uPVC/HDPE	m	1	
		Others	L/S	1	
	Elevated Tank	220m ³ , l=12m (R.W.L.)	No	1	[E]
3	Distribution Facility				
	Distribution Pipeline	DN225-PN50mm, uPVC/HDPE	m	1,055	
		OD575mm, uPVC/HDPE	m	2,165	
		OD900mm, uPVC/HDPE	m	100	
		OD1100mm, uPVC/HDPE	m	580	
		Others(valves, flange blocks)	L/S	1	
	Water Kiosk	Staps	Nos	29	[K]
	School Connection		pls	1.1	[S]
	Health Center Connection		pls	1	[H]
	House Connection		pls	242	



Figure 16-34 Preliminary Design of Water Supply system for Selected RGC (Namungalwe RGC)

Outline of Water Supply Facilities

RGC: Nambale
 Sub-Country: Nambale
 District: Iganga

Years	Population	Category	Consumption per capita		Water Demand m ³ /day
			lit/day/capita	m ³ /day	
2015	5,715	IV	20		114.3
2020	6,760	IV	25		169.0
2035	11,178	IV	30		335.3

Work Quantities

No	Item	Description	Unit	Quantity	Remark
1 Intake Facility					
	Deep Borehole Facility	Dia 125mm, h=70m	pts	2	
	Power source	National Electric Grid Supply	L/S	1	
		Diesel Generator	L/S	0	
		Solar Power System	L/S	0	
2 Transmission Facility					
	Transmission Pipeline	OD303mm, uPVC/HDPE	m	1,600	
		OD900mm, uPVC/HDPE	m	0	
		OD110mm, uPVC/HDPE	m	0	
		Others	L/S	0	
	Elevated Tank	90m ³ , h=12m (Ch+H.W.L.)	No	1	ET
3 Distribution Facility					
	Distribution Pipeline	DN25-4DN50mm, uPVC/HDPE	m	210	
		OD303mm, uPVC/HDPE	m	2,200	
		OD900mm, uPVC/HDPE	m	175	
		OD110mm, uPVC/HDPE	m	0	
		Others (valves, flust blocks)	L/S	1	
	Water Kiosk	Flags	Nos	12	▲
	School Connection		pts	5	SC
	Health Center Connection		pts	1	HTC
	House Connection		pts	96	



Figure 16-35 Preliminary Design of Water Supply system for Selected RGC (Nambale RGC)

Outline of Water Supply Facilities

RGC: Ikumbya
 Sub-Country: Ikumbya
 District: Soroti

Years	Population	Category	Consumption per capita		Water Demand m³/day
			liters/capita	m³/day	
2015	1,508	II	20	30.2	
2020	1,783	II	25	44.6	
2035	2,948	II	30	88.4	

Work Quantities

No	Item	Description	Unit	Quantity	Remark
1 Intake Facility					
	Deep Borehole Facility	Dia 125mm, l=70m	pls	1	
	Power source	National Electric Grid Supply	L/S	0	
		Diesel Generator	L/S	1	
		Solar Power System	L/S	0	
2 Transmission Facility					
	Transmission Pipeline	GD63mm, uPVC/HDPE	m	1,000	
		GD90mm, uPVC/HDPE	m	0	
		GD110mm, uPVC/HDPE	m	0	
		Culvers	L/S	1	
	Elevated Tank	3m x 3, l=12m (GL+H.W.L.)	No	1	[ET]
3 Distribution Facility					
	Distribution Pipeline	DN25-DN50mm, uPVC/HDPE	m	103	
		GD63mm, uPVC/HDPE	m	2,060	
		GD90mm, uPVC/HDPE	m	0	
		GD110mm, uPVC/HDPE	m	100	
		Culvers (valves, thrust blocks)	L/S	1	
	Water Kiosk	Flaps	No.s	4	[K]
	School Connection		pls	4	[SC]
	Health Center Connection		pls	1	[HC]
	House Connection		L/S	1	



Figure 16-36 Preliminary Design of Water Supply system for Selected RGC (Ikumbya RGC)

Outline of Water Supply Facilities

RGC: Naigobya
 Sub-Country: Ikumbaya
 District: Iganga

Years	Population	Category	Consumption per capita		Water Demand m ³ /day
			liters/capita	liters/capita	
2015	1,942	II	29	38.8	
2020	2,286	II	25	57.4	
2025	3,797	III	30	113.9	

Work Quantities

No	Item	Description	Unit	Quantity	Remark
1 Intake Facility					
	Deep Borehole Facility	Dia 125mm, h=70m	pls	1	
	Power source	National Electric Grid Supply	L/S	1	
		Diesel Generator	L/S	0	
		Solar Power System	L/S	0	
2 Transmission Facility					
	Transmission Pipeline	OD33mm, uPVC/HDPE	m	1,650	
		OD90mm, uPVC/HDPE	m	0	
		OD110mm, uPVC/HDPE	m	0	
		Others	L/S	1	
	Elevated Tank	9m ³ , h=12m (GL,H,W,L)	No	1	ET
3 Distribution Facility					
	Distribution Pipeline	DN25-DN50mm, uPVC/HDPE	m	100	
		OD33mm, uPVC/HDPE	m	1,500	
		OD90mm, uPVC/HDPE	m	320	
		OD110mm, uPVC/HDPE	m	0	
		Others (valves, thrust blocks)	L/S	1	
	Water Kiosk	Staps	Noas	5	▲
	School Connection		pls	4	SC
	Health Center Connection		pls	1	HTC
	House Connection		L/S	1	



Figure 16-37 Preliminary Design of Water Supply system for Selected RGC (Naigobya RGC)

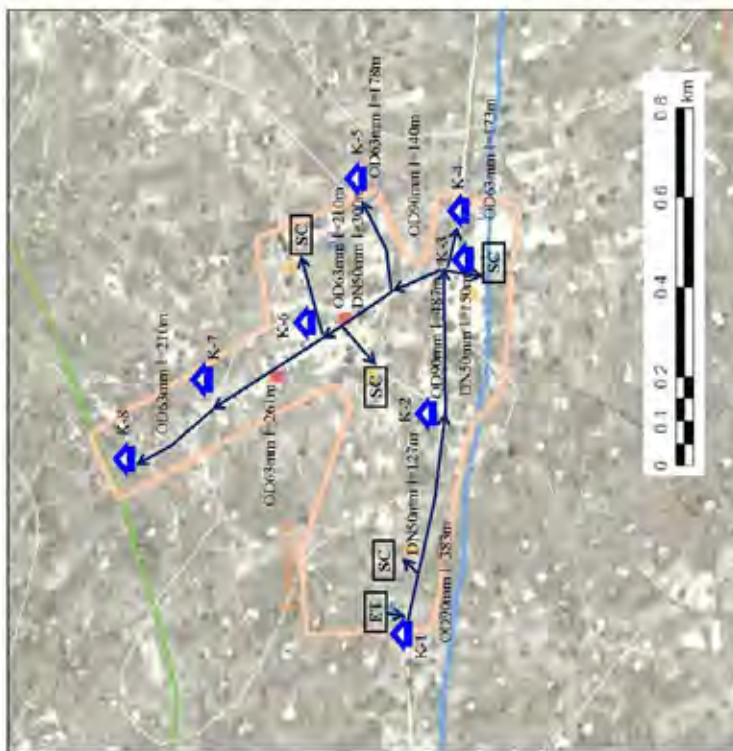
Outline of Water Supply Facilities

RGC: Kameke
 Sub-Country: Kameke
 District: Pallisa

Years	Population	Category	Consumption per capita		Water Demand m ³ /day
			liters/day	m ³ /day	
2015	3,194	III	20	63.9	
2020	3,663	III	25	91.6	
2035	6,127	IV	30	183.8	

Work Quantities

No	Item	Description	Unit	Quantity	Remark
1	Intake Facility				Symbol etc.
	Deep Borehole Facility	Dia 125mm, h=70m	pbs	2	
	Power source	National Electric Grid Supply	L/S	1	
		Diesel Generator	L/S	0	
		Solar Power System	L/S	0	
2	Transmission Facility				
	Transmission Pipeline	OD63mm, uPVC/HDPE	m	2,960	
		OD90mm, uPVC/HDPE	m	0	
		OD110mm, uPVC/HDPE	m	0	
		Others	L/S	1	
	Elevated Tank	5(m ³ , h=12m(H.W.L.))	No	1	ET
3	Distribution Facility				
	Distribution Pipeline	DN25-DN50mm, uPVC/HDPE	m	577	
		OD63mm, uPVC/HDPE	m	1,032	
		OD90mm, uPVC/HDPE	m	1,010	
		OD110mm, uPVC/HDPE	m	0	
		Others(valves, thrust blocks)	L/S	1	
	Water Kiosk	Stape	No	8	
	School Connection		pbs	4	SC
	Health Center Connection		pbs	1	HC
	House Connection		pbs	0	



Outline of Water Supply Facilities

RGC: Buseta
 Sub-Country: Buseta
 District: Pallisa

Years	Population	Category	Consumption per capita		Water Demand
			lit./day/capita	m ³ /day	
2015	2,839	II	20	56.8	
2020	3,370	III	25	84.3	
2035	5,637	IV	30	166.1	

Work Quantities



No.	Item	Description	Unit	Quantity	Remark	
1	Intake Facility	Deep Borehole Facility	pie	2	Symbol: 	
		Power source	L/S	1		
		Diesel Generator	L/S	0		
		Solar Power System	L/S	0		
2	Transmission Facility	Transmission Pipeline	m	3,240		
			m	0		
			m	0		
			L/S	1		
3	Distribution Facility	Elevated Tank	No.	1	ET	
			No.	1		
			No.	1		
			No.	1		
	Distribution Pipeline	DN25-DN50mm, ePVC/HDPE	m	390		
		ePVC/HDPE	m	2,335		
		ePVC/HDPE	m	990		
		ePVC/HDPE	m	0		
		Others (valves, thrust blocks)	L/S	1		
		Water Tank	No.	7		Water Tank Symbol: 
		School Connection	pie	2		
		Health Center Connection	pie	1		
		Horse Connection	pie	0		



Figure 16-39 Preliminary Design of Water Supply system for Selected RGC (Buseta RGC)

Outline of Water Supply Facilities

RGC: Kadama
 Sub-Country: Kadama
 District: Pallisa

Years	Population	Consumption per cap./day	Water Demand m ³ /day
2015	12,888	IV	257.8
2020	15,208	IV	302.5
2025	21,987	IV	392.6

Work Quantities

No	Item	Description	Unit	Quantity	Remark
1	Intake Facility				
	Deep borehole Facility	Dia 125mm, h=70m	pts	4	
	Power source	National Electric Grid Supply	L.S	1	
		Diesel Generator	L.S		
		Solar Power System	L.S		
2	Transmission Facility				
	Transmission Pipeline	ØD30mm, uPVC/HDFE	m	2,800	
		ØD90mm, uPVC/HDFE	m	0	
		ØD110mm, uPVC/HDFE	m	0	
		Others	L.S	1	
	Elevated Tank	210m ³ , h=12m (H.W.L.)	No	1	ET1
3	Distribution Facility				
	Distribution Pipeline	DN25-DN50mm, uPVC/HDFE	m	660	
		ØD30mm, uPVC/HDFE	m	1,300	
		ØD90mm, uPVC/HDFE	m	100	
		ØD110mm, uPVC/HDFE	m	501	
		Others (valves, flange blocks)	L.S	1	
	Water Kiosk	Page	No	26	KS1
	School Connection	pts		4	SC1
	Health Center Connection	pts		1	HC1
	Home Connection	pts		215	



Figure 16-40 Preliminary Design of Water Supply system for Selected RGC (Kadama RGC)

Outline of Water Supply Facilities

RGC: Kagwara Port
 Sub-Country: Kadungulu
 District: Siaya

Years	Population	Category	Consumption per capita		Water Demand m ³ /day
			lit/day/capita	m ³ /day	
2015	3,796	III	20		75.9
2020	4,618	III	25		115.5
2035	8,317	IV	30		249.5

Work Quantities

No.	Item	Description	Unit	Quantity	Remark
1 Intake Facility					
	Deep Borehole Facility	Dia 125mm, l=70m	pts	1	
	Power source	National Electric Grid Supply	L/S	0	
		Diesel Generator	L/S	1	
		Solar Power System	L/S	0	
2 Transmission Facility					
	Transmission Pipeline	OD63mm, aPVC/HDPE	m	0	
		OD90mm, aPVC/HDPE	m	0	
		OD110mm, aPVC/HDPE	m	5,000	
		Others	L/S	1	
	Elevated Tank	60m ³ , l=12m (H.W.L.)	No	1	ET
3 Distribution Facility					
	Distribution Pipeline	DN25-DN50mm, aPVC/HDPE	m	870	
		OD63mm, aPVC/HDPE	m	477	
		OD90mm, aPVC/HDPE	m	679	
		OD110mm, aPVC/HDPE	m	0	
		Others(valves, thrust blocks)	L/S	1	
	Water Kiosk	Rupe	No	9	
	School Connection		pts	1	SC
	Health Center Connection		pts	1	HC
	House Connection		L/S	0	



Figure 16-41 Preliminary Design of Water Supply system for Selected RGC (Kagwara Port RGC)

Outline of Water Supply Facilities

RGC: Kidetok
 Sub-Country: Pinye
 District: Soroti

Years	Population	Category	Consumption per capita		Water Demand m ³ /day
			liters/capita	m ³ /day	
2015	1,265	II	20	25.3	
2020	1,439	II	25	38.5	
2035	2,772	II	30	83.2	

Work Quantities

No	Item	Description	Unit	Quantity	Remark
1	Intake Facility				
	Deep Borehole Facility	Dia 125mm, h=70m	pls	1	
	Power source	National Electric Grid Supply	L/S	1	
		Diesel Generator	L/S	0	
		Solar Power System	L/S	0	
2	Transmission Facility				
	Transmission Pipeline	GD63mm, uPVC/HDPE	m	1,050	
		GD90mm, uPVC/HDPE	m	0	
		GD110mm, uPVC/HDPE	m	0	
		Others	L/S	1	
	Elevated Tank	20m ³ , h=12m (HAW.L.)	No	1	ET
3	Distribution Facility				
	Distribution Pipeline	DN25-DN50mm, uPVC/HDPE	m	450	
		GD63mm, uPVC/HDPE	m	570	
		GD90mm, uPVC/HDPE	m	0	
		GD110mm, uPVC/HDPE	m	0	
		Others(valves, thrust blocks)	L/S	1	
	Water Kiosk	Staps	No	3	KS
	School Connection		pls	3	SC
	Health Center Connection		pls	1	HC
	House Connection		pls	0	



Figure 16-42 Preliminary Design of Water Supply system for Selected RGC (Kidetok RGC)

c) Community Level

Communities are responsible for operating and maintaining rural water supply and sanitation facilities. A water user committee (WUC) should ideally be established at each water point.

2) Water Supply System and O&M Organization

Water supply system and O&M organization in each area are shown in Table 16-52. Water supply facilities in the rural area are mainly point water sources and operated and maintained by the communities, except those for RGCs with small scale of water supply system with pipeline and pumps. Water supply facilities in the small towns in urban area are mainly water supply system with pipeline and operated and maintained by the private operators, with some exceptions. In large towns NWSC operates and maintains the large scale of water supply systems.

Table 16-52 Water Supply System and O&M Organization

Area	Population	Type of Water Supply System	O&M Organization of the Facilities	
Rural	Village	Less than 500 (Point Water Source) • Borehole with hand pump • Shallow well • Protected spring • Gravity flow scheme Tap • Rain water tank	Water User Community or Water User Group (WUC* ¹ or WUG* ²): The whole community served by the individual point water facility Water and Sanitation Committee (WSC* ³): A competent WSC of about 6 people elected by the WUC Water User Association (WUA* ⁴): In case of many WUC/WCG being served by one water source (like a GFS), the WSCs come together to form a WUA, who in turn can select/elect the Central Committee (like a WSC) to O&M the whole scheme.	
	Rural Growth Center (RGC)	500 ~ 5,000	Point Water Source Small scale of Water Supply System with pipeline and pumps.	Same the above Water Supply Board under Water Authority
Urban	Small Town	5,000 ~ 15,000	Water Supply System with pipeline and pumps	Town Board Water Supply Office Private Operator under the Town Water Authority
	Large Town	More than 15,000	Large Scale Water Supply System	National Water and Sanitation Corporation (NWSC)

*1 Water User Community, *2 WUG: Water User Group, *3 WSC: Water and Sanitation Committee, *4 WUA: Water User Association

(2) O&M in Rural Water Supply System

The National Water Policy (1999) provides for user ownership and management of rural water and sanitation facilities as a sustainability strategy. This is promoted through the Community Based Maintenance System (CBMS) as the most appropriate management option where the users take full responsibility over management and maintenance of their facilities.

1) Organizations related to CBMS

In the CBMS the Communities should take responsibility for O&M of their facilities as shown in Table 16-53. At the same time, organizations of the local governments and the central government in

charge of rural water supply should undertake their duties to pursue a sustainability of the facilities and improvement of the water supply ratio.

Moreover, Development Partners, NGO·CBO and Private Sector are providing funds, technical assistance, training, supply of spare parts and repair etc. to support the smooth management of the rural water supply system. Table 9-18 shows the related organizations and their duties. Work items and relation of each organization are shown in Figure 16-43.

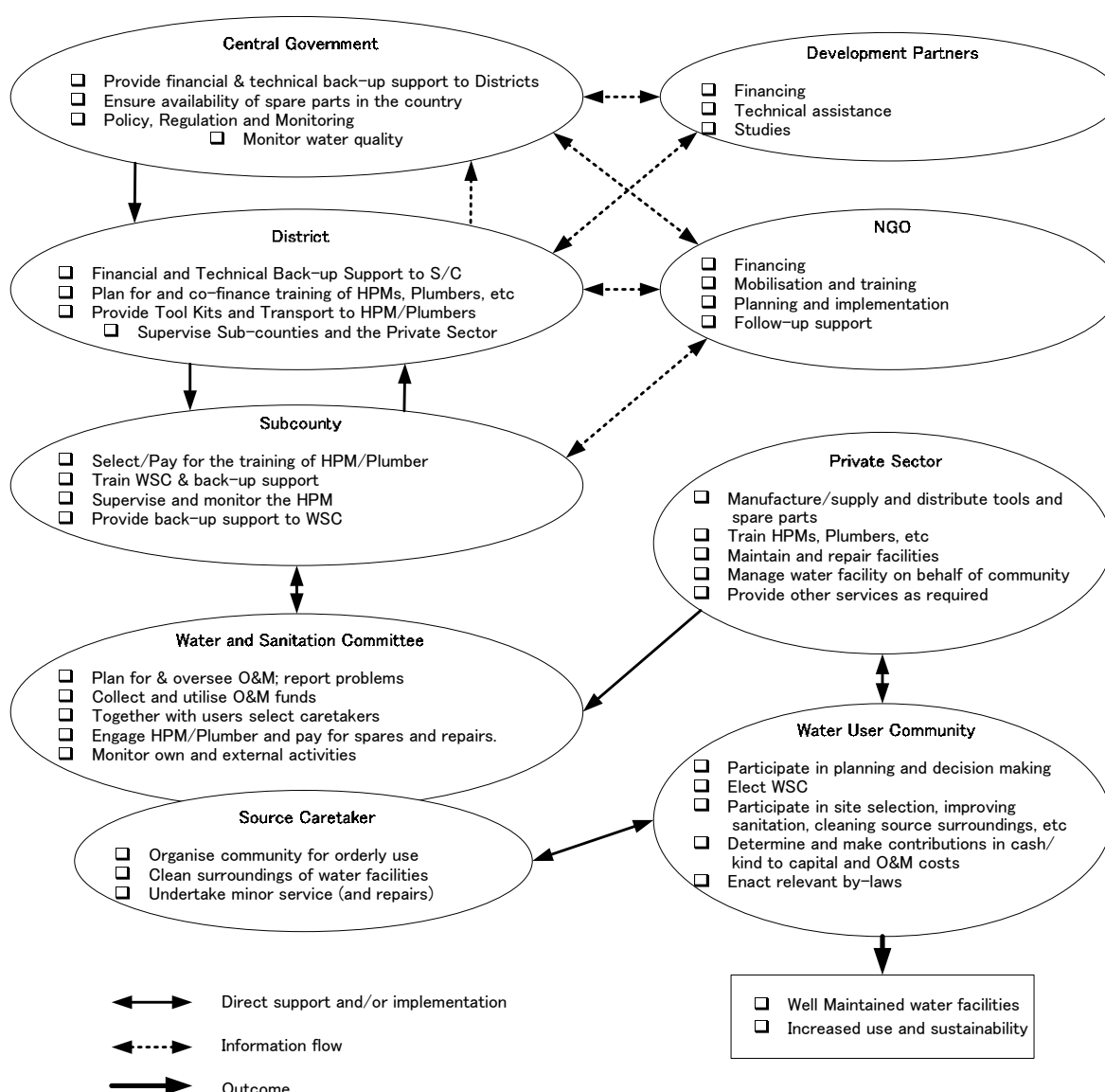


Figure 16-43 Work Items and Relation of each Organization

Table 16-53 Organizations in CBMS and their Duties

Organization	Duties
Central Government	Government prepares the overall policy framework, legislation and guidelines under which the sector operates. Central government here refers to the line Ministry (MWE/DWD) and other sector relevant Ministries responsible for Health, Gender, Agriculture, etc. The Central government coordinates funding, training, supply of inputs and implementation. It is responsible for ensuring that policies are followed, and approaches used contribute towards the attainment of sector objectives. It should therefore monitor the performance and functionality of the water facilities nationally, and take the necessary remedial action. MWE/DWD also contributes towards the costs of major repairs beyond community capacity. Also TSU supports DWO for capacity building for O/M of rural water supply system.
District	The District provides back-up support and technical guidance to Sub-Counties in planning and budgeting, implementation and monitoring of their work plans. It should also budget for co-funding of major repairs as part of the planning process. Where the need for major repairs arises the District should provide the required guidance and supervision, and also play a key role in ensuring established standards for O&M are maintained. The District is also responsible for routine water quality monitoring (after construction) to assess its suitability for consumption. It is also responsible for monitoring the performance of O&M and taking relevant actions to address shortcomings with support from DWD.
Sub-County	The Sub-County is a body corporate, and has a mandate to plan and oversee implementation of development programs. Therefore they should prepare plans and budgets incorporating O&M aspects. The O&M budget should provide for follow-up support and co-financing of major repairs. They can also supervise the private sector carrying out training and monitoring of O&M.
Community	The community is responsible for management and maintenance of their water facilities. Preventive maintenance and repairs, and payment of required funds. Each community should select a competent WSC and Care-takers to guide their participation. The mode of community involvement is dictated by the type of community and the type of water supply system.
Development Partners	Development partners support the government in improving the safe water and sanitation coverage. They provide funding and technical assistance directly to government programs and through other agencies, and also offer support in studies to assess performance of different aspects of the sector, with a view to improvement. All support should be coordinated with government.
NGOs and CBOs	Several NGOs and CBOs are involved in the water and sanitation sector. They have useful roles to play as partners in mobilization, training, planning, follow-up support and other activities, being already established in communities.
Private Sector	The role of the private sector is to support the communities in carrying out any activities beyond their capability. HPMs, masons and plumbers carry out maintenance and repair work, and are paid by the communities. Private firms manufacture, supply and distribute inputs and spares, and undertake major repairs. PSOs can also undertake community mobilization and training. They can also manage point or small piped water supplies on behalf of the users, particularly in RGCs.

Source: "A National Framework for Operation and Maintenance of Rural Water Supplies"

2) Maintenance Items

As shown in Table 16-54 maintenance of water supply facilities consists of daily inspection/ maintenance and repairs. Repairs are divided into minor and major repairs; minor repairs contains those of minor cracks and leaks etc. other than daily services, and major repairs include replacement of major components of the facilities. Communities are responsible for the daily inspection / maintenance and minor repair of their water facilities. With good routine maintenance the need for repair is normally minimal, and where it occurs the costs are relatively low.

Table 16-54 Maintenance Items for Each Water Supply System

Type of WSS	Daily inspection / Maintenance	Minor Repair	Major Repair
Borehole (with hand pump)	Clearing drains and surroundings Maintaining fence. Checking of handpump. Periodical replacement of fast wearing parts (buckers, valves, etc)	Repair of damaged parts outside routine service. Replacement of damaged slow wearing parts (handle, chain, few pipes and/or rods, cylinder). Repair or cracks to platform or drain.	Fishing of dropped pipes and rods. Desilting of borehole. Repairs to borehole casing and screens. Replacement of platform and drain. Replacement of rising mains.
Protected Spring	Cleaning Intake area, drains and surroundings. Maintaining fence.	Repair or cracks to retraining wall, platform or drain.	Re-protection (due to diversion or major failure)
Gravity Flow Scheme	Cleaning Intake area, drains and surroundings. Maintaining fence(s). Periodical checking of components for proper functioning. Periodical replacement of fast wearing parts (taps, etc).	Repair of minor leaks in structures or components. Repair of pipe bursts.	Rebuilding of intake works or other major structures. Replacement of long pipeline sections damaged by landslides, etc.
Pumped and Piped Scheme	Cleaning intake area, drains, fence and surroundings. Checking of pump.	Repair of minor leaks in structures or components. Repair of pipe bursts.	Rebuilding of intake works or other major structures. Replacement of long pipeline sections damaged by landslides, etc.

(3) Constraints on O&M of Rural Water Supply

1) Technical Capacity and Staff Deployment

Table 9-20 shows the present status and constraints of O&M organizations with regard to technical capacity and staff deployment, stated in the “Strategic Investment Plan for the Water and Sanitation Sub Sector (MWE, July 2009)”. During the site surveys in some Districts by the study Team, daily maintenance works by the staffs of WSCs at the Point Water Sources shown in the Table 16-55, such as Cleaning intake area and checking of pumps etc, were found to be inadequate. Training the staffs of WSCs and back up supports by Sub-counties and DWOs are required. Although not indicated in Table 9-20 it was found that in some DWOs staffs required had not been deployed yet and daily works could not be conducted sufficiently because of failure of necessary equipment such as computers etc. Capacity building and staff deployment including necessary equipment in other organizations engaged in O&M of water supply facilities are also considered to be required.

Table 16-55 Present Status of O&M Organization

Organization	Role	Present Status	Links	Staffing	Major Constraints
Technical Support Units (TSU)	Capacity building support to DWO for facilitating O/M of rural system	Inadequate resources to fully support the implementation of the CBMS	DWD Districts	Knowledge and skills adequate	Capacity to adequately cover the new districts
Districts (DWO)	Support to management of RGC system and village committees for point sources	Inadequate priority and resources for implementation of the CBMS	DWD Sub-counties Communities Private sector	Inadequate capacity at LG and community levels	Inadequate support to CBMS in both parishes and RGCs
Sub-counties/ water Authorities	Supporting formation and functioning of Water and Sanitation Committees to solve management issues and problems. Function as Water Authorities for RGCs systems	Working but limited resources for facilitating the support to water committees and managing RGCs	Water & Sanitation Committees Districts Private Operators	Limited technical capacity	Inadequate support to parishes Technical capacity to manage RGCs
Communities (WSC)	Management, operation and maintenance of point sources and RGCs	Working but limited technical capacity for efficient O&M. Bottlenecks in spare-part supply chain	Parish/Sub-county Private Operators Water Users	Inadequate knowledge and skills in water, sanitation and hygiene	Limited technical capacity affect effective O&M
Private Sector	Operation of water supply schemes through contracts with Water Authorities	Work but some constrains by technical skills and inadequate financing due to delayed Water Authority payments and release of subsidy to nonviable schemes	Sub-counties Districts DWD Water Users	Limited planning and technical skills	Spare-parts and supplies in rural areas Limited planning and technical capacity of local private Operators
NGOs, CBOs	Training and support to communities in O&M	Need to harmonies approach of different NGOs in communities	Districts Sub-counties Communities		Need to anchor NGO activities in LG structures for sustainability

2) Funding for O&M

At the point water sources, users usually take the water without tariff. And at the time of Minor Repair shown in Table 9-19, WSC collects the fee from users if required. Major repairs and extensions of the scheme are sometimes not affordable to the local community. Funding for them should come from outside, that is the local/central Government.

As for the water supply schemes with pipeline and pumps, it was found in the field survey that the private operator was not able to supply the water to the users continuously but intermittently because they did not pay the electricity charge due to lack of operation fund, and the users were returning to the old point water sources they had used previously.

Thus the O&M fund is inadequate in both point water sources and water supply schemes in RGCs. Therefore as measures to solve the O&M fund constraints, there is the following organization at present.

a) Umbrella Organizations (UOs)

Umbrella Organizations were constituted as regional organizations in three regions.

- “The South Western Umbrella of Water and Sanitation (SWUWS)” was set up to give back-up support to water authorities and water supply boards for RGCs and small towns in operation and maintenance (O&M). It was constituted in 2002 as an association of the local Water Supply and Sanitation Boards, and currently provides support for piped water supply schemes in seven Districts in 2008. The SWUWS carries out the role for the member towns as follows:

- Water quality monitoring, supplying spare parts to members, locating spare-parts suppliers
- Providing technical backup support, regular monitoring inspections for the member schemes and reporting to DWD

However, it requires a subsidy in the form of grant financing from the Austrian Development Cooperation (ADC) which is channeled through the Joint Partnership Fund in DWD.

- “The Eastern Umbrella of Water and Sanitation (EUWS)” was constituted based on the Joint Partnership Fund in 2007. It provides the same support as mentioned above in 24 Districts as of September 2010.

- “The Mid-Western Umbrella of Water and Sanitation (MWUWS)” was set up to give supports to water supply schemes in 8 Districts, but the activities were not started yet because of lack of Funds as of February 2010.

b) Town Cluster Operators

In the “Long-term strategy for Investment Planning, Implementation and Operation & Maintenance of Water Supply and Sanitation in Rural Growth Centres” (May 2005, DWD), the following recommendation is shown.

“The main approach will be that the WSC hires a Local Private Scheme Operator (SO) for the operation and maintenance of the scheme. The SO will do the day-to-day operation and maintenance. In the Small Town Strategy it is recommended that O&M for small town is contracted to private Town Cluster Operators. For RGCs it is recommended that O&M for RGCs that will develop into small towns in the near future are included in the clusters for small towns. The chosen technology for those RGCs will be more similar to small towns and the RGCs will benefit from the “economies of scale”.

The concept of “CLUSTER” has just been started by IFC (International Finance Corporation) : this means that a few Towns join together to form the “CLUSTER” and one Private Operator is then allowed to bid for O&M for all these Towns under the “CLUSTER”. There is a chance that the Private Operator can conduct the operation and minor repairs sufficiently by the increased income inspite of low Tariff because of the increased population served. And he might be able to afford to conduct some

major repairs. The adoption of this system is now under study by DWD.

16.5.2 O&M of Existing Water Supply System in Priority Districts

(1) Implementation System

Implementation of the Rural Water Supply System in the selected priority Districts is conducted based on the Local Government Work Plan as same as in other Districts. Construction of the water supply facilities and major rehabilitations are conducted by utilizing the “District Water & Sanitation Conditional Grant”. “Specific Schedules / Guidelines for Utilization of District Water & Sanitation Condition Grant (2010/11), June 2010” provides the roles and responsibilities of each organization as follows.

a) Communities are responsible for demanding for, planning, contributing a cash contribution to, operating and maintaining rural WSS facilities. A water user committee (WUC) should be established at each water point.

b) The Ministry of Finance, Planning and Economic Development (MFPED), mobilizes funds, allocates them to sectors and coordinates development partner inputs. MFPED reviews sector plans as a basis for releasing allocated funds, and reports on compliance with sector objectives.

c) The Ministry of Water and Environment (MWE) has overall responsibility for setting national policies and standards, and priorities for water development and management. It also monitors and evaluates sector development programmes to keep track of their performance, efficiency and effectiveness in service delivery. MWE is responsible for the regarding the planning and provision of sanitation / hygiene facilities in Rural Growth Centres (RGCs) & public places as well as hygiene and sanitation education & promotion in areas around the water facilities constructed. In practice these activities are undertaken at District Government level.

d) The Directorate of Water Development (DWD), under MWE is the lead agency responsible for managing water resources, coordinating and regulating all water and sanitation activities and providing support services to local Governments and other service providers. DWD regulates water use and waste discharge, supports districts in implementing decentralized WSS programmes and implements scheme (new construction and rehabilitation) in small town and rural growth centres. DWD approves local Government work plans and reports.

e) Local Governments (Districts, towns, Sub-Counties) are empowered by the Local Governments Act (1997) for the provision of water services. They receive grant funding and may mobilize local resources for implementing rural WSS programmes and to support small town WSS. Local Governments, in consultation with DWD / MWE also appoint and manage private operators for urban schemes outside the jurisdiction of NWSC. District Governments are being encouraged to set up

District Water and Sanitation technical Committees (DWSC) to oversee and provide effective coordination of water sector activities in the respective Local Governments.

f) Private Sector firms undertake design and construction in the sector under contract to local and central government. Private hand pump mechanics and scheme attendants provide maintenance services to water users in rural and peri-urban areas. Private operators manage piped water services in the majority of small towns with piped water and vendors often bring water from the point of collection to the user.

(2) Current State of O&M of Existing Water Supply Facilities

1) Point Water Source

a) Current state of Existing water Sources in the three Districts is stated in the Results of RGC Survey. In many water sources, few WSCs have working members as stipulated. For sufficient O&M, Sub-County / District should guide and supervise WSCs to allocate the members. Water Tariff for minor repairs should be collected. In the RGC Survey, Tariff collection was conducted only in 21% of water sources in the Three Districts.

b) Functionality of water Sources

In the WATSUP Survey, total Functionality of Water Sources in the Three Districts was 85.3 % (Table 16-6). Main reason of Non-Functional is considered to be lack of Fund for Major Repair and Replacement of borehole pumps etc.

2) Piped Water Supply Scheme

As there was no piped water supply scheme working in the Three Districts at the time of RGC Survey, a survey by the Study Team was conducted on the existing RGC piped water supply schemes in Kamuli District - Kasambira Water Supply Scheme and Namwendwa Water Supply Scheme. Outline of the schemes is shown in Table 16-56.

a) Both RGCs were not gazetted as Towns yet, although the population exceeded 5,000 at the time of the survey.

b) O/M organizations in both RGCs were Water Supply Boards under the Sub-Counties, not private operation company.

In future the O/M organizations are considered to be private operation companies, as the privatization of small town water supply scheme is the policy of the MWE.

c) O/M of both water supply schemes seemed to be comparatively good, because the facilities were constructed in 2008 and major repairs were not required yet.

d) Balance of Income / Expenditure

In Kasambira scheme it was profit in 2009 / 2010. In Namwendwa scheme it was also profit except Electricity charge. They were negotiating with Electricity Company regarding the settlement of the charge to be paid.

e) In 2009 both schemes were registered to the members of Eastern Umbrella of Water and Sanitation Mbale. In Kasambira Scheme, the Umbrella Organization provided the assistance of water quality testing (twice a year), water flow meters and extension pipeline and public stand pipes, which contributed the benefit of the scheme.

Table 16-56 RGC Piped Water Supply Schemes in Kamuli District

(September 2010)		
Name of the Scheme	Kasambira Water Supply Scheme	Namwendwa water Supply Scheme
Sub-County	Bugulumbya	Namwendwa
Number of LC1 in the RGC	13	9
Constructed in	2008	Nov. 2008
O/M Organization	Kasambira Waver Scheme Supply Board under the Sub-County (Water Authority)	Namwendwa Water Scheme Supply Board under the Sub-County (Water Authority)
Number of the staff organization	5 members of Water Board Committee 4 technical staffs including scheme operators.	5 members of Water Board Committee 4 technical staffs including scheme operators.
Population Served	Approx. 20,000	Approx. 10,000
Water Source	2 Deep Boreholes (1 Borehole working)	1 Borehole
Water Supply Facilities	Borehole pump (15m ³ /H, 61m H) Reservoir (90 m ³ , 12m H) 7 Kiosks (3 taps each) 175 Yard Taps	Borehole pump Reservoir 6 Kiosks 90 Yard Taps
Power source of Borehole Pump	Generator (36 KVA) (No power supply)	From Electricity Company (UMEME)
Balance of Income / Expenditure	Profit (2009 / 2010)	Profit (2009 / 2010) Except Electricity charge
Tariff collection Ratio	94~96%	Approx. 60%

(3) Financial condition of existing Piped Water Supply Scheme

Balance of Income / Expenditure in Kasambira Water Supply Scheme was surveyed.

1) According to the Water Supply Board, total balance of Income / Expenditure in the financial year 2009-2010 was profit. (22,589 x 103 SH / 22,527 x 103 SH)

Income was a total amount of Tariff collection. Approx. 45% of total Expenditure was Fuel & transport cost for borehole pump. Remaining 55 % of Expenditure was allowance for board members, salary for scheme operators, minor repairs and office expenses. This implies that there is a possibility that the scheme could get more profit if it could receive the electricity power from electricity company with reasonable charge.

2) The scheme received the assistance from Eastern Umbrella of Water and Sanitation, such as water quality testing, provision of water flow meters and extension pipeline and public stand pipes, from April 2009 to April 2010, which are not included in the above balance. That shows the scheme gets the benefit from the Umbrella organization.

(3) Major issues on O &M organizations

O&M organizations and the constraints of the existing Rural Water Supply Facilities are stated in Chapter 3.3. And the present status and the constraints of each organization indicated in the “SIP for the Water and Sanitation Sub Sector (MWE, July 2009)” are shown in Table 9-20. Followings are the major issues to be mentioned particularly on O&M organizations in the Three Districts.

1) New Districts

Three Districts were split up into six Districts from the beginning of July 2010. This is the major issue for the new Districts and DWOs. New offices and equipment as well as staffs should be allocated. At the time of site visits by the study Team in September 2010, offices, equipment and staffs were not fully allocated. The numbers of staffs of TSU4 (for Iganga and Pallisa) and TSU3 (for Soroti) might be required to be increased to cover the new Districts adequately.

2) District Water Office

a) “Specific Schedules / Guidelines for Utilization of District Water & Sanitation Condition Grant, 2010/11” provides the District Water Office Staffing as follows.

The following qualified staffs are required in each DWO.

- 1 Senior Engineer / Senior Water Officer.
- 1 Hygiene Education / Sanitation Officer / Planner.
- 1 Assistant District Water Officer (ADWO) Mobilization
- 1 Technical Officer in each county for planning, supervision, of construction and overseeing maintenance of installed water supplies.
- 1 Borehole maintenance Supervisor

Three DWOs of former Districts have allocated the above staffs so far. But the staffs for new Districts should be selected and allocated.

b) Water quality testing at the point water sources should be conducted periodically. But it seemed to be inadequate.

16.5.3 Proposed O&M Structure

O&M Structures for Rural Water Supply Facilities in the Three Districts are proposed as follows.

(1) Village Water Supply Facilities (Other than RGC) (Category I)

The following conventional WSC for point water source will be the O&M organization.

- Chairman 1

- Treasurer 1
- Caretakers 2 (One of whom must be a woman)
- Committee Member 1
- Secretary 1
- Total 6

(at least 3 of whom must be women, at least one holding an executive post e.g. Chairperson, Treasurer or Secretary)

(2) RGC Water Supply Scheme (Category II-IV)

For RGC piped water supply schemes, the following members of Water Supply Board and technical staffs are proposed as O/M organization.

- Water Board Members : 5

Chairman	1
Treasurer	1
Secretary	1
Board Members	2

- Technical Staffs : *4

Scheme Operators	*2
Security Guard	1
Secretary	1

*Numbers of Scheme Operators should be decided depending on the scale of the scheme.

16.5.4 Capacity Development Plan

For smooth implementation of the master plan for the priority districts, the capacity building of the operation and maintenance organizations, monitoring to grasp the operation and maintenance situations, the workshops and trainings are proposed to be conducted at the times of construction and rehabilitation of facilities by the district water office under the support of TSU as shown in Table 7-20. The targets of the activities are water users, WSC members, members of Water Supply Boards, scheme operators and extension workers of sub-counties.

1) Capacity building for water users by extension workers (Hygiene Education/Sanitation Officer in DWO, Officers in Health Department and social workers in Sub-Counties) is conducted in the Three Districts also, using documents such as “Rural Water Supply and Sanitation HANDBOOK for Extension Workers”, However it seems to be insufficient judging from the present condition of O/M in water sources. Workshops to instruct the water users the importance of O/M based on the CBMS are required at the time of implementation of Master Plan.

2) Training of HPM (Hand Pumps Mechanics)

According to DWD, at least 2 HPMs in each Sub-County or 1 HPM in 50 Hand Pumps should be allocated. In the Three Districts the training of HPMs has already been conducted, but the numbers of HPMs are not enough at present and the Training of HPMs at sites using the actual pumps installed is required at the time of construction.

3) Monitoring of O/M

Records on O/M are the basis of good maintenance, by which the time of replacements of the facilities could be judged and annual work plan could be made. Formats of daily report and inspection report should be provided and training of WSC members and scheme operators should be conducted during and after completion of construction of the facilities.

Table 16-57 Workshops and Trainings

Timing/ Activities	Detail of Activities	Targets	Documents	Remarks
(1) Before construction Workshops & Site explanation	1) Announcement to water users	- Water users	- Broad casting - Bulleting - Pamphlet	- By central & Local government
	2) Explanation of the Facilities (Capacity, Specification etc.)	- Water users - WSC members	- Planning documents	- DWO should be the chairman of the work shops.
	3) Explanation of O/M including Minor & Major repairs	- Extension workers - Board members of the scheme	- Document for maintenance including repairs	- Members of DWD, TSU should attend and lead/assisst the work shops.
	4) Decision of Water Tariff and collection method	- Scheme operators - Sub-County chief		
	5) Capacity building of WSC and Water Supply Board members i) Role and responsibility of each member ii) O/M procedure and records	- WSC members - Board members - Scheme operators - Extension Workers - Hand Pump Mechanics	- O/M manual	- The minutes should be made by DWO
(2) During and after construction Workshops & site trainings	1) Capacity building of WSC and Water Supply Board members i) Role and responsibility of each member ii) Confirmation of O/M procedure and records	- WSC members - Board members - Scheme operators - Extension Workers - Hand Pump Mechanics	- O/M manual - Handling instructions	
	2) O/M by the WSC members and scheme operators	- WSC members - Scheme operators - Hand Pump Mechanics	- O/M manual - Handling instructions	
	3) Training of Hand Pump Mechanics i) Inspection, repair ii) Records of inspection & repairs iii) Spare parts supplier	- Hand Pump Mechanics	- Documents & drawings from supplier	
	4) Monitoring i) Records on O/M ii) Updated lists on household iii) Daily inspection of pumps and facilities vi) Collection v) Record on spare parts purchased	- WSC members - Board members - Scheme operators	- Daily report - Inspection Report	