Contents

ANNEXES

A. Partial Results from the Scenario Analysis

A.1 Hydrological Information

Table A.1.1: Estimated Discharges at Selected Gauging Stations (in m3/s)

Name of Catchment & Location	Ruvubu (Burasira)	Ruvyironza (Kibya)	Ruvubu (Gitega)	Ruvubu Muyinga)	Kanyaru (Butare/Nigozi)	Nyabarongo (Kigali)	Nyabarongo (Kanzenzi)	Kagera (Rusumo Falls)	Kagitumba (Kagitumba)	Kagera (Kyaka Ferry)	Kagera (mouth)
Catchment Area (km2)	1130	1994	6232	10450	2381	8397	14019	30700	3500	54600	59800
Average Runoff (MCM)	13.9	22.3	69.8	94.5	17.6	90.8	129.6	241.2	13.4	227.3	149.2
Unit Runoff (lt/s/km2)	12.3	11.2	11.2	9.0	7.4	10.8	9.2	7.9	3.8	4.2	2.5
January	15.1	23.9	81.7	101.2	17.1	83.6	121.8	238.8	9.9	182.7	144.3
February	15.9	27.7	87.9	110.6	17.6	89.9	141.3	250.9	10.5	186.3	142.7
March	17.3	29.5	97.0	120.1	19.6	95.4	163.3	267.8	11.4	200.0	144.6
April	22.6	33.3	111.0	147.5	31.0	135.3	190.5	313.6	24.5	227.0	160.6
May	19.7	40.2	85.1	149.4	27.2	134.4	184.0	340.1	24.3	264.6	183.0
June	10.5	24.1	52.3	87.0	14.6	86.3	128.3	289.5	11.9	282.6	180.3
July	8.2	15.8	41.9	61.4	11.5	68.1	88.1	250.9	8.6	284.2	162.4
August	7.4	12.7	37.7	52.9	10.9	63.6	81.6	197.8	7.5	261.4	146.6
September	8.2	11.2	40.5	53.9	12.3	69.9	93.3	176.1	9.5	230.7	131.5
October	11.3	11.4	52.3	63.4	13.6	74.5	107.6	166.4	12.9	206.3	122.2
November	15.8	14.5	74.0	85.1	18.7	95.4	128.3	190.6	14.6	199.1	127.3
December	15.5	23.7	76.1	102.1	17.5	93.5	127.0	212.3	15.3	202.3	144.9

Table A.1.2: Estimated Runoff at Selected Gauging Stations (in Million m3)

Name of Catchment & Location	Ruvubu (Burasira)	Ruvyironza (Kibya)	Ruvubu (Gitega)	Ruvubu Muyinga)	Kanyaru (Butare/Nigozi)	Nyabarongo (Kigali)	Nyabarongo (Kanzenzi)	Kagera (Rusumo Falls)	Kagitumba (Kagitumba)	Kagera (Kyaka Ferry)	Kagera (mouth)
Catchment Area (km2)	1130	1994	6232	10450	2381	8397	14019	30700	3500	54600	59800
Average Runoff (MCM)	439	703	2198	2980	556	2864	4085	7609	423	7179	4709
Unit Runoff (mm)	389	353	353	285	234	341	291	248	121	131	79
January	40.3	64.0	218.6	271.0	45.8	223.8	326.3	639.6	26.6	489.3	386.5
February	38.8	67.5	214.6	269.9	43.0	219.3	344.6	612.0	25.5	454.6	348.1
March	46.3	78.9	259.7	321.5	52.4	255.5	437.6	717.3	30.5	535.6	387.3
April	58.5	86.2	287.7	382.3	80.5	350.8	493.8	812.9	63.6	588.5	416.2
May	52.6	107.6	228.1	400.0	72.8	360.0	492.9	911.1	65.0	708.6	490.2
June	27.1	62.5	135.6	225.5	37.9	223.7	332.6	750.3	30.9	732.4	467.4
July	22.0	42.4	112.3	164.6	30.7	182.4	236.0	671.9	23.0	761.2	434.9
August	19.8	34.1	100.9	141.9	29.3	170.2	218.6	529.7	20.1	700.3	392.6
September	21.3	28.9	104.9	139.7	32.0	181.2	241.9	456.5	24.7	598.0	340.8
October	30.3	30.5	140.3	169.7	36.4	199.2	288.1	445.9	34.5	552.7	327.4
November	40.8	37.6	191.7	220.6	48.5	247.2	332.6	493.9	37.9	516.1	330.0
December	41.4	63.4	203.8	273.5	46.8	250.6	340.3	568.6	40.9	541.6	388.0

Table A.1.3: Estimated Runoff at Dam Sites (in Million m3)

Name of Dam Location	Upper Ruvubu Dam Site	Ruvyironza Dam Site	Kanyaru Dam Site	Nyabarongo Dam Site	Rusumo Fall Dam Site	Kagitumba-Maziba Dam Site	Lower Kagera Cascade Dam Site
Catchment Area (km2)	548	1994	1832	5750	30700	856	47200
Average Runoff (MCM)	239	703	739	2175	7609	163	7179
Unit Runoff (mm)	437	353	403	378	248	190	152
January	22.0	64.0	60.9	175.5	639.6	10.2	489.3
February	21.1	67.5	57.2	185.3	612.0	9.8	454.6
March	25.2	78.9	69.7	234.7	717.3	11.7	535.6
April	31.9	86.2	107.0	268.3	812.9	24.4	588.5
May	28.7	107.6	96.7	275.4	911.1	25.0	708.6
June	14.8	62.5	50.4	166.3	750.3	11.9	732.4
July	12.0	42.4	40.8	129.4	671.9	8.8	761.2
August	10.8	34.1	38.9	114.5	529.7	7.7	700.3
September	11.6	28.9	42.5	125.3	456.5	9.5	598.0
October	16.5	30.5	48.4	149.7	445.9	13.2	552.7
November	22.2	37.6	64.4	170.0	493.9	14.6	516.1
December	22.6	63.4	62.2	181.0	568.6	15.7	541.6

Table A.1.4: Estimated Average Rainfall at Reservoirs (in mm)

Name of Reservoir & Location	Upper Ruvubu Reservoir	Ruvyironza Reservoir	Kanyaru Reservoir	Nyabarongo Reservoir	Rusumo Falls Reservoir	Kagitumba-Maziba Reservoir	Lower Kagera Reservoir System
Average Runoff (MCM)	1309	1262	1286	1215	795	1122	748
January	97	94	95	90	59	83	56
February	112	108	110	104	68	96	64
March	137	132	135	127	83	117	78
April	206	198	202	191	125	176	117
May	147	142	144	136	89	126	84
June	39	37	38	36	24	33	22
July	18	18	18	17	11	16	10
August	48	46	47	44	29	41	27
September	107	104	106	100	65	92	61
October	125	121	123	117	76	107	72
November	156	150	153	144	95	133	89
December	117	113	115	109	71	100	67

Table A.1.5: Estimated Average Evaporation at Reservoirs (in mm)

Name of Reservoir & Location	Upper Ruvubu Reservoir	Ruvyironza Reservoir	Kanyaru Reservoir	Nyabarongo Reservoir	Rusumo Falls Reservoir	Kagitumba-Maziba Reservoir	Lower Kagera Reservoir System
Average Runoff (MCM)	1245	1339	1339	1353	1393	1163	1488
January	101	108	108	109	113	94	120
February	91	97	97	98	101	85	108
March	98	105	105	106	110	92	117
April	89	96	96	97	100	83	106
May	96	103	103	104	107	89	114
June	104	111	111	113	116	97	124
July	122	132	132	133	137	114	146
August	136	146	146	148	152	127	163
September	114	122	122	124	127	106	136
October	106	114	114	116	119	99	127
November	92	99	99	100	103	86	110
December	98	105	105	106	110	91	117

A.2 Patterns of Flows of Scenarios

Table A.2.1: Patterns of flow at downstream of Upper Ruvubu Reservoir

Month	Current Flow	WSS		Scenario 1		Scenario 2		Scenario 3	
		(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Jan	22,0	21,6	21,6	21,6	21,6	19,9	19,4	19,9	19,4
Feb	21,1	20,8	20,8	20,7	20,7	19,0	18,9	19,0	18,9
March	25,2	24,9	24,9	24,5	24,5	18,4	18,3	18,4	18,3
April	31,9	31,6	31,6	31,5	31,5	27,4	28,3	27,4	28,3
May	28,7	28,4	28,4	28,4	28,4	26,9	26,8	26,9	26,8
June	14,8	14,4	14,4	13,4	13,4	8,0	9,5	8,0	9,5
July	12,0	11,7	11,7	11,2	11,2	11,2	11,5	11,2	11,5
Aug	10,8	10,5	10,5	10,0	10,0	12,0	12,5	12,0	12,5
Sept	11,6	11,3	11,3	11,0	11,0	12,4	12,5	12,4	12,5
Oct	16,5	16,2	16,2	16,1	16,1	14,3	13,3	14,3	13,3
Nov	22,2	21,9	21,9	21,9	21,9	17,9	16,6	17,9	16,6
Dec	22,6	22,2	22,2	21,4	21,4	13,6	13,0	13,6	13,0
Annual	**239,3**	**235,5**	**235,5**	**231,7**	**231,5**	**201**	**200,6**	**201**	**200,6**

Chart A.2.1: Patterns of flow of Scenario 2 & 3 at downstream of Upper Ruvubu Reservoir

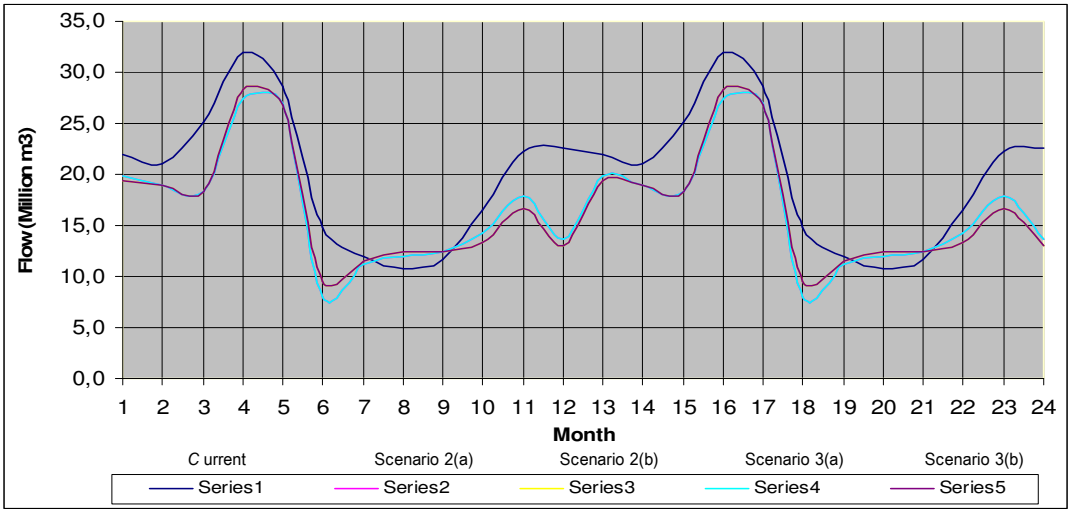


Table A.2.2: Patterns of flow at downstream of Ruvyironza Reservoir

Month	Current Flow	WSS		Scenario 1		Scenario 2		Scenario 3	
		(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Jan	64,0	62,7	62,7	62,6	62,6	62,6	62,6	58,3	56,0
Feb	67,5	66,3	66,3	65,8	65,8	65,6	65,6	60,8	60,9
March	78,9	77,7	77,7	76,3	76,3	75,7	75,6	70,5	71,1
April	86,2	84,9	84,9	84,7	84,7	84,6	84,6	79,5	80,2
May	107,6	106,3	106,3	106,3	106,3	106,3	106,3	101,7	102,0
June	62,5	61,2	61,2	57,6	57,5	55,8	55,6	55,2	55,3
July	42,4	41,2	41,2	39,6	39,5	38,8	38,7	40,4	40,3
Aug	34,1	32,8	32,8	31,4	31,3	30,7	30,6	37,0	37,8
Sept	28,9	27,7	27,7	26,6	26,5	26,0	25,9	35,8	38,1
Oct	30,5	29,2	29,2	28,9	28,8	28,7	28,6	38,1	39,7
Nov	37,6	36,4	36,4	36,4	36,4	36,4	36,4	39,3	39,2
Dec	63,4	62,1	62,1	59,2	59,1	57,8	57,6	49,3	44,2
Annual	**703,5**	**688,5**	**688,5**	**675,5**	**674,9**	**669**	**668,1**	**665,8**	**664,8**

Chart A.2.2: Patterns of flow of Scenario 2 & 3 at downstream of Ruvyironza Reservoir

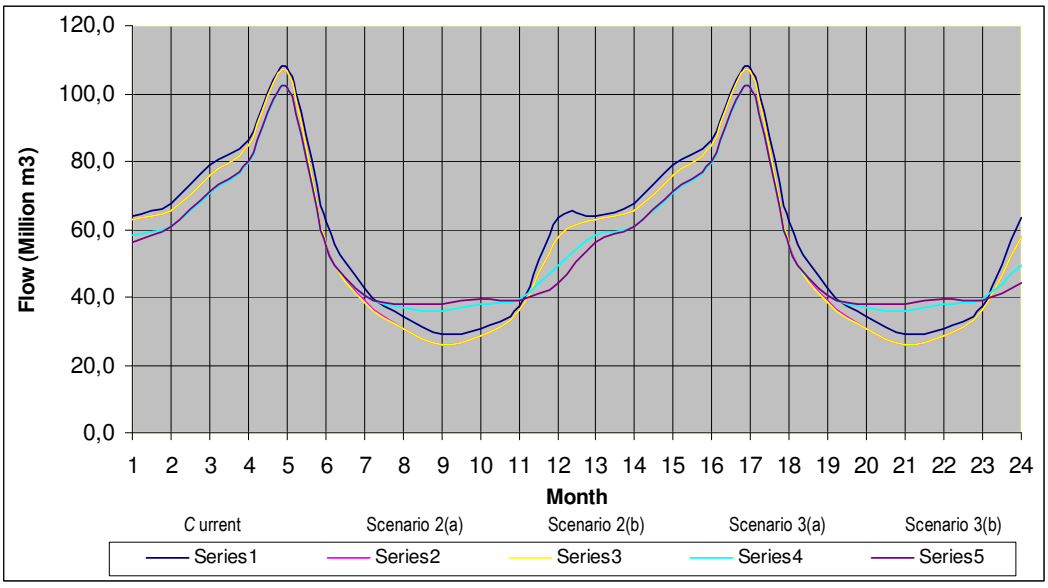


Table A.2.3: Patterns of flow at downstream of Kanyaru Reservoir

Month	Current Flow	WSS		Scenario 1		Scenario 2		Scenario 3	
		(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Jan	60,9	59,5	59,5	59,4	59,4	58,0	57,6	58,0	57,6
Feb	57,2	55,7	55,7	55,4	55,4	52,6	52,2	52,6	52,2
March	69,7	68,2	68,2	67,2	67,2	52,5	51,8	52,5	51,8
April	107,0	105,5	105,5	105,3	105,3	92,6	94,2	92,6	94,2
May	96,7	95,2	95,2	95,2	95,2	91,4	89,9	91,4	89,9
June	50,4	49,0	49,0	46,3	46,1	29,4	32,4	29,4	32,4
July	40,8	39,3	39,3	38,2	38,1	33,6	35,7	33,6	35,7
Aug	38,9	37,5	37,5	36,4	36,4	35,9	37,0	35,9	37,0
Sept	42,5	41,1	41,1	40,2	40,2	38,7	37,5	38,7	37,5
Oct	48,4	46,9	46,9	46,6	46,6	46,0	43,6	46,0	43,6
Nov	64,4	62,9	62,9	62,9	62,9	58,3	54,5	58,3	54,5
Dec	62,2	60,7	60,7	58,5	58,4	41,4	40,7	41,4	40,7
Annual	**739,2**	**721,5**	**721,5**	**711,7**	**711,3**	**630,5**	**627,2**	**630,5**	**627,2**

Chart A.2.3: Patterns of flow of Scenario 2 & 3 at downstream of Kanyaru Reservoir

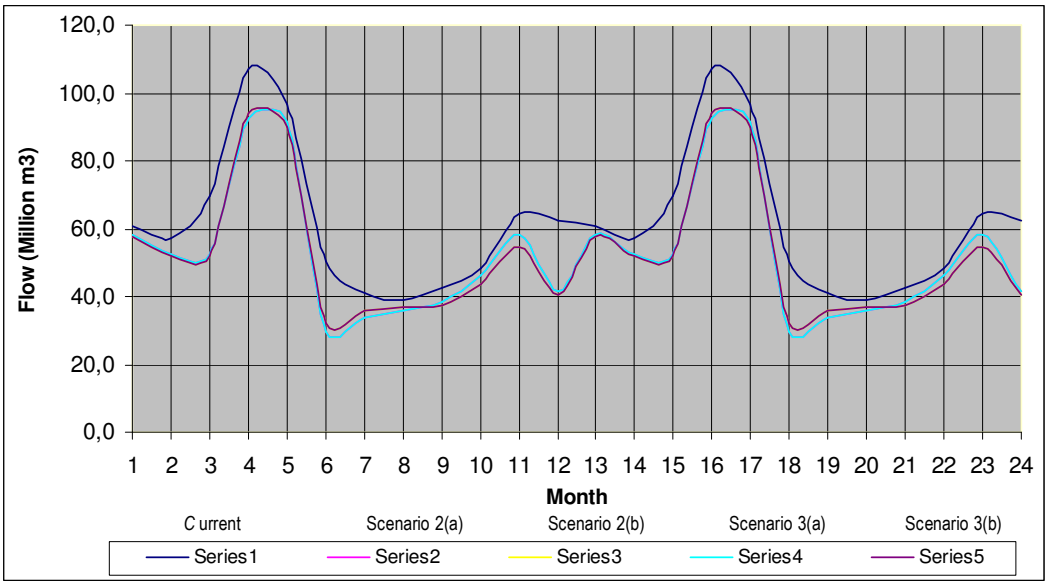


Table A.2.4: Patterns of flow at downstream of Nyabarongo Reservoir

Month	Current Flow	WSS		Scenario 1		Scenario 2		Scenario 3	
		(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Jan	175	171	170	170	168	170	167	170	167
Feb	185	180	180	173	170	172	168	172	169
March	235	230	230	209	209	207	206	207	207
April	268	263	263	252	249	252	247	252	248
May	275	270	270	260	260	261	264	261	261
June	166	161	161	132	132	128	128	128	128
July	129	125	124	121	121	119	119	119	119
Aug	114	110	109	118	118	116	116	116	116
Sept	125	120	120	120	120	118	118	118	118
Oct	150	145	144	140	141	139	138	139	138
Nov	170	165	165	161	161	161	163	161	163
Dec	181	176	176	157	154	153	152	153	152
Annual	**2175**	**2116,3**	**2112,6**	**2011,9**	**2004,4**	**1995,3**	**1987**	**1995,3**	**1987**

Chart A.2.4: Patterns of flow of Scenario 2 & 3 at downstream of Nyabarongo Reservoir

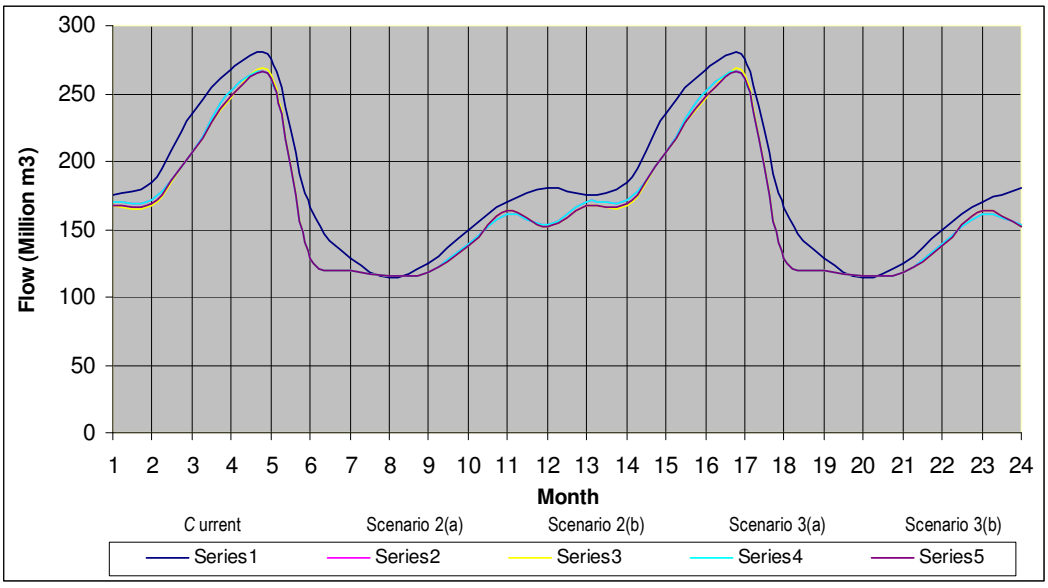


Table A.2.5: Patterns of flow at downstream of Rusumo Falls Reservoir

Month	Current Flow	WSS		Scenario 1		Scenario 2		Scenario 3	
		(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Jan	640	621	620	620	617	616	611	575	563
Feb	612	594	593	581	578	574	569	555	548
March	717	699	698	663	662	633	630	612	605
April	813	795	793	781	777	762	760	735	742
May	911	893	892	882	881	878	878	868	867
June	750	732	731	661	659	617	618	608	607
July	672	654	652	632	630	618	617	614	612
Aug	530	511	510	504	502	496	495	504	504
Sept	457	438	437	425	424	417	415	441	443
Oct	446	428	426	419	418	414	408	451	453
Nov	494	476	474	472	471	463	459	469	469
Dec	569	550	549	498	493	455	449	468	451
Annual	**7609,5**	**7390,5**	**7374,2**	**7138**	**7111**	**6942,2**	**6908,2**	**6900,9**	**6864**

Chart A.2.5: Patterns of flow of Scenario 2 & 3 at downstream of Rusumo Falls Reservoir

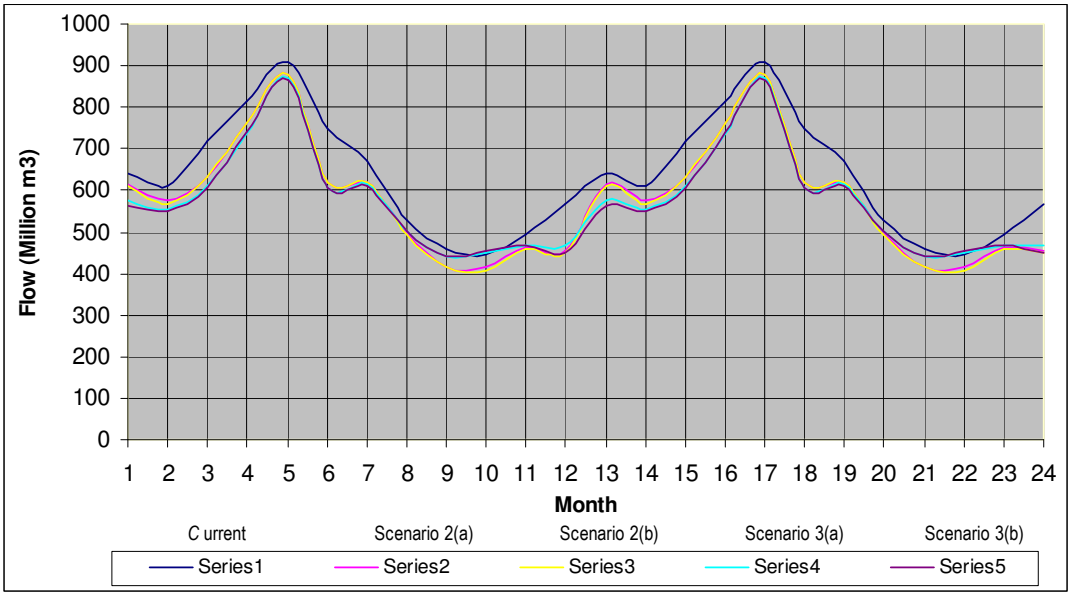


Table A.2.6: Patterns of flow at downstream of Kagitumba-Maziba Reservoir

Month	Current Flow	WSS		Scenario 1		Scenario 2		Scenario 3	
		(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Jan	10,2	9,5	9,5	9,5	9,5	9,5	9,5	11,8	12,8
Feb	9,8	9,1	9,1	9,0	9,0	8,9	8,9	10,3	11,4
March	11,7	11,0	11,0	10,6	10,5	10,3	10,3	10,0	10,5
April	24,4	23,7	23,7	23,6	23,6	23,6	23,6	18,4	15,1
May	25,0	24,3	24,3	24,3	24,3	24,3	24,3	20,7	17,1
June	11,9	11,2	11,2	9,9	9,9	9,3	9,2	6,7	7,1
July	8,8	8,1	8,1	7,6	7,5	7,3	7,3	9,0	10,3
Aug	7,7	7,0	7,0	6,5	6,5	6,3	6,3	9,3	10,9
Sept	9,5	8,8	8,8	8,4	8,4	8,2	8,2	9,4	10,5
Oct	13,2	12,5	12,5	12,4	12,4	12,4	12,3	11,5	11,6
Nov	14,6	13,9	13,9	13,9	13,9	13,9	13,9	12,5	12,2
Dec	15,7	15,0	15,0	14,0	14,0	13,5	13,5	9,6	8,8
Annual	**162,5**	**154,1**	**154,1**	**149,6**	**149,4**	**147,4**	**147,1**	**139**	**138,1**

Chart A.2.6: Patterns of flow of Scenario 2 & 3 at downstream of Kagitumba-Maziba Reservoir

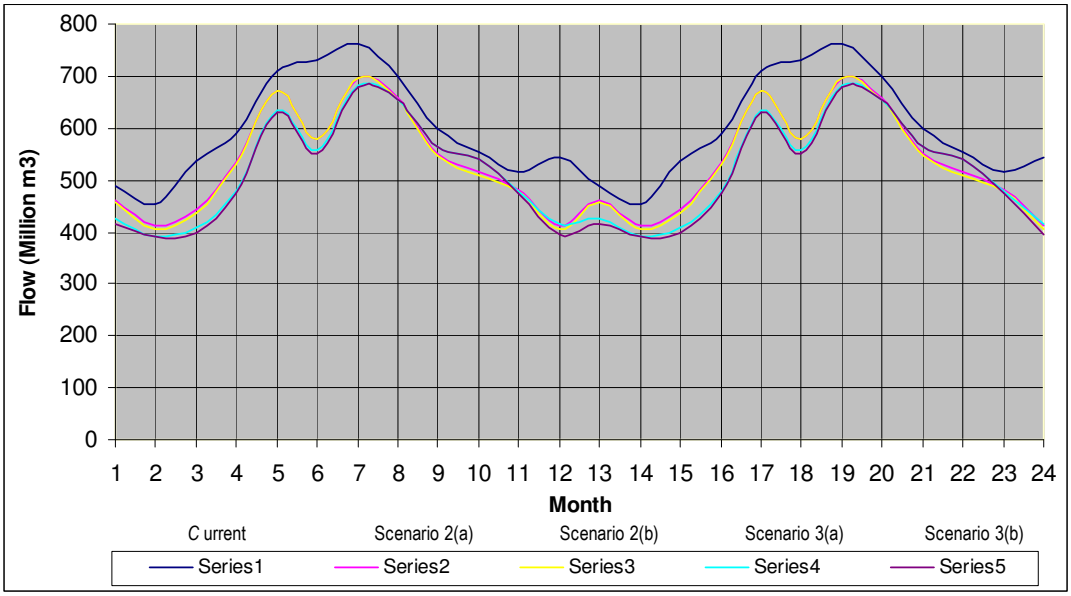
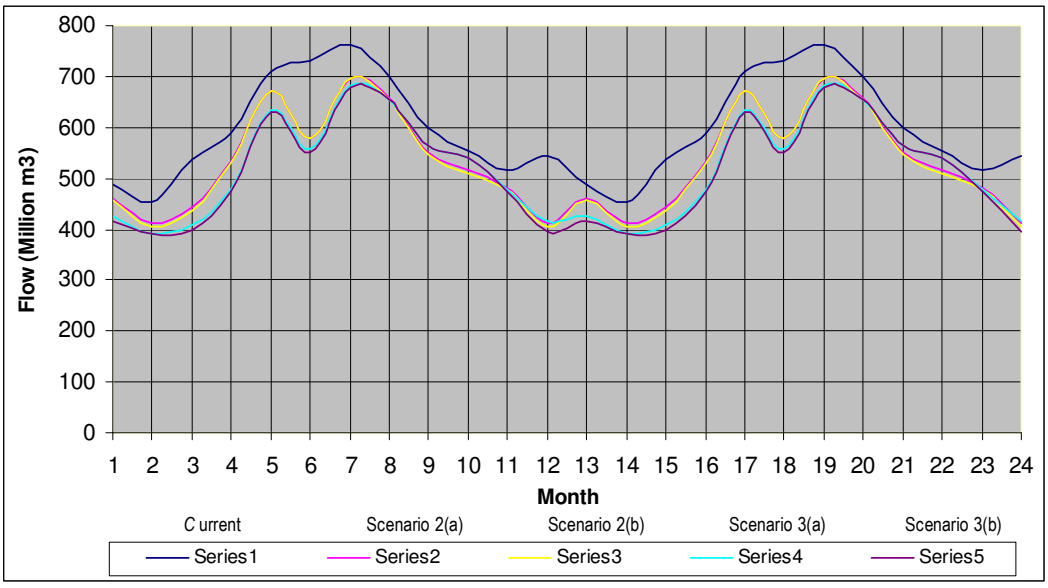


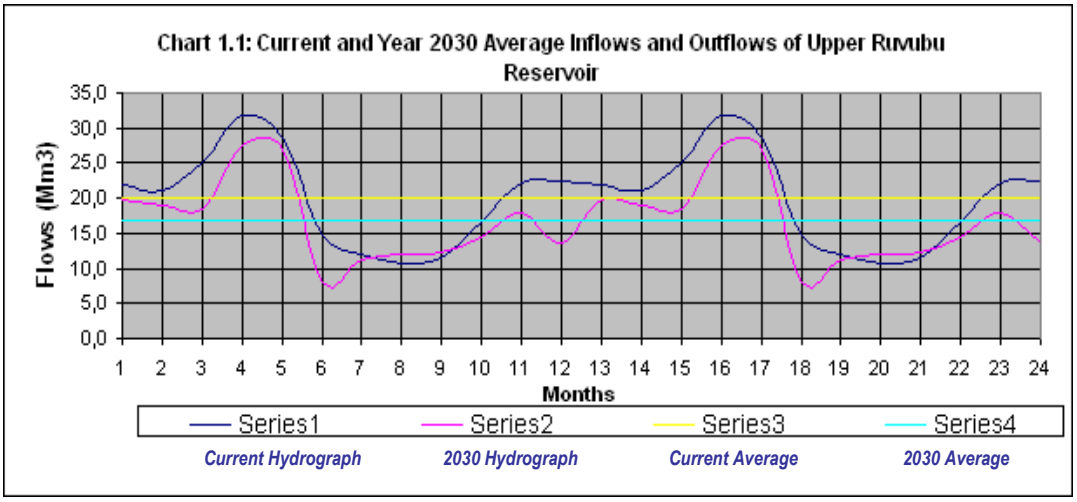
Table A.2.7: Patterns of flow at downstream of Lower Kagera Cascade Reservoirs

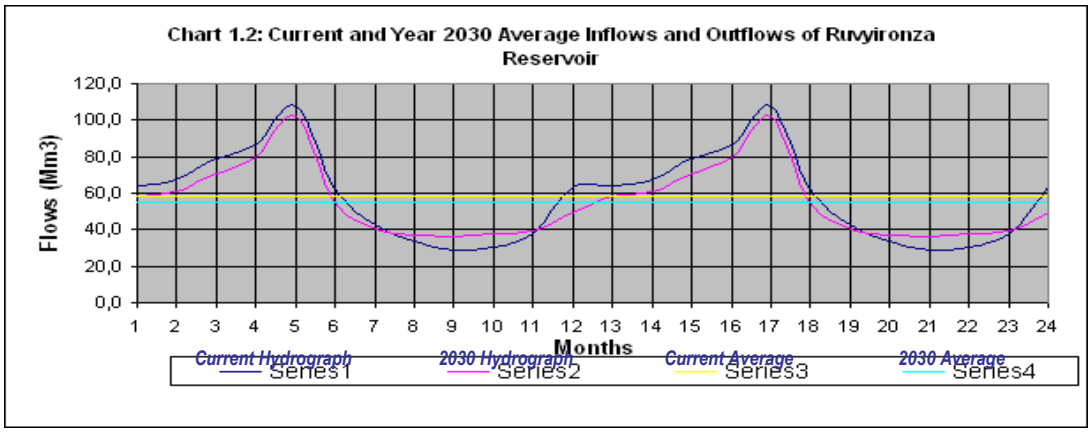
Month	Current Flow	WSS		Scenario 1		Scenario 2		Scenario 3	
		(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Jan	489	468	466	466	462	462	456	425	414
Feb	455	433	431	420	415	412	405	392	391
March	536	514	512	475	472	443	438	408	400
April	588	567	565	553	548	534	530	478	474
May	709	687	685	676	675	672	672	634	631
June	732	711	709	630	626	580	580	558	552
July	761	740	737	714	710	697	695	681	678
Aug	700	679	676	667	664	657	655	655	654
Sept	598	577	574	560	558	551	547	563	564
Oct	553	531	529	521	519	516	509	539	539
Nov	516	495	493	491	489	482	477	477	476
Dec	542	520	518	460	453	412	405	414	395
Annual	**7178,6**	**6922,2**	**6892,7**	**6632,4**	**6590,6**	**6417,9**	**6368,3**	**6225,1**	**6166,9**

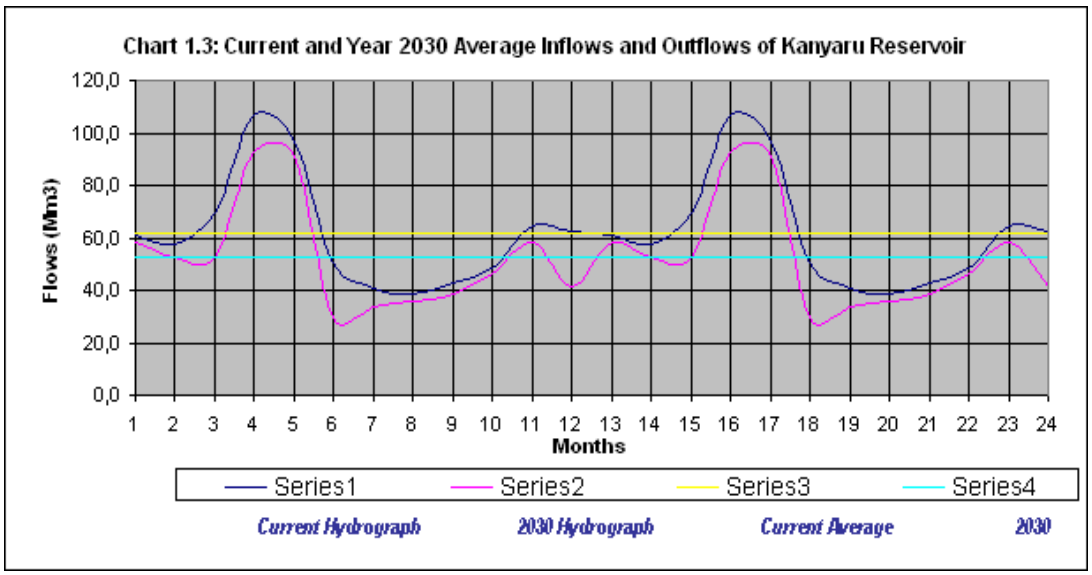
Chart A.2.7: Patterns of flow of Scenario 2 & 3 at downstream of Lower Kagera Reservoirs



A.3 Scenarios without Climate Change







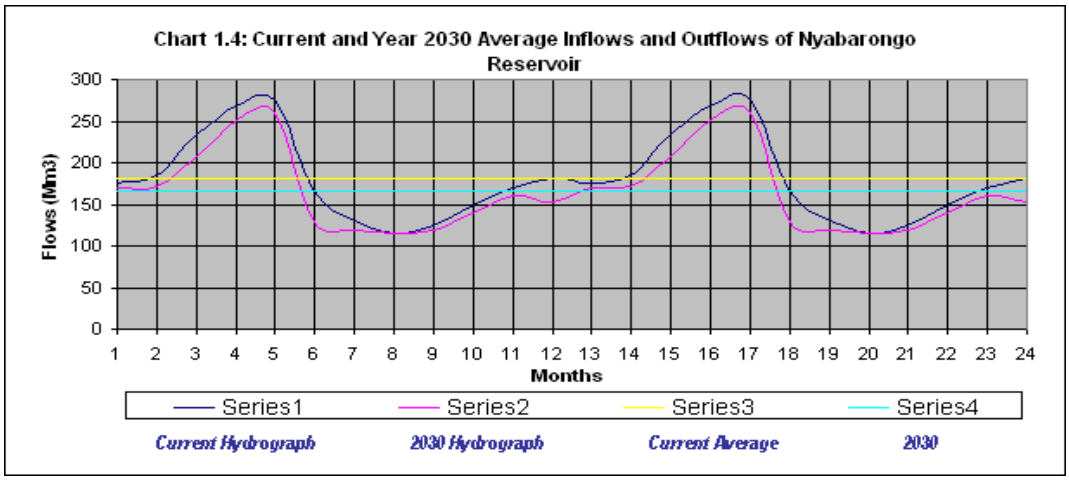


Chart 1.4: Current and Year 2030 Average Inflows and Outflows of Nyabarongo Reservoir
Flows (Mm3)
300
250
200
150
100
50
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Months
Series1
Series2
Series3
Series4
Current Hydrograph
2030 Hydrograph
Current Average
2030

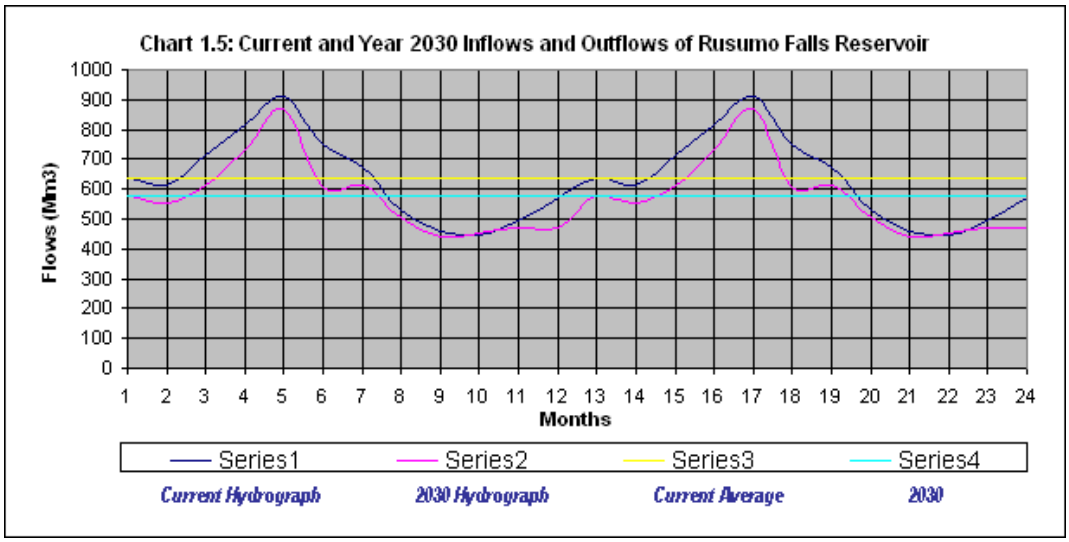


Chart 1.5: Current and Year 2030 Inflows and Outflows of Rusumo Falls Reservoir
Flows (Mm3)
1000
900
800
700
600
500
400
300
200
100
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Months
Series1
Series2
Series3
Series4
Current Hydrograph
2030 Hydrograph
Current Average
2030

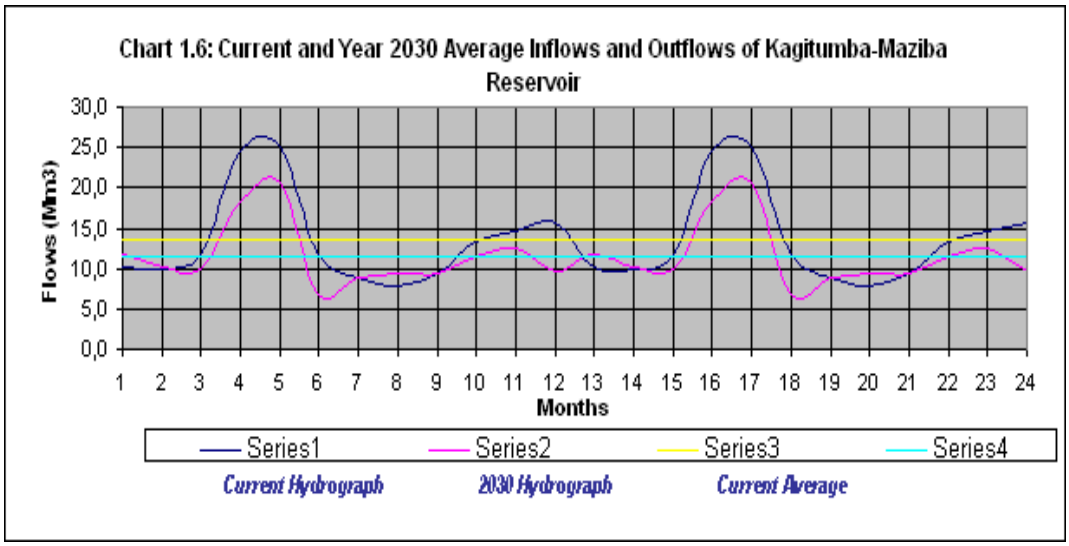


Chart 1.6: Current and Year 2030 Average Inflows and Outflows of Kagitumba-Maziba Reservoir
Flows (Mm3)
30,0
25,0
20,0
15,0
10,0
5,0
0,0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Months
Series1
Series2
Series3
Series4
Current Hydrograph
2030 Hydrograph
Current Average

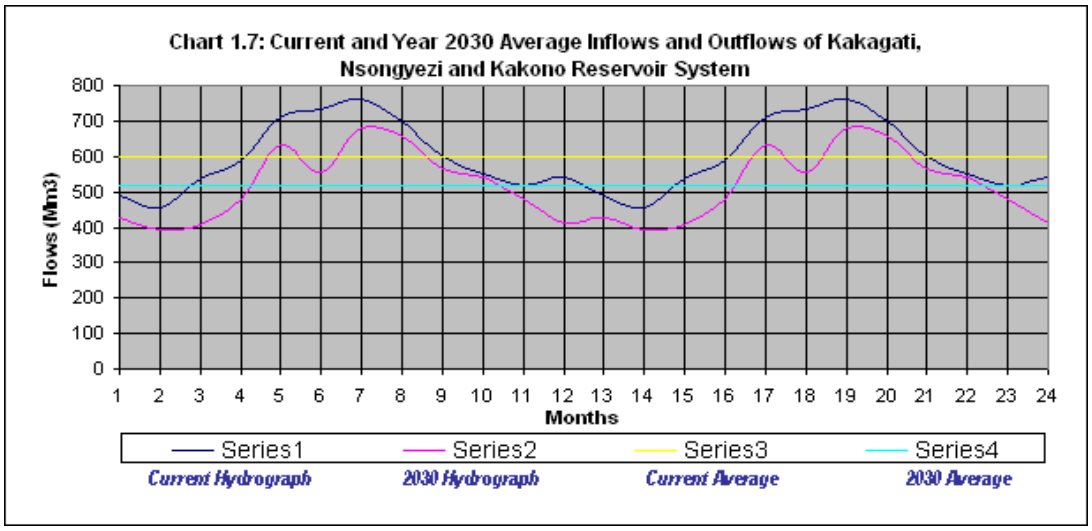


Chart 1.7: Current and Year 2030 Average Inflows and Outflows of Kakagati, Nsongyezi and Kakono Reservoir System
Flows (Mm3)
Months
Series1
Series2
Series3
Series4
Current Hydrograph
2030 Hydrograph
Current Average
2030 Average

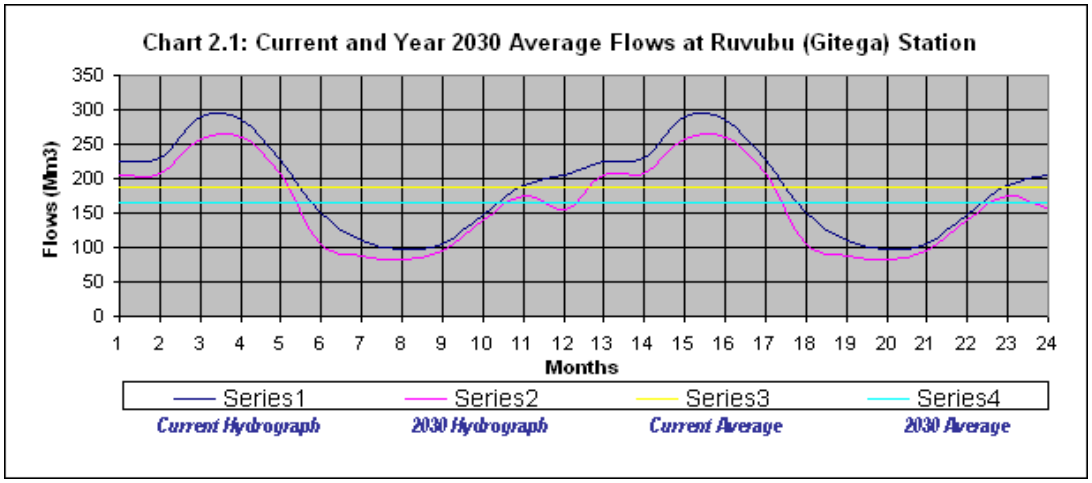


Chart 2.1: Current and Year 2030 Average Flows at Ruvubu (Gitega) Station
Flows (Mm3)
Months
Series1
Series2
Series3
Series4
Current Hydrograph
2030 Hydrograph
Current Average
2030 Average

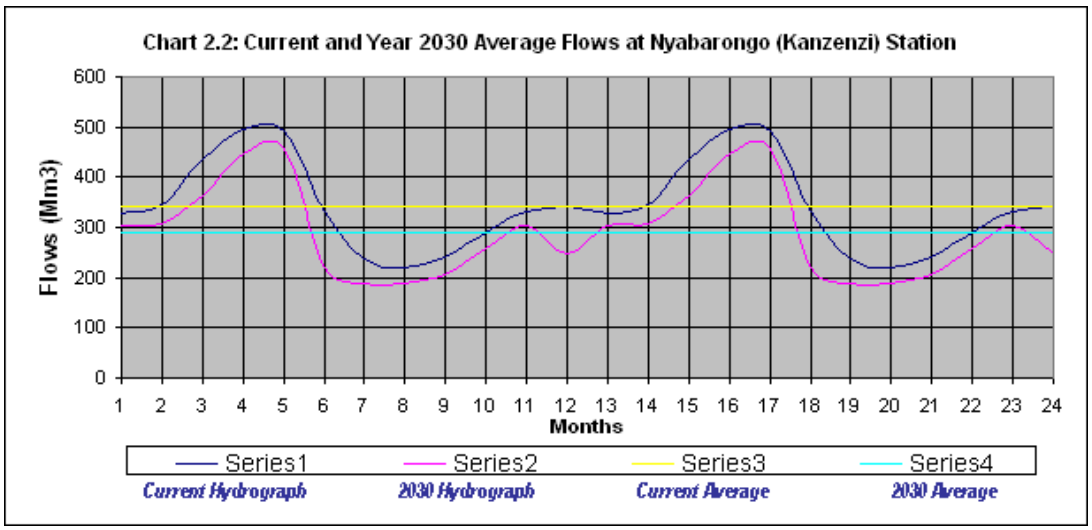


Chart 2.2: Current and Year 2030 Average Flows at Nyabarongo (Kanzenzi) Station
Flows (Mm3)
Months
Series1
Series2
Series3
Series4
Current Hydrograph
2030 Hydrograph
Current Average
2030 Average

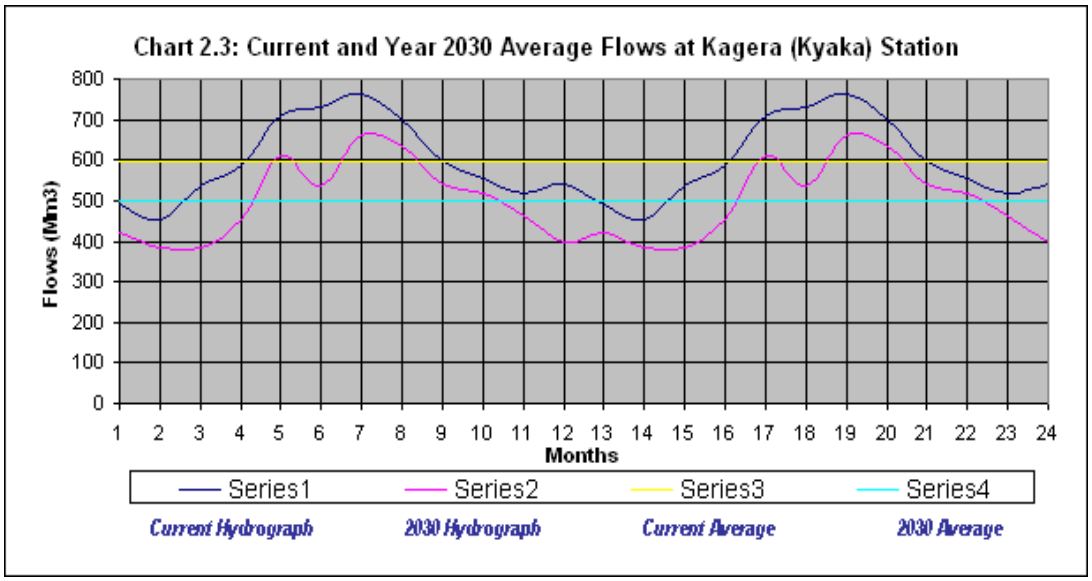


Chart 2.3: Current and Year 2030 Average Flows at Kagera (Kyaka) Station
Flows (Mm3)
800
700
600
500
400
300
200
100
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Months
Series1
Series2
Series3
Series4
Current Hydrograph
2030 Hydrograph
Current Average
2030 Average

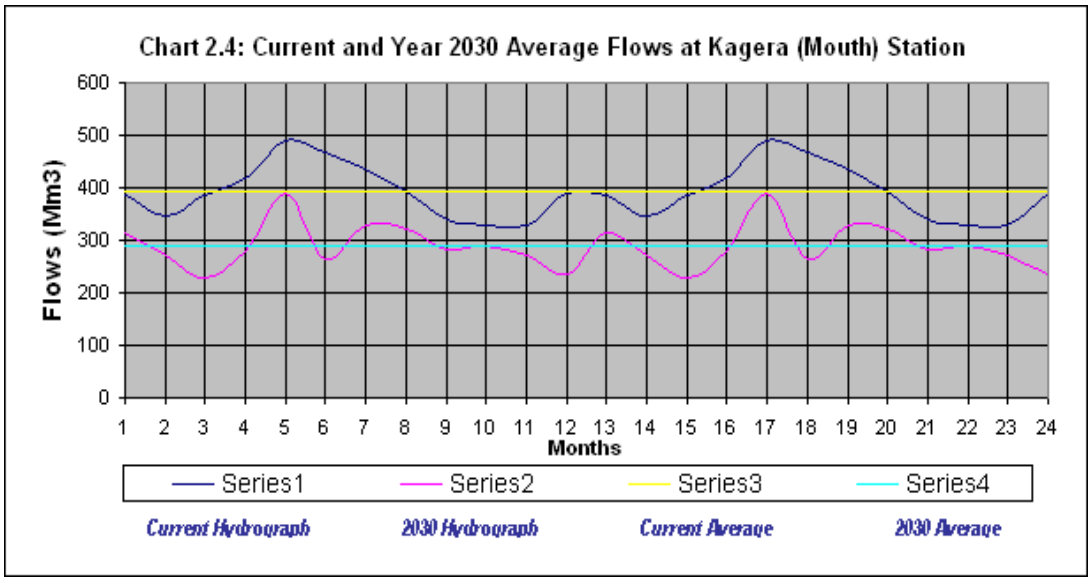
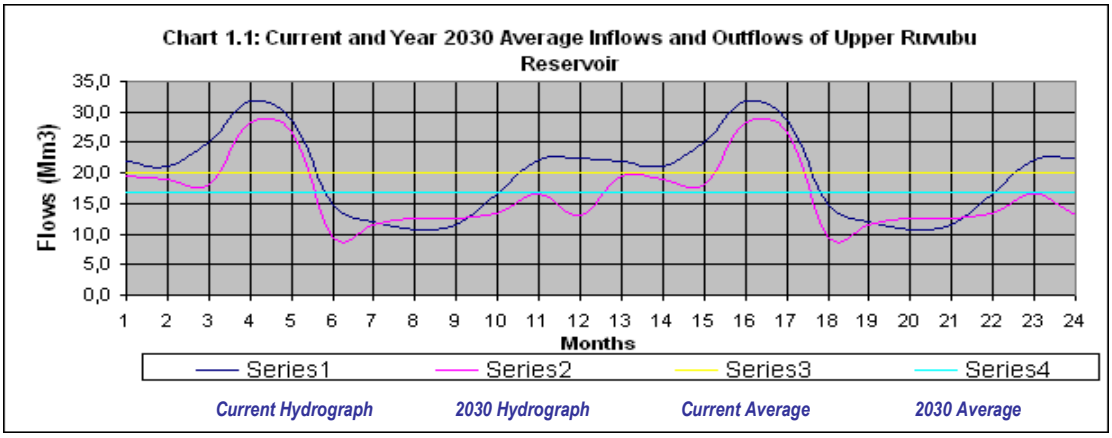
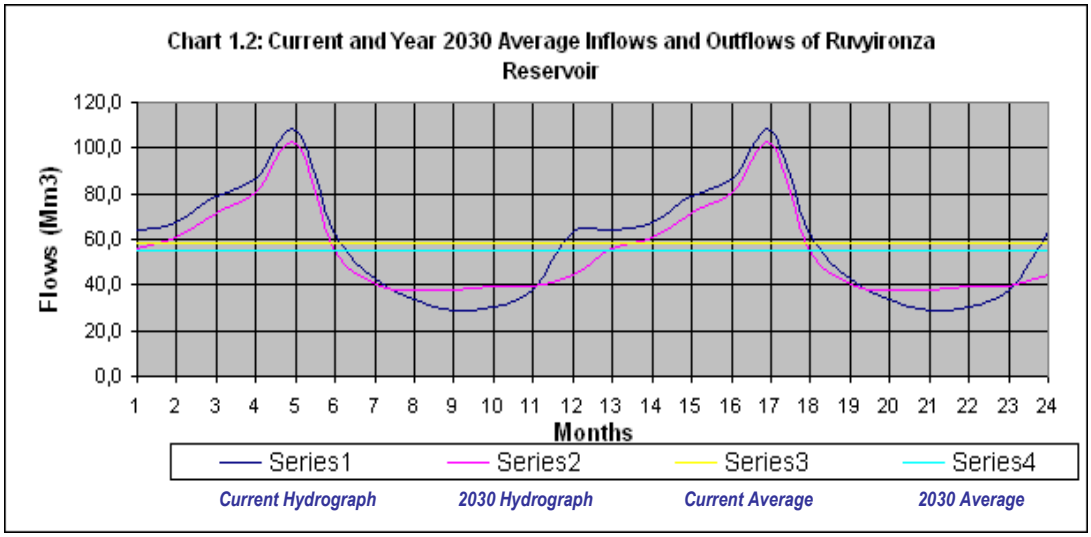
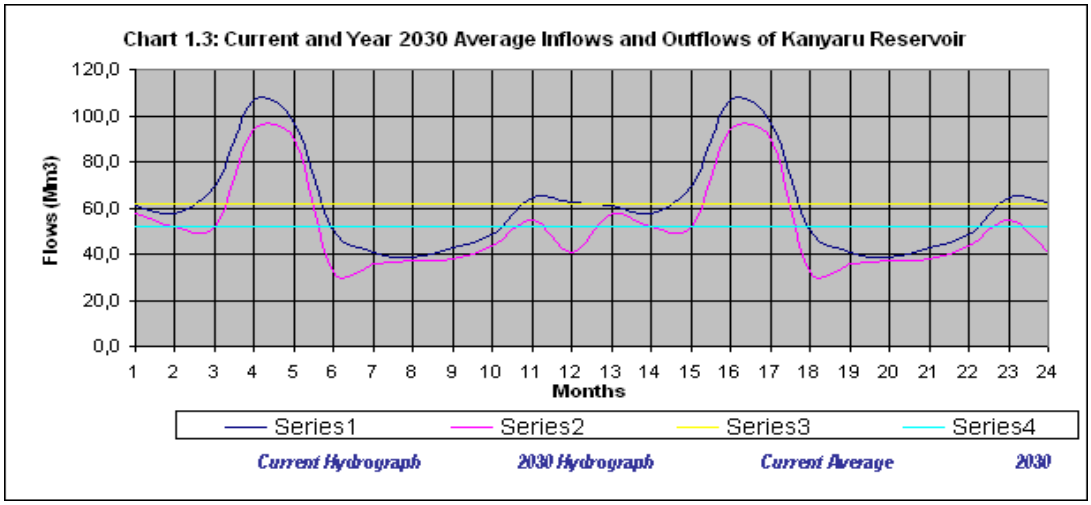


Chart 2.4: Current and Year 2030 Average Flows at Kagera (Mouth) Station
Flows (Mm3)
600
500
400
300
200
100
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Months
Series1
Series2
Series3
Series4
Current Hydrograph
2030 Hydrograph
Current Average
2030 Average

A.4 Scenarios with Climate Change







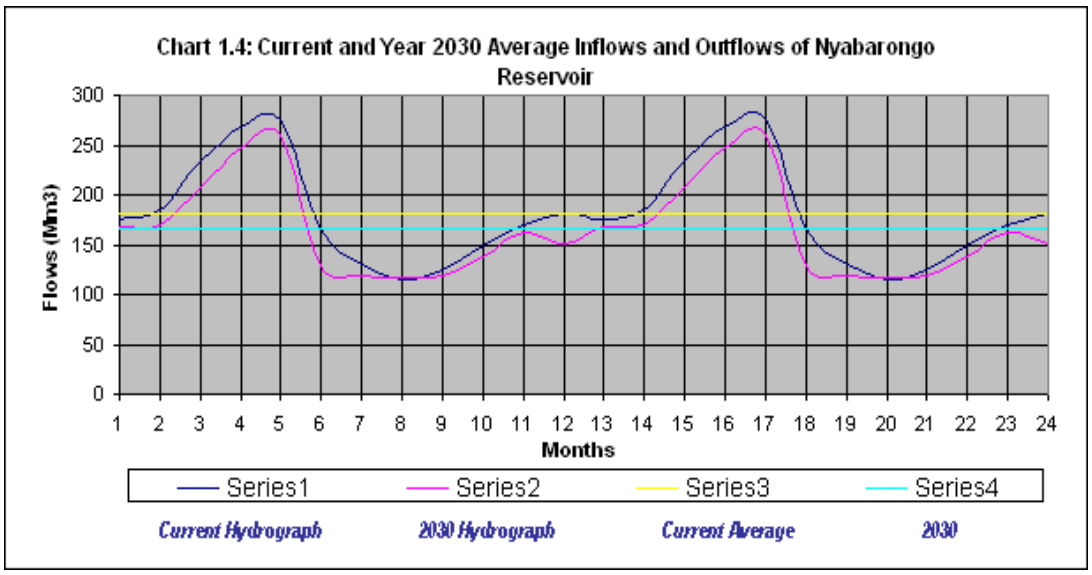


Chart 1.4: Current and Year 2030 Average Inflows and Outflows of Nyabarongo Reservoir
Flows (Mm3)
300
250
200
150
100
50
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Months
Series1
Series2
Series3
Series4
Current Hydrograph
2030 Hydrograph
Current Average
2030

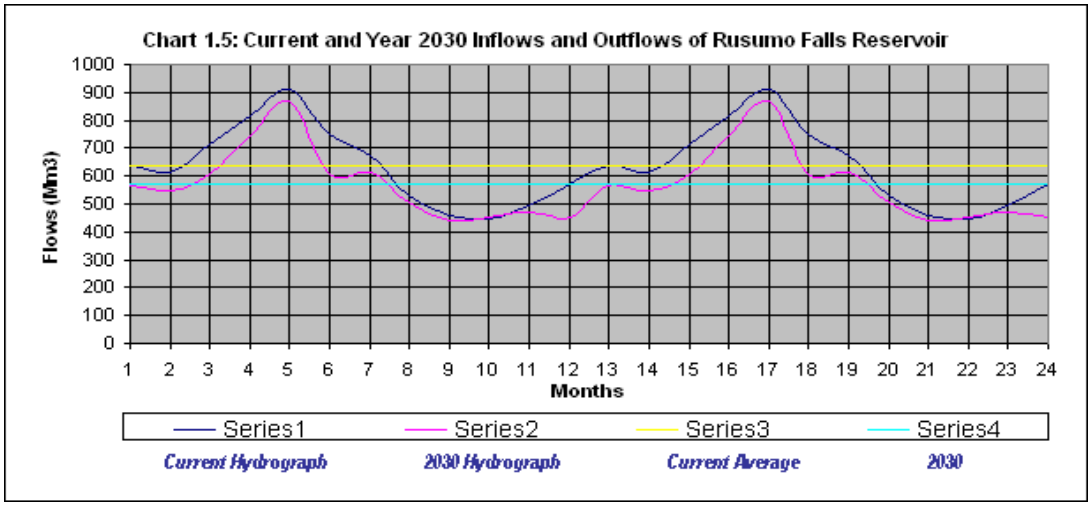


Chart 1.5: Current and Year 2030 Inflows and Outflows of Rusumo Falls Reservoir
Flows (Mm3)
1000
900
800
700
600
500
400
300
200
100
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Months
Series1
Series2
Series3
Series4
Current Hydrograph
2030 Hydrograph
Current Average
2030

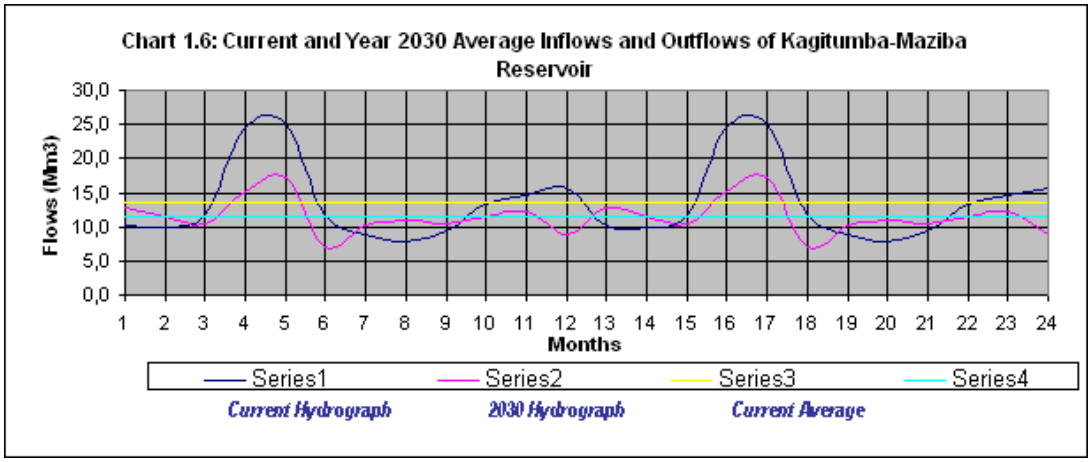


Chart 1.6: Current and Year 2030 Average Inflows and Outflows of Kagitumba-Maziba Reservoir
Flows (Mm3)
30,0
25,0
20,0
15,0
10,0
5,0
0,0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Months
Series1
Series2
Series3
Series4
Current Hydrograph
2030 Hydrograph
Current Average

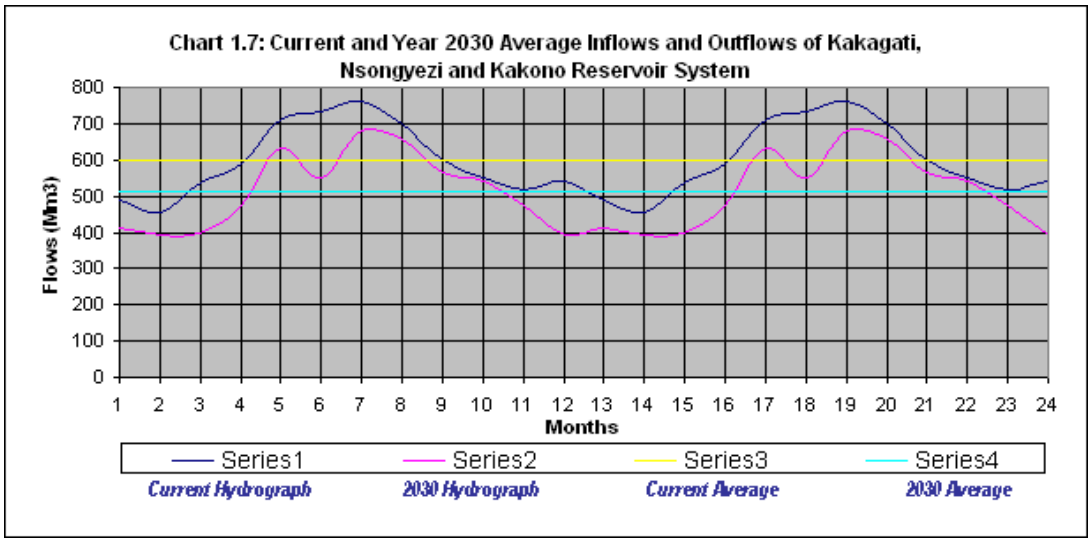


Chart 1.7: Current and Year 2030 Average Inflows and Outflows of Kakagati, Nsongyezi and Kakono Reservoir System
Flows (Mm3)
Months
Series1
Series2
Series3
Series4
Current Hydrograph
2030 Hydrograph
Current Average
2030 Average

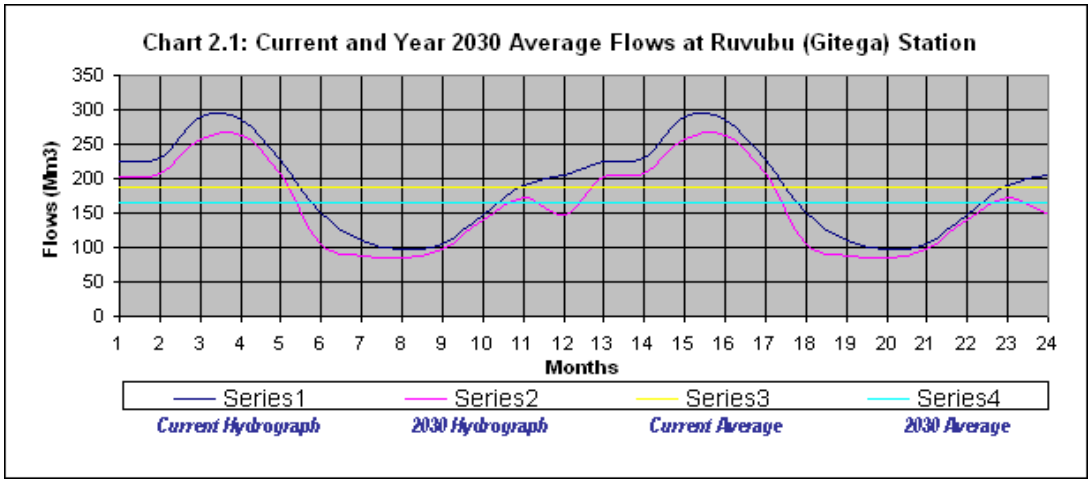


Chart 2.1: Current and Year 2030 Average Flows at Ruvubu (Gitega) Station
Flows (Mm3)
Months
Series1
Series2
Series3
Series4
Current Hydrograph
2030 Hydrograph
Current Average
2030 Average

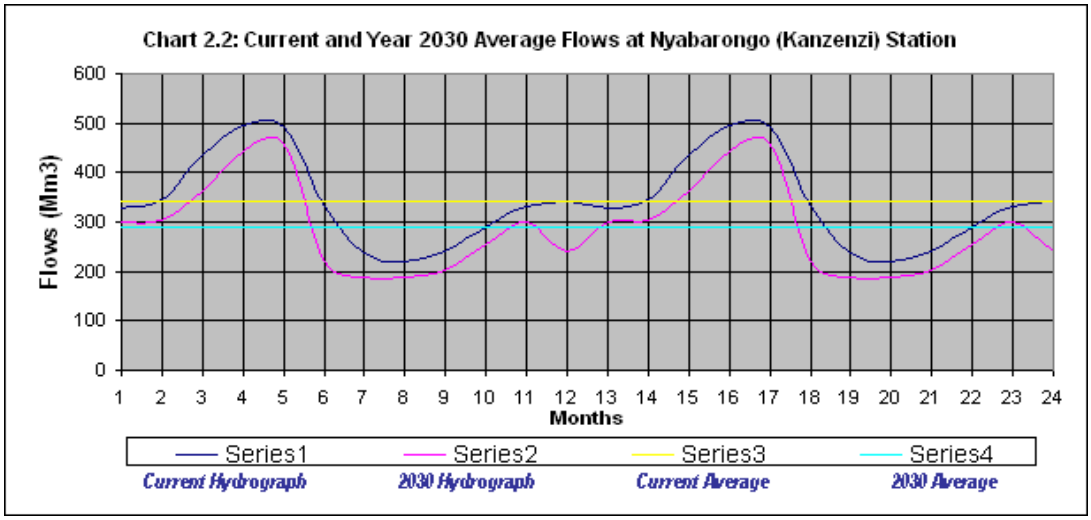


Chart 2.2: Current and Year 2030 Average Flows at Nyabarongo (Kanzenzi) Station
Flows (Mm3)
Months
Series1
Series2
Series3
Series4
Current Hydrograph
2030 Hydrograph
Current Average
2030 Average

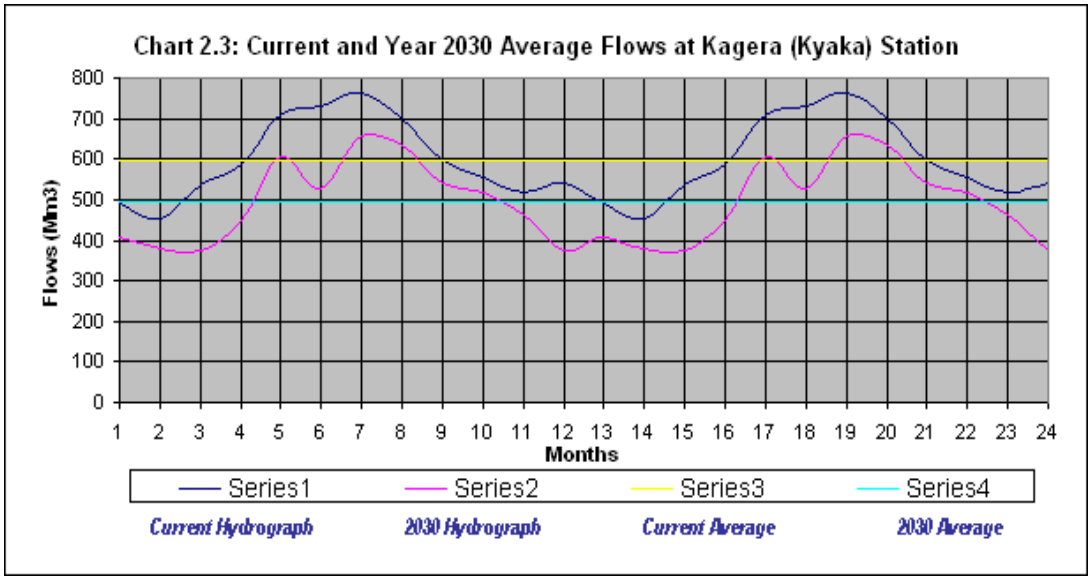


Chart 2.3: Current and Year 2030 Average Flows at Kagera (Kyaka) Station
Flows (Mm3)
800
700
600
500
400
300
200
100
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Months
Series1
Series2
Series3
Series4
Current Hydrograph
2030 Hydrograph
Current Average
2030 Average

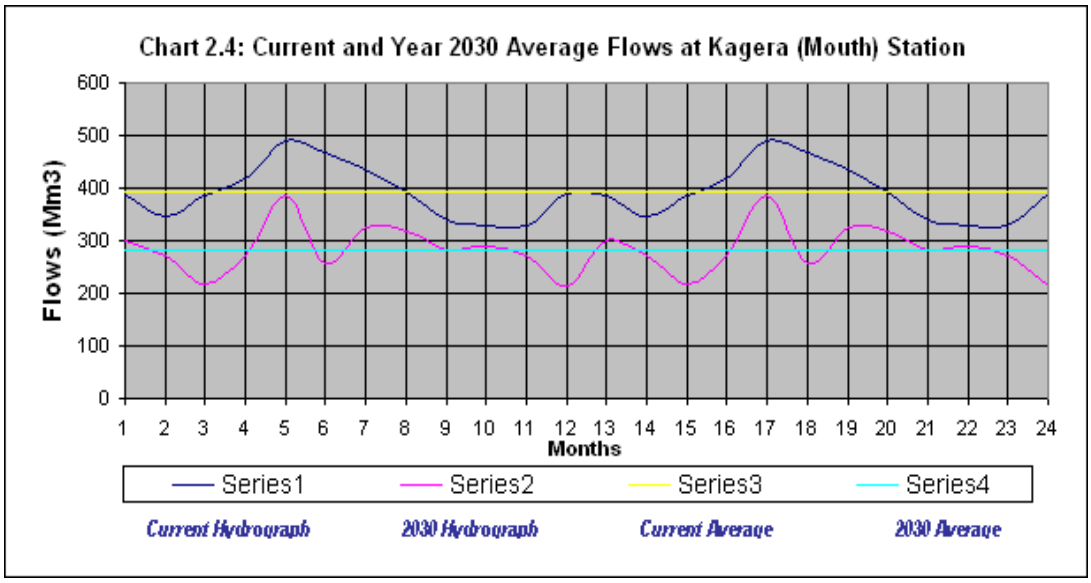


Chart 2.4: Current and Year 2030 Average Flows at Kagera (Mouth) Station
Flows (Mm3)
600
500
400
300
200
100
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Months
Series1
Series2
Series3
Series4
Current Hydrograph
2030 Hydrograph
Current Average
2030 Average

A.5 Implementation Schedules of Projects

Chart 1: Upper Ruvubu Multipurpose Project Implementation Schedule

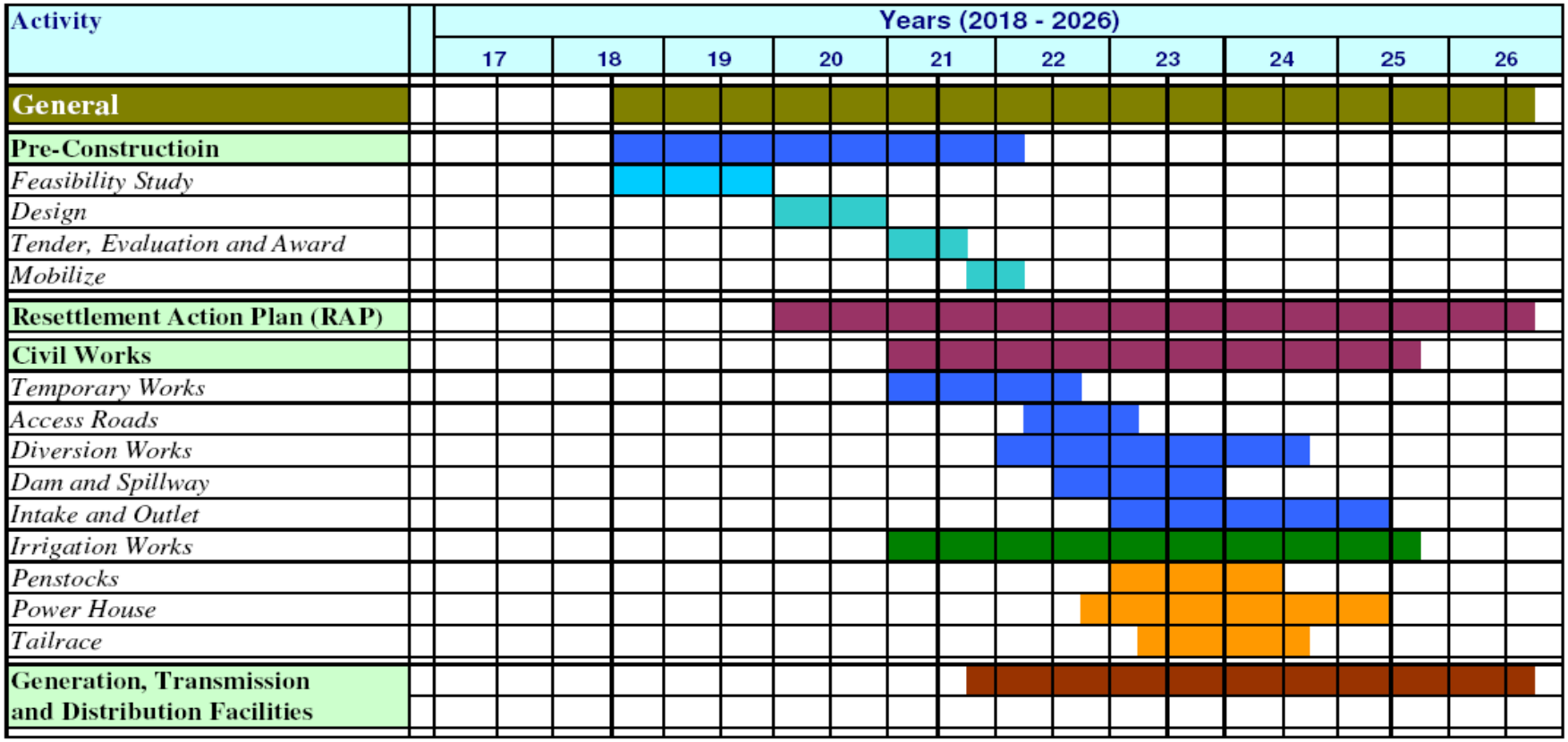


Chart 2: Ruvyironza Hydropower Project Implementation Schedule

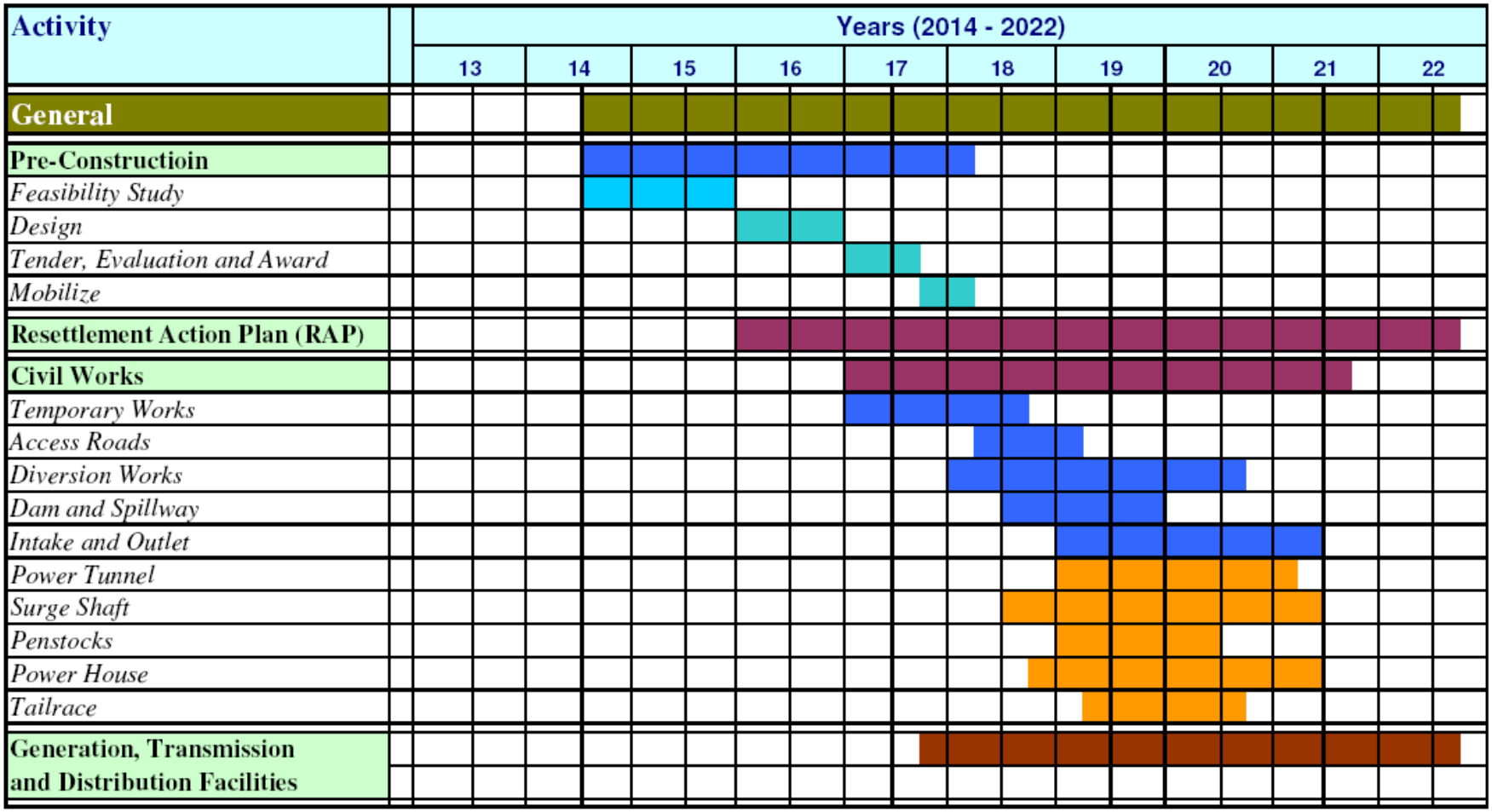


Chart 3: Kanyaru Multipurpose Joint Project Implementation Schedule

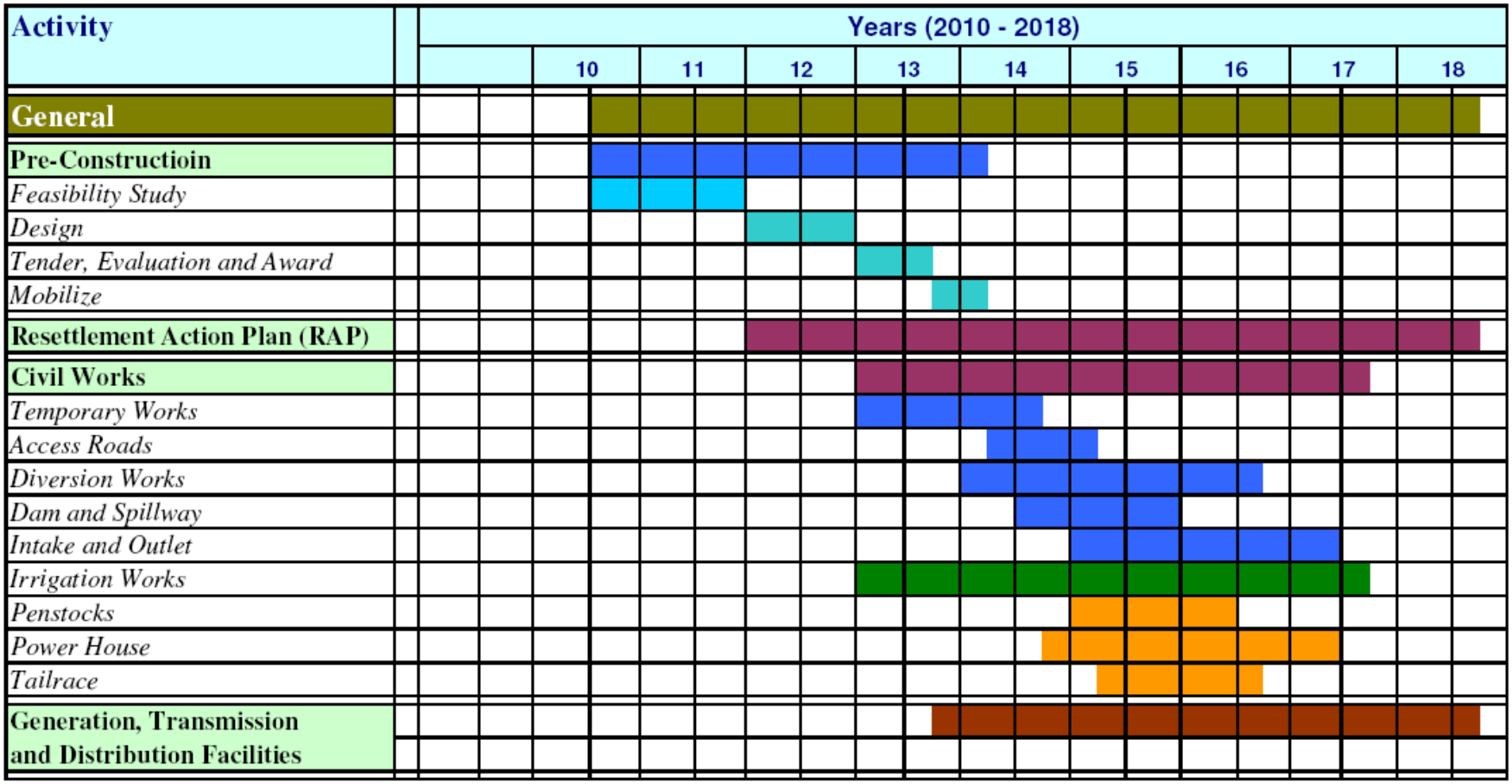


Chart 4: Nyabarongo Multipurpose Project Implementation Schedule

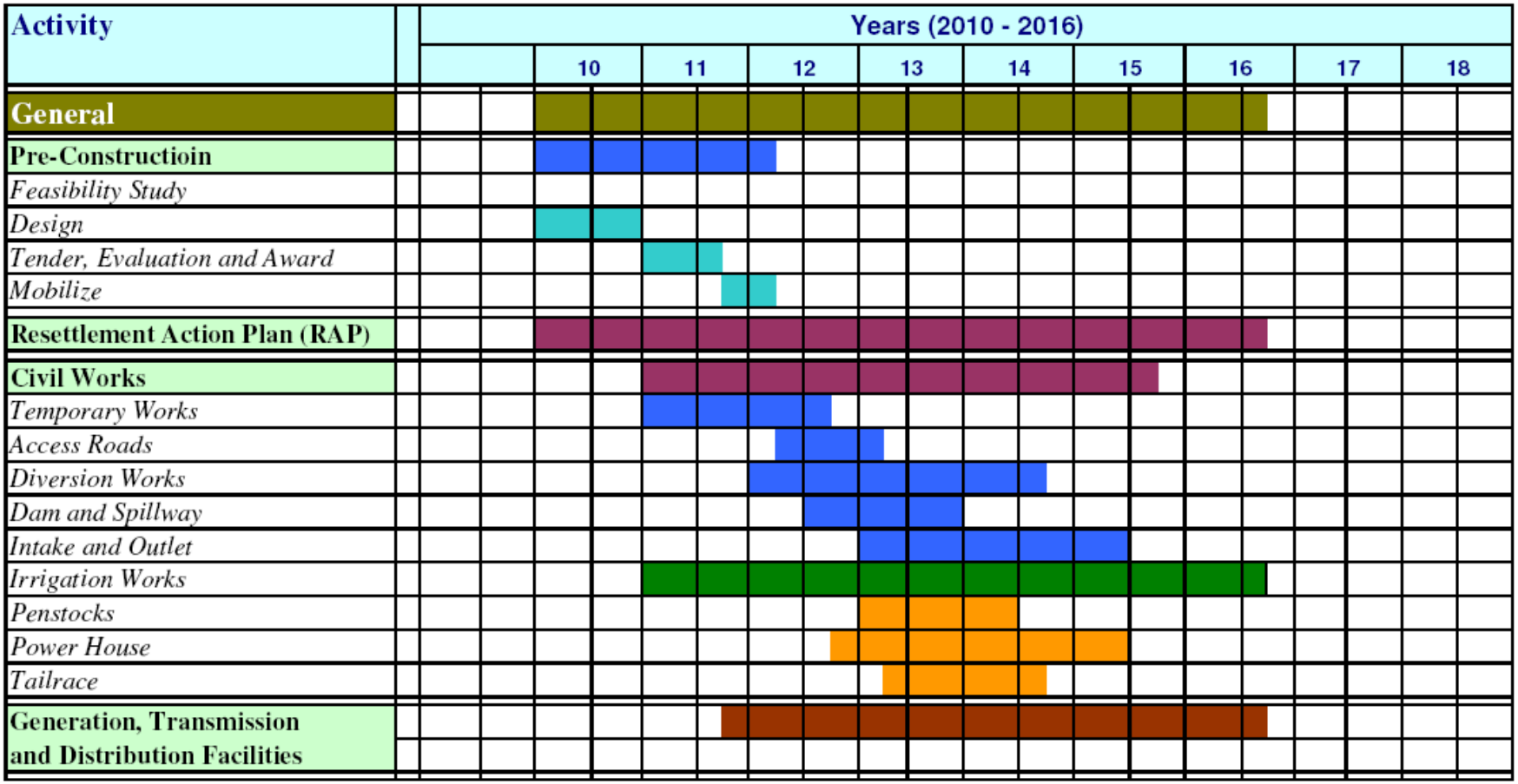


Chart 5: Rusumo Falls Hydropower and Multipurpose Joint Project Implementation Schedule

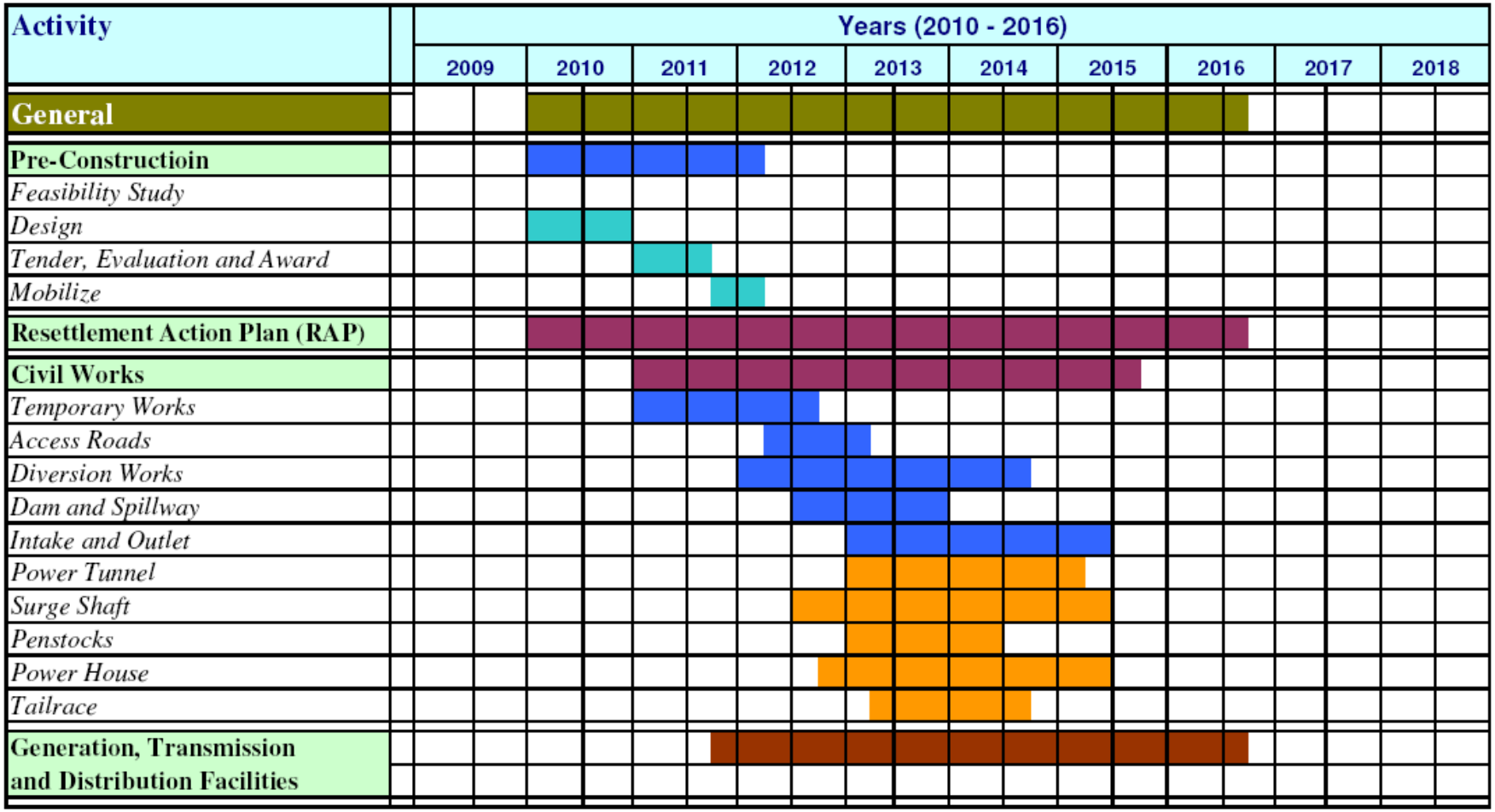


Chart 6: Kagitumba-Maziba Hydropower and Multipurpose Joint Project Implementation Schedule

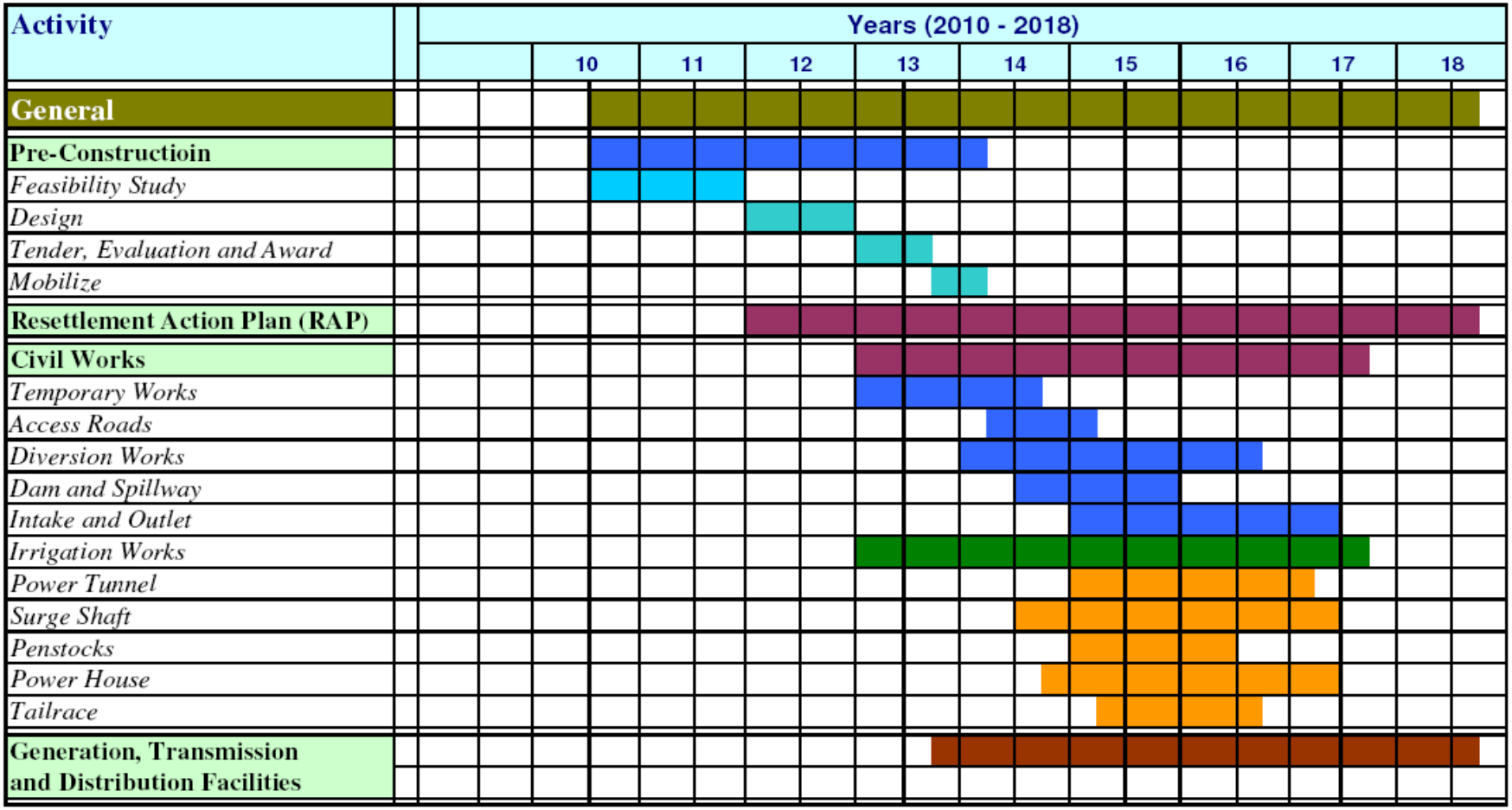
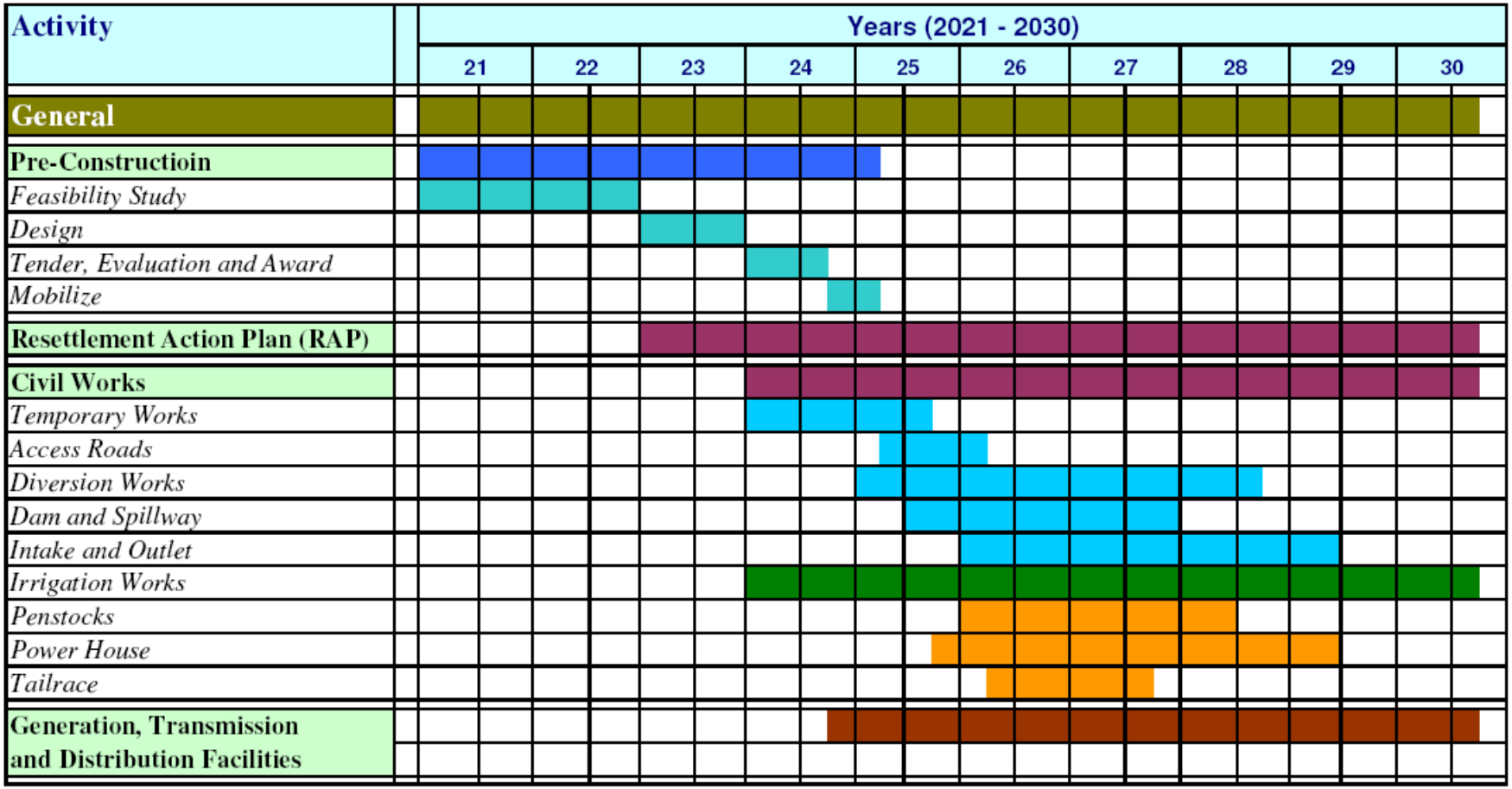


Chart 7: Lower Kagera (Kikagati, Nsongyezi & Kakono) Hydropower Project Implementation Schedule



B. Estimated Investments

B.1 Sources of Coasting Information

Summary of overall investments and disbursement schedules in the Kagera River basin over the coming 20-year (2010-2030) is presented in this Annex. In addition the corresponding responsible organizations for implementing the investments are also presented in Annex B.

The investments have been estimated at about US$ 3.0, US$ 4.4 and US$ 5.6 billion for Scenario 1 (Low Development), Scenario 2 (Medium or Agricultural Development) and Scenario 3 (High Development), respectively.

The investments proposed by this report do not cover all investments in the Kagera Basin, but still it covers those which are considered to be essential for the sustainable integrated water resource development and management. The implementation rates are assumed to gradually increase to an average year level within three years. Then after, for all the years between 2013 and 2030, the overall annual implementation rate and the corresponding required investment is approximately equal.

The sources of unit cost estimates shown in Annex B are as follows:

1. *Large-scale infrastructures*: [ref: Part I of the Main report]
2. *Potable water supply and sanitation*: [ref: (a) Kagera Monograph, summary is shown in Annex F.4; (b) Estimates for urban centers are based on surface water supply that need infrastructures including treatment facilities that need higher unit rates per unit volume of water.]
3. *Soil and water conservation*: [ref: (a) Kagera Monograph, summary is shown in Annex F.4; (b) Dent et al (2007); (c) ADB (2009); HYDROPLAN (1999)]
4. *Irrigation and drainage*: [ref: (a) Kagera Monograph, summary is shown in Annex F.4; (b) ADB (2009); HYDROPLAN (1999)]
5. *Support for agricultural activities*: [ref: Kagera Monograph, summary is shown in Annex F.4]
6. *Small and mini hydropower development:* [ref: Kagera Monograph, Annex F.4]
7. *Fishery and aquaculture:* [ref: Kagera Monograph, summary is shown in Annex F.4]
8. *River transport and navigation:* [ref: Kagera Monograph, summary is shown in Annex F.4]
9. *Pro-poor tourism:* [ref: Kagera Monograph, summary is shown in Annex F.4]
10. *Environmental resources:* [ref: Kagera Monograph, summary is shown in Annex F.4]
11. *Joint Kagera River Basin Organization activities*: [ref: Part 3, Tables 3.5 and 3.6]

B.2 Summary of Estimated Investment Costs Corresponding to Scenarios

(Unit: Million US$)

Sector, Component and Activity[1]	Unit C. (1000US$)	Quantity of Scenarios Snr 1	Snr2	Snr	Investment Costs of Scenarios Scenario 1	Scenario 2	Scenario 3
1 Large-Scale Infrastructures					**153.9**	**319.0**	**1535.9**
Upper-Ruvubu Multipurpose Project		0	1	1	0.0	69.6	69.6
Ruvyironza Hydropower Project		0	0	1	0.0	0.0	109.6
Kanyaru Multipurpose Project		0	1	1	0.0	95.6	95.6
Nyabarongo Multipurpose Project		1	1	1	153.9	153.9	153.9
Rusumo Falls Hydropower Project		0	0	1	0.0	0.0	337.0
Kagitumba-Maziba Hydropower Project		0	0	1	0.0	0.0	117.6
Lower Kagera Multipurpose Project		0	0	1	0.0	0.0	652.7
2 Potable Water Supply and Sanitation					**1347.0**	**1347.0**	**1347.0**
Rehabilitation of non-functional water sources							
Rehabilitation of sources	8.00	16500	16500	16500	132.0	132.0	132.0
Construction of improved water sources							
Construction of new borehole based schemes.	24.00	25000	25000	25000	600.0	600.0	600.0
Construction of new surface-water schemes	9000.00	45	45	45	405.0	405.0	405.0
Sanitation and hygiene awareness campaign		1	1	1	110.0	110.0	110.0
Community awareness		1	1	1	75.0	75.0	75.0
Institutional strengthening, capacity building, sector management and community awareness		1	1	1	100.0	100.0	100.0
3 Soil and Water Conservation					**490.0**	**940.0**	**940.0**

[1] Some of the components and activities are adopted from Kagera Monograph (BRLi, 2008)

	Physical measures (stone bund, soil bund, fanya juu)	5.40	50000	100000	100000	540.0	540.0	540.0
	Biological measures (grass strips, agro-forestry)	1.80	100000	200000	200000	360.0	360.0	360.0
	Water harvesting		1	1	1	40.0	40.0	40.0
4	**Irrigation and Drainage**					**445.0**	**945.0**	**945.0**
	Marshlands irrigation schemes (ha)	10.00	39500	82000	82000	395.0	820.0	820.0
	Plains irrigation schemes (ha)	5.00	10000	25000	25000	50.0	125.0	125.0
5	**Support for Agricultural Activities**					**271.3**	**542.5**	**542.5**
	Livestock development and rural income diversification		0.5	1	1	142.5	284.9	284.9
	Policy support – training/ capacity building							
	Agricultural research		0.5	1	1	40.0	40.0	40.0
	Agricultural extension		0.5	1	1	137.6	137.6	137.6
	Agricultural market development, proximity services to producers		0.5	1	1	40.0	40.0	40.0
	Rural financial systems and agriculture credit development		0.5	1	1	40.0	40.0	40.0
6	**Small and mini hydropower development**		1	1	1	**72.0**	**72.0**	**72.0**
7	**Fishery and Aquaculture**					**26.0**	**52.0**	**52.0**
	Aquaculture development program (in natural lakes)		0.5	1	1	25.0	50.0	50.0
	Multipurpose reservoir-based fisheries management		0.5	1	1	1.0	2.0	2.0
8	**River Transport and Navigation**		1	1	1	**0.5**	**0.5**	**0.5**
	Lower Kagera River navigation (feasibility Study)		1	1	1	0.5	0.5	0.5
9	**Pro-Poor Tourism**		1	1	1	**1.5**	**1.5**	**1.5**
	Support to cottage industry and Pro-Poor Tourism		1	1	1	1.5	1.5	1.5
10	**Environmental Resources**					**11.0**	**11.0**	**11.0**
	Kagera River Basin Environment Management Information System		1	1	1	3.0	3.0	3.0

	Protected Areas - Inventory Study		1	1	1	1.0	1.0	1.0
	Environmental Beneficial Uses - Valuation Study		1	1	1	1.0	1.0	1.0
	Water Resources Development and Environmental Monitoring Program		1	1	1	5.0	5.0	5.0
	Harmonization and Environmental Quality Standards		1	1	1	1.0	1.0	1.0
11	**Kagera River Basin Organization Activities**					**132.2**	**141.4**	**144.4**
	Planning and Technical Support Division (PTSD)		1	1	1	46.0	46.0	46.0
	Environment Division (EVD)		1	1	1	18.0	18.0	18.0
	Operations Division (OPD)		1	1	1	50.0	50.0	50.0
	Office of Chief Executive Officer (OCEO)		0.6	0.9	1	18.2	27.4	30.4
	Total					**2950.4**	**4371.8**	**5591.8**
	Percentage of High Development Scenario					*52.8*	*78.2*	*100.0*

B.3 Disbursement Schedule of Investment Costs

Table 1: Disbursement Schedule of Investment Costs for Large-Scale Water Infrastructures

(*Unit: Million US$*)

Year	Upper-Ruvubu Multipurpose Project	Ruvyironza Hydropower Project	Kanyaru Multipurpose Project	Nyabarongo Multipurpose Project	Rusumo Falls Hydropower Project	Kagitumba-Maziba Hydropower Project	Lower Kagera Multipurpose Projects	Total
2010	0,00	0,00	0,00	3,30	5,62	1,96	0,00	**10,87**
2011	0,00	0,00	0,00	25,10	41,42	1,96	0,00	**68,48**
2012	0,00	0,00	0,00	25,10	41,42	1,96	0,00	**68,48**
2013	0,00	0,00	1,59	25,10	41,42	18,62	0,00	**86,73**
2014	0,00	1,83	1,59	25,10	41,42	18,62	0,00	**88,55**
2015	0,00	1,83	1,59	25,10	41,42	18,62	0,00	**88,55**
2016	0,00	1,83	15,13	25,10	41,42	18,62	0,00	**102,09**
2017	0,00	17,36	15,13	0,00	41,42	18,62	0,00	**92,53**
2018	1,62	17,36	15,13	0,00	41,42	18,62	0,00	**94,15**
2019	1,62	17,36	15,13	0,00	0,00	0,00	0,00	**34,11**
2020	1,63	17,36	15,13	0,00	0,00	0,00	0,00	**34,12**
2021	10,78	17,36	15,13	0,00	0,00	0,00	9,79	**53,06**
2022	10,78	17,36	0,00	0,00	0,00	0,00	9,79	**37,93**
2023	10,78	0,00	0,00	0,00	0,00	0,00	79,14	**89,92**
2024	10,78	0,00	0,00	0,00	0,00	0,00	79,14	**89,92**
2025	10,78	0,00	0,00	0,00	0,00	0,00	79,14	**89,92**
2026	10,78	0,00	0,00	0,00	0,00	0,00	79,14	**89,92**
2027	0,00	0,00	0,00	0,00	0,00	0,00	79,14	**79,14**
2028	0,00	0,00	0,00	0,00	0,00	0,00	79,14	**79,14**
2029	0,00	0,00	0,00	0,00	0,00	0,00	79,14	**79,14**
2030	0,00	0,00	0,00	0,00	0,00	0,00	79,14	**79,14**
Total	**69,55**	**109,6**	**95,6**	**153,9**	**337,0**	**117,6**	**652,7**	**1535,87**

Table 2: Disbursement Schedule of Investment Costs Corresponding to Scenario 1.
(Unit: Million US$)

Year	Large-Scale Infrastructures	Potable Water Supply and Sanitation	Soil and Water Conservation	Irrigation and Drainage	Support for Agricultural Activities	Small and mini hydropower development	Fishery and Aquaculture	River Transport and Navigation	Pro-Poor Tourism	Environmental Resources	Kagera River Basin Organization	**Total**
2010	3,30	64,14	23,33	3,63	12,92	3,43	1,24	0,25	0,50	0,52	0,56	**113,81**
2011	25,10	64,14	23,33	5,45	12,92	3,43	1,24	0,25	0,50	0,52	1,12	**137,99**
2012	25,10	64,14	23,33	9,08	12,92	3,43	1,24		0,50	0,52	1,68	**141,93**
2013	25,10	64,14	23,33	12,70	12,92	3,43	1,24			0,52	2,79	**146,16**
2014	25,10	64,14	23,33	16,34	12,92	3,43	1,24			0,52	3,90	**150,92**
2015	25,10	64,14	23,33	16,34	12,92	3,43	1,24			0,52	5,02	**152,04**
2016	25,10	64,14	23,33	21,80	12,92	3,43	1,24			0,52	6,69	**159,17**
2017	0,00	64,14	23,33	21,80	12,92	3,43	1,24			0,52	6,69	**134,07**
2018	0,00	64,14	23,33	21,80	12,92	3,43	1,24			0,52	6,69	**134,07**
2019	0,00	64,14	23,33	21,80	12,92	3,43	1,24			0,52	6,69	**134,07**
2020	0,00	64,14	23,33	21,80	12,92	3,43	1,24			0,52	6,69	**134,07**
2021	0,00	64,14	23,33	27,25	12,92	3,43	1,24			0,52	8,37	**141,19**
2022	0,00	64,14	23,33	27,25	12,92	3,43	1,24			0,52	8,37	**141,19**
2023	0,00	64,14	23,33	27,25	12,92	3,43	1,24			0,53	8,37	**141,20**
2024	0,00	64,14	23,33	27,25	12,92	3,43	1,24			0,53	8,37	**141,21**
2025	0,00	64,15	23,33	27,25	12,92	3,43	1,24			0,53	8,37	**141,22**
2026	0,00	64,15	23,33	27,25	12,92	3,43	1,24			0,53	8,37	**141,22**
2027	0,00	64,15	23,34	27,25	12,92	3,43	1,24			0,53	8,37	**141,22**
2028	0,00	64,15	23,34	27,25	12,92	3,42	1,24			0,53	8,37	**141,21**
2029	0,00	64,15	23,34	27,25	12,92	3,42	1,24			0,53	8,37	**141,21**
2030	0,00	64,15	23,34	27,25	12,92	3,42	1,24			0,53	8,37	**141,21**
Total	**153,90**	**1347,00**	**490,00**	**445,00**	**271,30**	**72,00**	**26,00**	**0,50**	**1,50**	**11,00**	**132,20**	**2950,40**

Table 3: Disbursement Schedule of Investment Costs Corresponding to Scenario 2.
(Unit: Million US$)

Year	Large-Scale Infrastructures	Potable Water Supply and Sanitation	Soil and Water Conservation	Irrigation and Drainage	Support for Agricultural Activities	Small and mini hydropower development	Fishery and Aquaculture	River Transport and Navigation	Pro-Poor Tourism	Environmental Resources	Kagera River Basin Organization	**Total**
2010	3,3	64,14	44,76	7,71	25,83	3,43	2,47	0,25	0,50	0,52	0,60	**153,51**
2011	25,1	64,14	44,76	11,57	25,83	3,43	2,47	0,25	0,50	0,52	1,19	**179,76**
2012	25,1	64,14	44,76	19,29	25,83	3,43	2,47		0,50	0,52	1,79	**187,83**
2013	26,69	64,14	44,76	26,96	25,83	3,43	2,47			0,52	2,99	**197,79**
2014	26,69	64,14	44,76	34,71	25,83	3,43	2,47			0,52	4,17	**206,72**
2015	26,69	64,14	44,76	34,71	25,83	3,43	2,47			0,52	5,37	**207,92**
2016	40,23	64,14	44,76	46,29	25,83	3,43	2,47			0,52	7,16	**234,83**
2017	15,13	64,14	44,76	46,29	25,83	3,43	2,47			0,52	7,16	**209,73**
2018	16,75	64,14	44,76	46,29	25,83	3,43	2,48			0,52	7,16	**211,36**
2019	16,75	64,14	44,76	46,29	25,83	3,43	2,48			0,52	7,16	**211,36**
2020	16,76	64,14	44,76	46,29	25,83	3,43	2,48			0,52	7,16	**211,37**
2021	25,91	64,14	44,76	57,86	25,83	3,43	2,48			0,52	8,95	**233,88**
2022	10,78	64,14	44,76	57,86	25,83	3,43	2,48			0,52	8,95	**218,75**
2023	10,78	64,14	44,76	57,86	25,83	3,43	2,48			0,53	8,95	**218,76**
2024	10,78	64,14	44,76	57,86	25,84	3,43	2,48			0,53	8,95	**218,77**
2025	10,78	64,15	44,76	57,86	25,84	3,43	2,48			0,53	8,95	**218,78**
2026	10,78	64,15	44,76	57,86	25,84	3,43	2,48			0,53	8,95	**218,78**
2027	0,00	64,15	44,77	57,86	25,84	3,43	2,48			0,53	8,95	**208,01**
2028	0,00	64,15	44,77	57,86	25,84	3,42	2,48			0,53	8,95	**208,00**
2029	0,00	64,15	44,77	57,86	25,84	3,42	2,48			0,53	8,95	**208,00**
2030	0,00	64,15	44,77	57,86	25,84	3,42	2,48			0,53	8,95	**208,00**
Total	**319,00**	**1347,00**	**940,00**	**945,00**	**542,50**	**72,00**	**52,00**	**0,50**	**1,50**	**11,00**	**141,40**	**4371,90**

Table 4. Disbursement Schedule of Investment Costs Corresponding to Scenario 3.
(Unit: Million US$)

Year	Large-Scale Infrastructures	Potable Water Supply and Sanitation	Soil and Water Conservation	Irrigation and Drainage	Support for Agricultural Activities	Small and mini hydropower development	Fishery and Aquaculture	River Transport and Navigation	Pro-Poor Tourism	Environmental Resources	Kagera River Basin Organization	Total
2010	10,87	64,14	44,76	7,71	25,83	3,43	2,47	0,25	0,50	0,52	0,61	161,09
2011	68,48	64,14	44,76	11,57	25,83	3,43	2,47	0,25	0,50	0,52	1,22	223,17
2012	68,48	64,14	44,76	19,29	25,83	3,43	2,47		0,50	0,52	1,83	231,25
2013	86,73	64,14	44,76	26,96	25,83	3,43	2,47			0,52	3,05	257,89
2014	102,09	64,14	44,76	34,71	25,83	3,43	2,47			0,52	4,26	282,21
2015	102,09	64,14	44,76	34,71	25,83	3,43	2,47			0,52	5,48	283,43
2016	102,09	64,14	44,76	46,29	25,83	3,43	2,47			0,52	7,31	296,84
2017	92,53	64,14	44,76	46,29	25,83	3,43	2,47			0,52	7,31	287,28
2018	93,69	64,14	44,76	46,29	25,83	3,43	2,48			0,52	7,31	288,45
2019	33,65	64,14	44,76	46,29	25,83	3,43	2,48			0,52	7,31	228,41
2020	20,11	64,14	44,76	46,29	25,83	3,43	2,48			0,52	7,31	214,87
2021	39,76	64,14	44,76	57,86	25,83	3,43	2,48			0,52	9,14	247,92
2022	38,16	64,14	44,76	57,86	25,83	3,43	2,48			0,52	9,14	246,32
2023	90,15	64,14	44,76	57,86	25,83	3,43	2,48			0,53	9,14	298,32
2024	90,15	64,14	44,76	57,86	25,84	3,43	2,48			0,53	9,14	298,33
2025	90,15	64,15	44,76	57,86	25,84	3,43	2,48			0,53	9,14	298,34
2026	90,15	64,15	44,76	57,86	25,84	3,43	2,48			0,53	9,14	298,34
2027	79,15	64,15	44,77	57,86	25,84	3,43	2,48			0,53	9,14	287,35
2028	79,14	64,15	44,77	57,86	25,84	3,42	2,48			0,53	9,14	287,33
2029	79,14	64,15	44,77	57,86	25,84	3,42	2,48			0,53	9,14	287,33
2030	79,14	64,15	44,77	57,86	25,84	3,42	2,48			0,53	9,14	287,33
Total	**1535,90**	**1347,00**	**940,00**	**945,00**	**542,50**	**72,00**	**52,00**	**0,50**	**1,50**	**11,00**	**144,40**	**5591,80**

B.4 Investments and Corresponding Responsible Organizations

	Sector, Component and Activity	Overall Responsibility (Primary Implementation Role)	Partial Responsibility (Supporting Role)
1.	**Large-Scale Infrastructures**		
	Upper-Ruvubu Multipurpose Project	Line Agencies of Burundi	KRBO through Dams & Hydropower Development Program (DHDP) and Irrigation & Drainage Development Program (IDDP)
	Ruvyironza Hydropower Project	Line Agencies of Burundi	KRBO through Dams & Hydropower Development Program (DHDP)
	Kanyaru Multipurpose Project	Line Agencies of Burundi and Rwanda	KRBO through Dams & Hydropower Development Program (DHDP) and Irrigation & Drainage Development Program (IDDP)
	Nyabarongo Multipurpose Project	Line Agencies of Rwanda	KRBO through Dams & Hydropower Development Program (DHDP) and Irrigation & Drainage Development Program (IDDP)
	Rusumo Falls Hydropower Project	Line Agencies of Burundi, Rwanda and Tanzania	Line Agencies of Uganda; KRBO through Dams & Hydropower Development Program (DHDP)
	Kagitumba-Maziba Hydropower Project	Line Agencies of Uganda	KRBO through Dams & Hydropower Development Program (DHDP)
	Lower Kagera Multipurpose Project	Line Agencies of Uganda and Tanzania	KRBO through Dams & Hydropower Development Program (DHDP) and Irrigation & Drainage Development Program (IDDP)
2.	**Potable Water Supply and Sanitation**		
	Rehabilitation of non-functional water sources		
	Rehabilitation of sources	Line agencies of the four Riparian Countries	KRBO through Water Supply and Sanitation Program (WSSP)
	Construction of improved water		

	sources		
	Construction of new borehole based schemes.	Line agencies of the four Riparian Countries	KRBO through Water Supply and Sanitation Program (WSSP)
	Construction of new surface-water schemes	Line agencies of the four Riparian Countries	KRBO through Water Supply and Sanitation Program (WSSP)
	Sanitation and hygiene awareness campaign	Line agencies of the four Riparian Countries	KRBO through Water Supply and Sanitation Program (WSSP)
	Community awareness	Line agencies of the four Riparian Countries	KRBO through Water Supply and Sanitation Program (WSSP)
	Institutional strengthening, capacity building, sector management and community awareness	Line agencies of the four Riparian Countries	KRBO through Water Supply and Sanitation Program (WSSP)
3.	**Soil and Water Conservation**		
	Physical measures (stone bund, soil bund, fanya juu)	Line agencies of the four Riparian Countries	KRBO through Soil & Water Conservation Program (SWCP)
	Biological measures (grass strips, agro-forestry)	Line agencies of the four Riparian Countries	KRBO through Soil & Water Conservation Program (SWCP)
	Water harvesting	Line agencies of the four Riparian Countries	KRBO through Soil & Water Conservation Program (SWCP)
4.	**Irrigation and Drainage**		
	Marshlands irrigation schemes (ha)	Line agencies of the four Riparian Countries	KRBO through Irrigation & Drainage Development Program (IDDP)
	Plains irrigation schemes (ha)	Line agencies of the four Riparian Countries	KRBO through Irrigation & Drainage Development Program (IDDP)
5.	**Support for Agricultural Activities**		
	Agricultural research	Line agencies of the four Riparian Countries	KRBO through Irrigation & Drainage Development Program (IDDP)
	Agricultural extension	Line agencies of the four Riparian Countries	
	Agricultural market development, proximity services to producers	Line agencies of the four Riparian Countries	

	Rural financial systems and agriculture credit development	Line agencies of the four Riparian Countries	
6.	**Small and mini hydropower development**	Line agencies of the four Riparian Countries	KRBO through Dams & Hydropower Development Program (DHDP)
7.	**Fishery and Aquaculture**	Line agencies of the four Riparian Countries	KRBO through Operations Division (OPD)
8.	**River Transport and Navigation**	Line Agencies of Rwanda, Tanzania and Uganda	KRBO through Operations Division (OPD)
9.	**Pro-Poor Tourism**	Line agencies of the four Riparian Countries	KRBO through Operations Division (OPD)
10	**Environmental Resources**		
	Kagera River Basin Environment Management Information System	Line agencies of the four Riparian Countries	KRBO through Environment Division (EVD)
	Protected Areas - Inventory Study	Line agencies of the four Riparian Countries	KRBO through Environment Division (EVD)
	Environmental Beneficial Uses - Valuation Study	Line agencies of the four Riparian Countries	KRBO through Environment Division (EVD)
	Water Resources Development and Environmental Monitoring Program	Line agencies of the four Riparian Countries	KRBO through Environment Division (EVD)
	Harmonization and Environmental Quality Standards	Line agencies of the four Riparian Countries	KRBO through Environment Division (EVD)
11	**Kagera River Basin Organization Activities**		
	Planning and Technical Support Division (PTSD)	KRBO through Planning and Technical Support Division (PTSD)	Line agencies of the four Riparian Countries
	Environment Division (EVD)	KRBO through Environment Division (EVD)	Line agencies of the four Riparian Countries
	Operations Division (OPD)	KRBO through Operations Division (OPD)	Line agencies of the four Riparian Countries
	Office of Chief Executive Officer (OCEO)	KRBO through Office of Chief Executive Officer (OCEO)	Line agencies of the four Riparian Countries

C. The relationship between Project and Program Managements

The purpose of this *Note* is to discuss and clarify the relationship between program management and project management, and define the attributes of a strong project management delivery approach. In order to proceed, recognizing the natures of both Project and Program is important.

> *A **Project** has a defined beginning and end. Resources -- e.g., staff and funding -- are allocated specifically for the length of the project. Projects are often not integrated into an organization's mission and goals.*
>
> *A **Program** is ongoing. It is part of what the organization does both now and in the future. A program is part of the organization's mission and not something that might be considered an after-thought. A program receives ongoing funding. It has people to attend to it ongoing basis.*

How Program management and Project management relate to and enhance delivery of Large Capital Programs

While definitions for program management abound, it is unarguably an approach delivering capital projects where the collective goal of the projects within that organization is to deliver a vision that supports and achieves the long-term goals and the organization. While a collection of projects may figuratively represent programs from which capital funds are committed, many organizations have learned that unless all projects within the *Program* are defined, prioritized, and included in the *Program* because they are critical to achieving a stated vision, funds can easily be spent without realizing the desired results.

Because of this, project inclusion in the *Program* is subservient to organization's strategic goals as defined and prioritized by the leadership of the organization with considerable stakeholder consideration. A programmatic approach provides a consistent and defined structure (e.g., work breakdown structure, business objectives, and performance indicators), sets a broad scope for each project, defines the interface among projects, ensures that funds are spent wisely and efficiently, and monitors compliance with program goals and standards.

Programs rely on consistently delivered projects

Program management tools and processes ensure the dependencies among multiple projects are managed in a concerted manner to serve the strategic vision of the organization. At the same time, program success is highly dependent on the successful execution of the individual projects of the program. Because projects are the foundation of the program, if delivery fails at the project level, the overall program will eventually fail. For this reason, most organizations with critical *Program* delivery challenges have chosen to formalize and institutionalize a consistent and rational approach to project

delivery and management, including strong and consistent staff training in project management and delivery.

Since a project is defined as a temporary endeavor, with a clear beginning, middle, and end that results in the creation of a specific facility, product or service, project management focuses on the successful delivery of a work package to achieve those defined goals, milestones, and deliverables. These are a number of "right" ways to deliver *individual* projects, and a number of good approaches already developed. Large organizations often find that they have a number of practices within their project management approach that, if consistently applied, would result in better projects throughout the program. It is often the case that project delivery challenges occur not because the best practices do not exist, but because the existing best practices have not been formalized, standardized or trained.

Consistency in Project delivery is crucial to a Program success

Despite various project delivery approaches, within the environment of a large program, the options for variance in the delivery on individual projects are decreased. With the need for integrated scheduling and reporting, fully understanding programmatic risks, and assuring quality across all projects in the program, a uniform and consistent approach to project management is paramount.

To address this issue, most agencies or organizations implementing projects within a program have chosen to highlight project management as a separate and distinct career path. This means that project managers are chosen for a specific skill set, trained in that skill set, and their accountabilities and authority are shifted from their past focus (usually technical in nature) to the focus on successful management of projects.

Clearly defined roles and responsibilities strengthen Program performance

When shifting to a strong delivery model in which empowered and capable project managers are reporting to a project delivery director at the program level, program and project roles must be clarified. Confusion is avoided by holding chartering sessions and providing training to help project managers, project team members, and support personnel understand how to be successful in their new and evolving roles.

One of the key contributors to "stall-outs" at program mobilization is a lack of consistent, direct and meaningful communication from management about the importance of various roles, recognition of the success factors for projects, and definition of how individuals will be evaluated in the program management environment.

A comprehensive and agreed upon RASI (Responsible, Accountable, Support and Inform) matrix created early in the development of the program can become a cornerstone of the program approach and can help to mediate the challenges of "who is doing what for whom" as they arise. The RASI matrix clearly identifies the person and organization that must take responsibility for decisions and how they will be supported by others. This clarification allows project managers and their teams to do what is necessary to get their projects done, meet the deliverables and schedules, and achieve

the desired quality, while staying aligned with the overarching program and strategic goals.

Further clarity is provided by ensuring all employees understand the relationship between the projects being delivered and the planning and strategic focusing effort that results in the definition and support structure of the program. Typically, initial program accountabilities cascade in the following manner.

The Program Management Team	***Project Managers and the Project Teams***
Defines and articulates the vision and goals, and ties program goals to project outcomes through Program validation and prioritization	
Assures and provides funding for projects	
Assigns the preliminary scope, budgets and schedule for projects	
Provides a set of common processes, procedures, and tools that are utilized by the individual projects of the program.	*Consistently uses and applies the agreed upon processes, procedures and tools for project delivery.*
Provides quality assurance systems.	*Assures quality control in compliance with program QA system.*
Provides technical standards for all projects encompassed by the program.	*Produces projects with the program technical standards.*
Assembles staff, assigns them to projects, and handles their HR needs	*Assigns specific responsibilities to team members and supervises their day-to-day activities.*
Monitors the schedule and budget of all projects through a program control function that reports at the programmatic level	*Reports progress and Estimates at Completion in both time and money for each project on a regular basis.*
Provides overall planning of the whole program	*Plans the individual projects in greater detail under the program planning umbrella*
Provides coordination coordination and optimization support that is not available at a project level, scheduling of interdependent tasks, synchronizing inter-project deliverables, optimizing cost and finance utilization, managing program risk	*Executes project delivery in a manner that meets project and program objectives while optimizing project resources and effectively managing project risk.*

Project management delivery

When the goals of individual projects within the program are defined, typically during the planning and studies phase, they are assigned unique project designations and numbers to track future assets and capture all product-related information for each project. Because projects are progressive and develop in steps that can be seen to align with functional organizations, the typical historical approach to projects was to assume that a project would progress through the functional phases (e.g., planning, pre-design, design, construction) effectively, assuming the good intent and attention of those assigned to the project in each functional area. While this approach does seem logical, in practical terms, it just does not work. Organizations with major capital programs are large, complex and busy. The demands on the employees, who are often assigned to

multiple projects, are great. Therefore, the "important" is often sacrificed to the "urgent" and project deliverables, deadlines, and quality suffer.

For this reason, the need for "cradle-to-commission" project is acknowledged. A project manager is assigned to manage all aspects of the project from concept through construction to close-out and turn-over to the owning or operating organization. For the most part, the project manager has a single mission – deliver the completed project. The project manager is responsible for forming a team to manage the entire process of project delivery for the particular project. These resources are assigned from the functional areas within the organization.

The project manager is responsible for the effective use of team resources throughout the lifecycle of the project. The program management organization assures support for project managers and project teams through training in the use of the tools and process (scope, cost, schedule, quality, controls) and key competencies (communication, risk management, collaboration) of project management. Through the use of reporting systems, "gate" or phase reviews, and lessons-learned debriefs, the practices of effective project management are reinforced in the organization.

Risks are managed at both the project and program level, but the risk type and magnitude are significantly different. Program risks tend to be political and financial, and create a ripple effect throughout the program. Project risks tend to concern technology choices, staffing, and project stakeholder expectations. A project manager is not expected to manage program risks and may not even be trained to do so. However, program managers are responsible for predicting programmatic risks and putting mitigation strategies in place in so that projects are not affected.

Other organizational benefits of a Program and Project management delivery approach

- A programmatic approach to applying lessons learned from project to project helps to decrease the incidence of the same type of problem resulting in the same type of mistake and creates the opportunity for learning organization to emerge.

- A great body of knowledge that is agency-specific can be built to address potential loss of specific project history, knowledge, and expertise through retirement and other employee turnover. This typically requires a specific focus on development of a knowledge management system.

- Development of a project management approach and the tools that accompany it, including customized Project Management Manuals, allows for a more seamless transition when project managers change.

- Project management is a great training ground for the future leaders of the organization. Increasingly difficult projects and sub-programs can be given to high-achieving project managers to prepare them for future program or functional roles.

- Project management "demystifies" the relationship between projects, and increased reporting and transparency improves individual and organizational accountability.

Conclusion

Currently, a specific focus on practical approaches for successful project and program delivery has resulted in the development of many systems and tools to support the success of project managers. Working with an environment that is standardized and maintained resources, project managers have the greatest opportunity to achieve success on their projects. Appropriately chosen projects, effectively delivered in the framework of programmatic control and oversight, create the highest probability for long-term success in delivering large and complex capital programs.

D. Kagera River Basin Institutional Framework

D.1 Set Up of Kagera Basin Management Unit (KBMU)[2]

1. Introduction

This Annex is the recommended institutional option together with an outline of action plans and provisional budgets for the recommended option for the Kagera Basin Cooperative Framework.

This option is to institutionalise cooperation under the auspices of the LVBC and the EAC with ties to the NBI. This will have the advantages of:

- being part of an existing organisation with a strong legal basis and political support;
- operating on the lowest appropriate level in accordance the subsidiarity principle; and
- maintaining linkages with the larger Nile Basin organisations.

It is further envisaged that parallel organisations will be formed for the other transboundary Lake Victoria basins, i.e. Mara and Sio-Malakisi-Malaba. This will facilitate management by the LVBC as well as exchanges between the three sub-basins.

The following sections describe the proposed organisation.

2. Objective of the KBMU

The objective of the proposed organisation is to:

'Promote the sustainable management and development of the water resources of the Kagera River basin'.

The work of the organisation will be based on IWRM principles and will be in line with the overall objectives of the EAC and the LVBC.

3. Functions of the KBMU

3.1 Main Functions

It is envisaged that the main functions organisation will be to:

[2] Adapted from: Draft Cooperative Framework Agreement and Set Up of KBMU: Development of a Kagera River Basin Transboundary Cooperative Framework and Management Strategy in the Four Riparian Countries of Burundi, Rwanda, Tanzania and Uganda, Volume 2: COWI Uganda, February 2009

(a) Prepare integrated management plans for the Kagera River basin in cooperation with the riparian states and the Lake Victoria Basin Commission with the aim to facilitate the sustainable management and development of its water resources.
(b) Coordinate hydrological and water quality monitoring in the basin.
(c) Facilitate joint water resources development projects.
(d) Collect and disseminate information on the water resources in the basin.
(e) Participate in the development of common standards.
(f) Develop or participate in the development of common guidelines for water resources activities or activities that affect water resources.
(g) Organise and implement capacity building activities in the field of water resources management for the riparian states.
(h) Assist the riparian states in harmonising policies and legal and institutional frameworks.
(i) Assist the riparian states in finding solutions to shared problems that impact on water resources through exchange of information and joint projects.
(j) Review and comment on EIAs on activities that significantly affect the water resources in the basin.
(k) Mediate between riparian states in case of disputes.
(l) Establish an informal network of technical working groups for specific issues.
(m) Facilitate transboundary cooperation by assisting the formation of transboundary water resources committees at district-level and provide technical support.
(n) Flood warning.

The functions are in line with obligations under the Convention on the Protection and Use of Transboundary Water Courses and International Lakes, Helsinki, 1992, as well as regional cooperation agreements. The functions are discussed in more detail below.

(a) Management Planning

The preparation of integrated river basin management plans is an important tool for planning and cooperation among the stakeholders. Basin management plans for the Kagera River basin should be coordinated with a similar plan for the entire Lake Victoria Basin, but the level of detail will be different.

It is crucial that the plan focuses on the main issues and does not become too detailed or rigid. It should be realistic and implementable. The content could be:

- Status of water resources.
- Objectives for the water bodies.
- Strategies and measures, and
- Indicators for achievement and implementation.

The plans should be prepared with participation of riparian countries and other stakeholders.

To support the preparation of integrated management plans, the KBMU will use a suitable model or a ***decision support system***. It is anticipated that this be developed in close collaboration with the LVBC and the NBI in order to avoid duplication of efforts and to facilitate data exchange.

(b) Monitoring

It is recommended that data collection in the field will be carried out by national organisations, but the KBMU will coordinate this work by reviewing the network of monitoring stations, the frequency of data collection and the parameters, procedures etc.

The KBMU should also consider designating key data collection and research stations as KBMU stations and enter into agreements with national institutions or the private sector regarding the operation and management of such stations.

In executing this role, the KBMU will work closely with the other parts of LVBC to ensure that monitoring activities, data formats etc. are streamlined within the Lake Victoria basin and are compatible with the requirements of the NBI organisations.

The data will also be used as inputs for modelling and decision support systems. Good quality data are essential for any modelling and for planning. Poor data will result in poor or even misleading predictions and thus poor planning. This is a long-term effort.

(c) Joint projects

The KBMU will facilitate joint water resources development projects and sharing of benefits. While such projects may contain elements of poverty alleviation, the main objective of such projects will be to address water resources issues and in order to maintain a clear focus, and in consideration of the resources expected to be available, the KBMU will not take on the wider development agenda, but leave that to other organisations.

KBMU will not implement large investment projects in water resources infrastructure as this is assumed to be better done by organisations set up specifically for such purposes by the countries concerned. The KBMU will therefore only will take on such work until the Feasibility Study Stage.

As concerns smaller projects dealing with the management of shared water bodies, the KBMU may either facilitate them or even take on the responsibility for their implementation. It will be decided on a case-by-case basis by the parties concerned, including the funding organisations.

A third group of projects are smaller water resources related projects that aim at finding solutions to common problems. It is proposed that the KBMU eventually gets a budget line that will enable it to fund such ‘demonstration type’ projects. The actual implementation of such projects will be done by national organisations or by project staff recruited for the purpose. The KBMU will facilitate the projects and it may help develop project ideas, but otherwise its role will be more that of supervisor or project coordinator; actual implementation will be outsourced.

(d) Information

It is recommended that the KBMU serves as a focal point for information regarding the water resources in the basin. This includes hydrological and water quality data as well as reports and other information.

It is envisaged that the riparian countries will be the primary custodians of data, but KBMU eventually maintains its own databases with data from stations designated as KBMU stations and perhaps copies of data from other stations.

The KBMU will disseminate such information to the riparian countries, the LVBC, and the NBI organisations and others.

In addition the KBMU will facilitate access to environmental information and prepare information materials for the general public.

(e) Common standards

The KBMU will not develop its own standards, but will work with other regional organisations to adopt common standards within its field. This will take place through the LVBC framework. Attention is also drawn to EAC Protocol on Environment and Natural Resources Management which is expected to be ratified in December 2007 and will set out binding standards.

(f) Guidelines

In some cases the KBMU may develop its own guidelines for activities that affect water resources, but in most in cases it will work with other organisations.

(g) Capacity building

An important activity of the organisation would be to organise and implement human resources development activities for the riparian states in the field of water resources management. Some of this may be done in cooperation with other LVBC units, NELSAP or other organisations.

The capacity building activities would focus on water resources management and would normally involve participants from several riparian states (for language reasons it may not always be practical to include all four states and it sometimes may be better to repeat the activity in English and French).

(h) Harmonisation

Harmonisation of the legal framework is a function of the EAC in the sense that laws enacted by the East African Legislative Assembly are binding for the Partner States and have to be transposed into national legislation where necessary. The KBMU can be a partner and facilitator as appropriate under the particular circumstances and could organise consultations, studies and workshops on particular issues. It is noted that the LVBC is considering employing a Legal Officer and KBMU activities in this field should obviously be coordinated with related work of the LVBC and the EAC Secretariat.

(i) Solutions to shared problems

Many of the problems related to water resources are the same or very similar in the four countries. The KBMU may therefore facilitate the exchange of experiences regarding such problems and, as mentioned above under (c), it may also implement studies or projects that address the issues and explore new approaches.

(j) Environment Impact Assessments (EIA)

Article 31 of the EAC Protocol on Environment and Natural Resources Management imposes the following obligations on EAC Member States:

- An obligation to harmonise and adopt common policies, laws and programmes requiring the conduct of environmental impact assessments for planned activities and projects which are likely to have significant adverse impacts;
- An obligation to plan at an early stage for transboundary activities and projects that may have significant adverse environmental impacts and to undertake comprehensive EIAs;
- An obligation to adopt common guidelines on EIAs in shared ecosystems; and
- An obligation to develop and adopt common guidelines and procedures for periodic project environmental audits.

The KBMU will review and comment upon EIAs for projects that may significantly affect the water resources in the basin. The LVBC already has this responsibility. The interpretation of 'significantly' should be defined in an agreement between the EAC Partner States.

(k) Resolution of disputes

Some conflicts of interests will be addressed during the river basin management planning process, but there may still be disputes and new issues may arise. In the case of disputes among the riparian states regarding water resources issues, the KBMU will try to mediate.
If that does not succeed, the Parties may be referred to the existing EAC mechanisms and ultimately to the East African Court of Justice.

(l) Transboundary district-level committees

Some water resource issues are best addressed at basin level while others are better dealt with a local level. In accordance with the subsidiarity principle and the decentralisation process, the KBMU will work with the national focal points to help establish district-level transboundary water resources committees where this is deemed feasible. The KBMU may also provide technical support to such committees.

(m) Informal working groups

Many issues are best addressed by groups of technical specialists from the four countries. These should work as informally as possible and could be standing

committees or ad-hoc groups. As an example, the KBMU could form a working group on hydrology that would review the monitoring networks, exchange experiences, identify needs and recommend solutions. The KBMU could support the working groups and coordinate their work, in cooperation with the national focal points. Some working groups could work on LVBC level where this is found more appropriate due to the nature of the issue.

(n) Flood warning

The KBMU will not operate a flood warning system, but will facilitate the exchange of hydrological data including information on water levels and flood warnings to downstream countries.

4. Institutional Arrangements for KBMU

4.1 Administration

The KBMU will be formed under LVBC and will adhere to LVBC administrative procedures. It will benefit from the established LVBC set up and will not be burdened by having to create its own administrative procedures.

At present the LVBC has a staff of 12 including: Executive Secretary; Deputy Executive Secretary (Administration & Finance); Deputy Executive Secretary (Programmes); Project Development Officer; Maritime Safety Officer; Accountant; Accounts Assistant; two secretaries; two drivers; and one other support staff. It has recently been proposed to increase the staff to 23[3].

It is recommended that the KBMU be organised as a LVBC unit, but with a clearly identified budget and work programme approved by the LVB Council.
It is recommended that the KBMU be headed by a Project Coordinator who reports to the LVBC head office.

It is further recommended that LVBC establishes a river basin unit in its head office to assist the Executive Secretary by coordinating and strengthening the three transboundary river basin management units.

The KBMU will submit regular progress reports to the LVB Council. The LVBC Secretariat will approve the accounts audited in accordance with LVBC requirements.

4.2 Office

Initially the KMBU may work from the LVBC office (to be relocated to Kisumu, Kenya), but it is recommended that the KBMU establishes itself in a major city in the basin with good communication facilities.

[3] East African Community, Lake Victoria Basin Commission, Operational Strategy 2007-2010, Final Report, July, 2007, Cardno Agrisystems Africa Ltd.

Kigali has the advantages of being a capital with good communication links. It is centrally located in the basin and the largest portion of the basin is actually in Rwanda. Furthermore, the NELSAP-CU is based there, which would facilitate coordination.

Bukoba is another option. It is located the near mouth of the Kagera River. The Tanzanian Lake Victoria Basin Water Office is located in Mwanza, but has two technicians placed in the Regional Water Engineer's office in Bukoba.

4.3 Legal Status

The East African Legislative Assembly is considering a bill that would make the LVBC a corporate body.

As the KBMU will be part of LVBC is not necessary to give it a special legal status.

The KBMU office will be an EAC office in a Member State and thus covered by existing EAC agreements. LVBC will make the necessary agreements with the host country.

4.4 Staffing

It is recommended to keep the KBMU organisation lean and to outsource many functions to private service providers, consultants or other partners. This will include technical functions such a monitoring or GIS where the KBMU could make contracts with a national institution or a university for specific services.

This could eventually lead to a network of topic centres in the countries similar to the network working with the European Environmental Agency.

The proposed staffing of the KBMU is composed of:

- A Project Coordinator.
- An Assistant Project Coordinator.

The **Project Coordinator** will have the overall responsibility for the management unit. S/he will be responsible for drafting and supervising agreements with consultants, service providers and key partner organisations. S/he will also take part in the technical work of the organisation. S/he will report to the LVBC head office.

The **Assistant Project Coordinator**, will report to the Project Coordinator, and will have specific responsibility for coordination, implementation, monitoring and evaluation of KBMU activities. KBMU activities will aim to promote coordination, cross learning and information exchange between the countries.

The specific activities will be determined after an assessment of existing needs at the basin level, the task of the coordinator will thus be to facilitate identification of synergies between the different national and district plans, support joint skills development or other activities on aspects of the projects that are similar and/or complimentary.

The staffing for the KBMU for the first 3 years of its operation is given below:

Table (a): Proposed Staffing of the KBMU

Position	Year 1	Year 2	Year 3
Project Coordinator	1	1	1
Assistant Project Coordinator		1	1
National Focal Point Institution			1
Secretaries	1	2	2
Accountant	1	1	1
Technical assistants		2	2
Drivers and other support staff	1	2	3
Total	5	11	13

4.5 Funding

Funding is needed for the basic operations of the organisation itself, for its regular work programme and for project activities.

Currently LVBC is funded through three channels: contributions by (a) Member States, (b) Partnership Fund, and (c) contributions by development partners outside the Partnership Fund.

The Partnership Fund has been established with support from Sweden, France, Norway and East African Development Bank and has been an important resource for the LVBC especially for funding small projects. Ongoing projects financed this way are:

- Strengthening the capacity of LVBC;
- Harmonization of Regional Policies, Laws, Regulations and Standards;
- Facilitation of Partnership Committee Meetings;
- Feedback for Lake Victoria Vision and Strategy Framework;
- Support for Investment Promotion in the Lake Victoria Basin;
- Support for Conflict Resolution and Negotiation Skill;
- Support for Participation in International Conferences; and Support to National Focal Points.

Activities supported by development partners outside the Partnership Fund include:

- NELSAP projects [Kagera River Basin Integrated Water Resources Management Project; Mara River Basin Transboundary Integrated Water Resources Management and Development Project; Nile Transboundary Environmental Action Plan (NTEAP); Sio-Malaba-Malakisi Catchments Transboundary Integrated Water Resources Management and Development Project; NELSAP Coordination Support Project (NEL-CU); Confidence Building and Stakeholder Involvement Project (CBSIP); Socio-economic Development and Benefits Sharing Project (SDBSP)],
- Kagera Transboundary Agro-Ecosystem Management Programme and Project (GEF);
- Lake Victoria Region Water and Sanitation Initiative (UN Habitat - LVWATSAN);

- Lake Victoria Region City Development Strategy: Cities Development Strategy for Improved Urban Environment and Poverty Reduction in the Lake Victoria Region (UN Habitat / SIDA);
- Lake Victoria Catchment Environmental Education Programme (WWF).

In order to bring in additional funds, the Operational Strategy Report suggests the creation of the (i) Lake Victoria Development Fund (LVDF), and (ii) Lake Victoria Basin Trust Fund as independent funds. The initial contributions to the Fund could come from existing trust funds. The Fisheries Levy Trust Fund is a means of mobilizing resources among the stakeholders in the fisheries sector and the report suggests that part of this be allocated to the proposed LVDF. A number of other trust funds are proposed. The second proposed fund would be a capital fund, the return of which could be used for operations leaving the capital intact.

It is expected that the core budget of the KBMU will be funded the same way through the LVBC using existing mechanisms.

In addition to this, it is proposed that the following options be explored:

- Charges for EIA applications for projects with potential transboundary impact. It is proposed to charge developers for the cost of processing applications, including necessary costs of external consultants. This will require changes to EAC legislation and subsequently to national legislation.

- Raw water charges. Some countries are using raw water charges as a means of financing water resources management and conservation. Raw water charges are payable by the water abstractors (mainly water works and industries as there often are exceptions for subsistence and agricultural use). Raw water charges are thus administratively fairly simple, but ultimately the water works will need to pass the expense on to consumers and, even with staged tariffs, that is politically difficult.

- Hydropower charges. A charge could be levied on hydropower production in the basin, the justification being that the organisation helps conserve the water resources.

5. Relationships with other Organisations

The organogram for the proposed KBMU is given below:

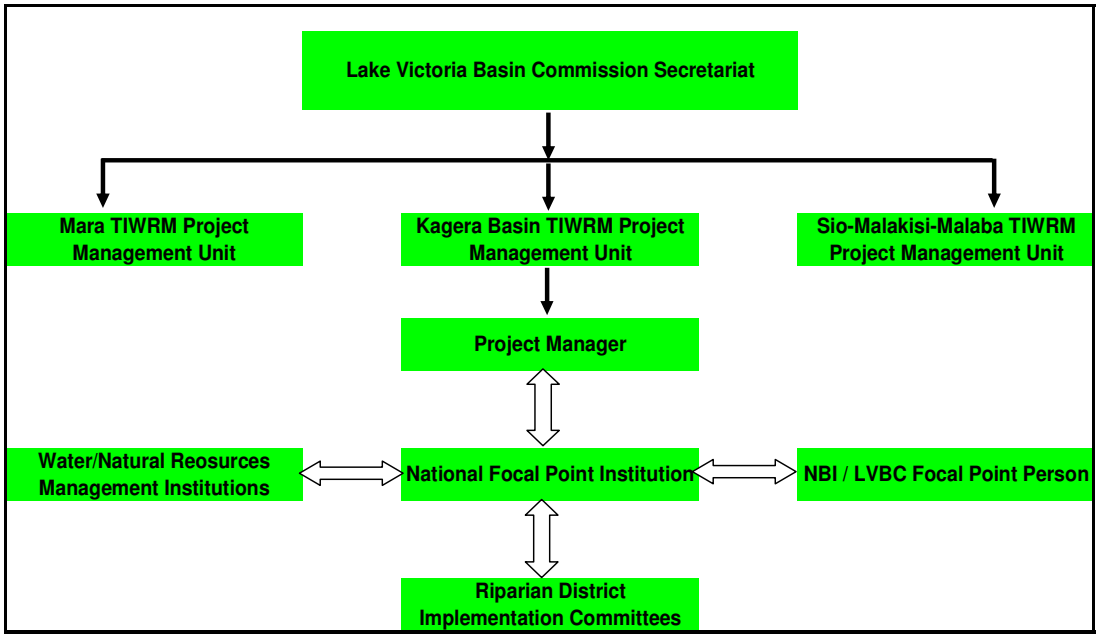


Figure (a): Proposed Organogram for the BMU under LVBC

5.1 Riparian States

National Institutions

The KBMU will work with a national institution that will be selected by each Member State. It is at the discretion of each country to select the institution. The criteria to select the institution should include the following:

- The institution should be a national one in its mandate and operations.
- The institution should deal with aspects of water and natural resources management.
- This institution should have a clearly defined mandate to handle transboundary issues, including the Kagera Basin area. In this way, it will be guaranteed that the institution will provide time, skills and human resources required to work with the KBMU.
- Where such an institution does not have specific capacity to handle transboundary related issues, support should be provided to develop this capacity, through providing training to key identified personnel.

LVBC and NBI National Focal Points

In each Member state, the focal point ministry has nominated a Focal Point Officer for LVBC. The LVBC Focal Officer is of a level that he/she is able to easily communicate, coordinate, reach, contact, or work with other stakeholders in government, private sector and civil society. The NFPO is responsible to the Permanent Secretary of the focal point ministry.

NBI also has National Focal Points whose key role is to coordinate and implement activities of NBI at national level. According to the Draft NBI Cooperative Framework

Agreement (S.32.2), "the function of National Nile Focal Point Institutions is to serve as national focal points for the Nile Commission with regard to matters within the competence of the Nile Commission." This description of function provides wide latitude, and it can be argued that the broad functions of the NBI National Focal Points are similar to those of the LVBC National Focal Point Officers.

National Focal Point Officers provide liaison between LVBC and the different government ministries on common issues of the basin development. They also facilitate stakeholder involvement in the development process, coordinate the activities of the LVBC at country level, and seek to harmonise the implementation of programmes and projects within the Lake Victoria Basin.

The functions of the NFP[4] are:

- Serving as a reference centre for all the activities of the LVBC in the country;
- Liaising with government ministries whose mandates cut across the Lake Victoria Basin in all matters relating to their activities and those of the NGOs within their sectors;
- Harmonisation of all stakeholder interventions in the Lake Basin in order to create the necessary synergies for development in the region as well as environmental protection;
- Collating all the activities of the ministries and other stakeholders in the lake and establishment of a national database of stakeholder activities and location in the lake Basin;
- Promoting knowledge sharing of information among national stakeholders in the areas of their interest;
- Promoting networking between the national actors such as the local authorities, private sector, NGOs, CBOs in order to enhance collaboration and information sharing;
- Serving as the main link with the EAC-LVBC. This implies the NFP will represent the Commission in all the relevant country meetings, seminars, etc. and in monitoring regional programmes and projects that are being implemented in the Member state;

Additionally, the NFP shall:

- Participate in all the Partnership Consultative Committee meetings since follow up is required in project identification and implementation under this scheme designed under the Partnership Agreement; and
- Be responsible for articulation of the Member state's issues for Lake Victoria Basin and therefore represent the Government position at regional fora.

National Focal Points are financed entirely by the Partner States. The Operational Strategy Report finds that each National Focal Point Office needs at least two assistant officers to ensure the following:

- All programmed activities are given adequate time.
- Activities do not stop because an officer is absent from the office.
- Succession planning.

[4] The list is extracted from the LVBC Operational Strategy Report.

- Capacity building.

Further, in terms of facilities, the National Focal Point Office requires facilitation with travel, communication, as well as computers and related equipment.

The increased activity due to the KMBU programmes may imply that the national governments may need to increase the resources of the National Focal Points. However, their main function is coordination and facilitation rather than implementation, so they should remain small.

Other National Cooperation Partners

It is critical that the Focal Points function effectively as facilitators and do not constitute administrative bottlenecks.

While the Focal Points should be kept informed, it is necessary that the KBMU is able to work directly with the relevant government agencies and other stakeholders in the riparian countries when this is deemed most practical, for instance in connection with agreed activities. In particular, the KBMU should seek to involve actors and development agencies that may not have a direct focus on water related issues, and yet their work has implications on the Kagera Basin. Examples include Ministries of Foreign Affairs, Lands and Environment, Gender, Labour and Social Development, Ministry of Energy, etc.

It is proposed that these institutions establish a regular consultation forum for the KBMU at national level. The function of this forum will be to ensure implementation of activities through monitoring and evaluations, as well as providing technical advise/support. The forum will also provide an opportunity for networking and information exchange, which will in turn feed into the planning process of the KBMU.

A number of Civil Society Organisations (CSOs) that work on issues relating to water and the environment operate at both national and local levels. In particular, the Nile Basin Forum has offices in all the countries in the Kagera Basin, and has established networks and links with CSOs operating at district. Developing a relationship with Nile Basin Discourse Forum (NBDF) would be strategic, because they have the networks, information and linkages with the grassroots, which present an opportunity for capacity building and engagement with communities on matters relating to water and natural resource management. The relationship can be formalised through a memorandum of understanding in which the NBDF would liaise with the KBMU in planning, monitoring and implementing their activities geared towards capacity building and awareness raising amongst communities.

Relationships with District Local Authorities

The KBMU should develop a close working relationship with district local authorities in the Kagera Basin catchment area. An association of local authorities operating in the Lake Victoria region exists (LVRLAC) and can be a good entry point for discussion and common planning. At the district level, all the countries have an office that is responsible for designing development plans for the district; this office is a good focal

point for the KBMU, and through liaising with this office, the KBMU can be kept abreast of the key issues and concerns in the various districts in the Kagera catchment area. This information can then in turn be used to develop programmes.

Relationships with Regional and International Organisations

The linkages to regional and international organisations will primarily take place through the LVBC, but the KBMU can also work directly with NELSAP and other regional or international organisations on technical matters or on projects that form part of a work programme approved by the LVB Council or approved by the LVBC Secretariat on a case-by-case basis.

D.2 Draft Charter for Joint Kagera River Basin Institutional Framework

The following organizational Charter is proposed as a result of realizing the necessity to provide an adequate, efficient and functional joint organizational structure to implement the Kagera River Basin Management and Development Strategy programs and activities taken there under in cooperation and coordination with each member and the internationa1 community, and to address and resolve issues and problems that may arise from the use and development of the Kagera River Basin water and related resources in an amicable, timely and good neighborly manner.

1. Joint Kagera River Basin Organization

1.1 Status

The institutional framework for cooperation in the Kagera River Basin shall be called the **Joint Kagera River Basin Organization (JKRBO)** and shall, for the purpose of the exercise of its functions, enjoy the status of an international body, including entering into agreements and obligations with the donor or international community.

1.2 Structure of Joint Kagera River Basin Organization

KRBO shall consist of three permanent bodies:

a) Standing Joint Executive Committee
b) Advisory Council, and
c) Secretariat

1.3 Budget of the Joint Kagera River Basin Organization

The budget of JKRBO shall be drawn up by the Standing Joint Executive Committee and shall consist of contributions from member countries on an equal basis, from the international community (donor countries), and from other sources.

2. The Advisory Council

2.1 Composition of the Advisory Council

The Advisory Council shall be composed of:

a) The ***four*** Members of Standing Joint Executive Committee (refer to Article 3.1)
b) ***Three*** members representing NELSAP
c) ***Three*** members representing LVBC
d) ***Ten*** members from ***each*** of the National Kagera Committees (NKCs) of the riparian State
e) ***Three*** members from Donor Consultative Group
f) The JKRBO Secretariat Senior Management Team members (CEO and three Division Directors, one from each riparian country)

2.2 Chairmanship of the Advisory Council

The Chairmanship of the Advisory Council shall be, among the Standing Joint Executive Committee members, for a term of one year and rotate according to the alphabetical listing of the riparian countries.

2.3 Sessions of the Advisory Council

The Advisory Council shall convene at least one regular session every year and may convene special sessions whenever it considers it necessary or upon the request of a member State. It may invite observers to its sessions as it deems appropriate.

2.4 Rules of Procedures

The Advisory Council shall adopt its own Rules of Procedures, and may seek technical advisory services as it deems necessary.

3. The Standing Joint Executive Committee

3.1 Composition of the Standing Joint Executive Committee

The Standing Joint Executive Committee shall be composed of one member from each participating riparian State at no less than Head of Department level.

3.2 Functions of the Standing Joint Executive Committee

The functions of the Standing Joint Executive Committee are:

a) To make policies and decisions and provide other necessary guidance concerning the promotion, support, cooperation and coordination in joint activities and projects in a constructive and mutually beneficial manner for the sustainable development, utilization, conservation and management of the Kagera River Basin waters on the basis of principles of NBI, LVBC Protocol and Integrated Water Resources Management and Development.

b) To decide any other policy-making matters and make decisions necessary to successfully implement NBI, LVBC Protocol, IWRM principles, including but not limited to approval of the basin development plan and major component projects/programs;

c) To establish guidelines for financial and technical assistance of development projects and programs; and if considered necessary, to invite the donors to coordinate their support through a Donor Consultative Group.

d) To confer with donors, directly or through their consultative group, to obtain the financial and technical support necessary for project/program implementation.

e) To make sure that the recommendations of the Advisory Council, with regard to the formulation and implementation Kagera River Basin Integrated Water Resources Management Development policies and strategies, are implemented.

f) To assign tasks and supervise the activities of the Secretariat.

3.3 Chairmanship of the Standing Joint Executive Committee

The Chairmanship of the Standing Joint Executive Committee will rotate according to the reverse alphabetical listing of the member countries and the Chairperson shall serve a term of one year, {the same as 2.2}.

3.4 Sessions of the Standing Joint Executive Committee

The Standing Joint Executive Committee shall convene at least four regular sessions every year and may convene special sessions whenever it considers it necessary or upon the request of a member State. It may invite observers to its sessions as it deems appropriate.

3.5 Rules of Procedures

The Standing Executive Committee shall set its own Rules of Procedures.

3.6 Decisions of the Standing Executive Committee

Decisions of the Standing Executive Committee shall be by unanimous vote except as otherwise provided for in its Rules of Procedures.

4. The JKRBO Secretariat

4.1 Purpose of Secretariat

The JKRBO Secretariat shall render technical and administrative services to the Standing Joint Executive Committee, and be under the supervision of the Standing Joint Executive Committee.

4.2 Functions of the Secretariat

The functions and duties of the Secretariat will be to:

a) To formulate a basin development plan that would be periodically reviewed and revised as necessary.
b) To submit the basin development plan and joint development projects/programs to be implemented in connection with it, to the Standing Joint Executive Committee for approval.
c) To regularly obtain, update and exchange information and data necessary to implement NBI, LVBC Protocol and IWRM principles.

d) To conduct appropriate studies and assessments for the protection of the environment and maintenance of the ecological balance of the Kagera River Basin.
e) To implement the policies and decisions of the Standing Joint Executive Committee and such other tasks as may be assigned by the Standing Joint Executive Committee.
f) To make recommendations to the Standing Joint Executive Committee for approval on the organizational structure, modifications and restructuring of the Secretariat.
g) To formulate the annual work program, and prepare all other plans, project and program documents, studies and assessments as may be required.
h) To implement and manage projects and programs which are approved by the Standing Joint Executive Committee.
i) To maintain databases of information.
j) To make preparations for sessions of the Standing Joint Executive Committee and the Advisory Council.
k) To carry out all other assignments given by the Standing Joint Executive Committee.

4.3 The KRBO Secretariat Management Team

The general organizational structure of the Secretariat will have three Divisions and Administrative Support. Individually, the three Division Directors will be reporting to the Chief Executive Officer (CEO) and each will be headed and managed by a senior riparian officer. The three Division Directors, together with the CEO, will form the Senior Management Team (one from each country) of the JKRBO Secretariat.

4.4 Chief Executive Officer

The Secretariat shall be under the direction of a Chief Executive Officer (CEO), who shall be appointed by the Standing Joint Executive Committee and shall serve for a five-year term. The Terms of Reference of the CEO shall be prepared by the Standing Executive Committee.

4.5 Assistant to the Chief Executive Officer

There will be one Assistant to the CEO, nominated by the Senior Management Team of JKRBO Secretariat and approved by the Chairman of the Standing Joint Executive Committee. Such Assistant will be of the same nationality as the Chairman of the Standing Joint Executive Committee and shall serve for a one-year term.

4.6 Riparian Staff

Riparian technical staffs of the Secretariat are to be recruited on a basis of technical competence, and the number of posts shall be assigned on an equal basis among the members. Riparian technical staff shall be assigned to the Secretariat for no more than two five-year terms, except as otherwise decided by the Standing Joint Executive Committee.

E. Questionnaire Related to the Development of KIRBMD Strategy

(Participants: Key Stakeholders of the Kagera River Basin)

E.1 Kagera River Basin Water Resources Management Strategic Options

This Questionnaire was filled by the Inception Workshop participants. It has the following contents:

1. Objectives of Water Resources Management and Development

1.1 General

A. Goal

(1) The overall goal is to enhance and promote all efforts towards the efficient, equitable and optimum utilization of the available Water Resources of Kagera River Basin for significant socioeconomic development on sustainable basis.

B. Objectives

(2) Development of the water resources of the Basin for economic, social and environmental benefits of the people, on equitable and sustainable basis.

(3) Allocation and apportionment of water based on comprehensive and integrated plans and optimum allocation principles that incorporate efficiency of use, equity of access, and sustainability of the resource.

(4) Managing and combating drought through efficient allocation, storage and efficient use of water resources.

(5) Conserving, protecting and enhancing water resources and the overall aquatic environment on sustainable basis.

1.2 Water Supply and Sanitation Sub-Sector

A. Overall Objective

(1) To enhance the well-being and productivity of the people through provision of adequate, reliable and clean water supply and sanitation services and to foster its tangible contribution to the economy by providing water supply services that meet the livestock, industry and other water users' demands.

B. Detail Objectives

Provision of sustainable and sufficient water supply services.

Satisfying water supply requirements for human, livestock, industries and other users as much as conditions permit.

(2) Promoting sustainable conservation and utilization of the water resources through protection of water sources, efficiency in the use of water as well as control of wastage and pollution.

Enhancing the well being and productivity of the people by creating conducive environment for the promotion of appropriate sanitation services.

(3) Creating sustainable capacity building in terms of the enabling environment, including institutions, human resources development, legislation and regulatory framework for water supply and sanitation.

1.3 Objectives for Irrigation Sub-Sector

A. Overall Objective

(1) To develop the irrigated agriculture potential for the production of food crops and raw materials needed for agro industries, on efficient and sustainable basis and without degrading the fertility of the production fields and water resources base.

B. Detail Objectives

(2) Development and enhancement of irrigated agriculture for food security and food self-sufficiency.

(3) Promotion of irrigation study, planning and implementation on economically viable, socially equitable, technically efficient, environmentally sound basis as well as development of sustainable, productive and affordable irrigation farms.

(4) Promotion of water use efficiency, control of wastage, protection of irrigation structures and appropriate drainage systems.

1.4 Objectives Hydropower Sub-Sector

A. Overall Objective

(1) To enhance efficient and sustainable development of the hydropower to meet the Basin's and surrounding energy demands.

B. Detail Objectives

(2) Ensuring that small, medium and large hydropower candidate projects are studied and designed to a stage ready for immediate implementation at any one time.

(3) Ensuring that a short, medium and long-term hydropower generation program is worked out well ahead of time.

(4) Ensuring that hydropower development projects are studied, designed, constructed, operated and utilized on economically viable basis to an acceptable technical, environmental and safety standards.

(5) Ensuring that the negative social and environmental impacts of hydropower are mitigated to the extent possible and that the positive environmental impacts are exploited as far as possible.

(6) Strengthening regional capacity for hydropower development, project study, design construction and operation.

(7) Encouraging involvement of the private sector in the development of hydropower.

2. Strategic Options for Water Resources Management and Development

2.1 General

(1) Enhance the integrated and comprehensive management of water resources that avoids fragmented approach.

(2) Recognize that water resources development, utilization, protection and conservation go hand in hand and ensure that water supply and sanitation, irrigation and drainage as well as hydropower, watershed management and related activities are integrated and addressed in unison.

(3) Recognize water as a scarce and vital socio-economic resource and to manage water resources on strategic planning basis with long term visions and sustainable objectives.

(4) Ensure that water resources management is compatible and integrated with other natural resources.

(5) Recognize and adopt the hydrologic boundary (basin or catchment or watershed) as the fundamental planning unit and water resources management domain.

(6) Ensure the provision of water supply services to the underprivileged sectors of the population based on a special "Social Strategy".

(7) Build and strengthen the necessary capacity in terms of institutions, legislation, facilities, human resources, finance, information systems, and the like for better and more efficient management of water resources including capacity building at the decentralized and lowest level.

(8) Ensure that water allocation gives highest priority to water supply and sanitation while apportioning the rest for uses and users that result in highest socio-economic benefits.

(9) Recognize that the basic minimum requirement, as the reserve (basic human and livestock needs, as well as environment reserve) has the highest priority in any water allocation plan.

(10) Enhance and encourage water allocation that is based on efficient use of water resources that harmonizes greater economic and social benefits.

(11) Ensure that water allocation shall be based on the basin, sub-basin and other hydrological boundaries and take into consideration the needs of drought prone areas.

(12) Promote the full involvement of women in the planning, implementation, decision making and training as well as empower them to play a leading role in self-reliance initiatives.

2.2 Sub-Sectors

A. Water Supply and Sanitation

(1) Recognize that water supply and sanitation services are inseparable and integrate the same at all levels through sustainable and coherent framework.

B. Irrigation

(2) Ensure the full integration of irrigation with the overall framework of the Basin's socio-economic development.

(3) Recognize that irrigation is an integral part of the water sector and consequently develop irrigation within the domain and framework of overall water resources management.

(4) Ensure the prevention and mitigation of degradation of irrigated water and maintain acceptable water quality standards for irrigation.

(5) Establish water allocation and priority setting criteria based on harmonization of social equity, economic efficiency and environmental sustainability requirements.

(6) Integrate the provision of appropriate drainage facilities in all irrigated agriculture schemes.

C. Drainage

(7) Integrate drainage issues within the domain of water resources management as appropriate.

(8) Establish guidelines and regulations for the development of storm drainage and sewerage in urban areas and field drainage on irrigated farms.

D. Hydropower

(9) Ensure that hydropower development is an integral part of the multipurpose uses of water.

2.3 Watershed Management

A. General

(1) Promote practices of efficient and appropriate watershed management to maximize water yields and quality.

(2) Ensure that watershed management practices constitute an integral part of the overall water resources management.

B. Water Resources Protection

(3) Create appropriate mechanisms to protect the water resources of the Kagera Basin from pollution and depletion so as to maintain sustainable development and utilization of water resources.

(4) Establish standards and classification for various uses of water in terms of quality and quantity for different scenarios including limits and ranges for desirable and permissible levels.

(5) Establish procedures and mechanisms for all actions that are detrimental to water resources including waste discharges, source development, catchment management etc.

C. Water Resources Conservation

(6) Conserve water resources through the integration of appropriate measures in the main water use categories.

D. Water Quality Management

(7) Develop water quality criteria, guidelines and standards for all recognized uses of water and ensure their implementation.

(8) Formulate receiving water quality standards and legal limits for pollutants for the control and protection of indiscriminate discharges of effluents into natural water courses.

(9) Develop appropriate water pollution prevention and control strategies pertinent to the Kagera Basin context.

E. Environment

(10) Incorporate environment conservation and protection requirements as integral parts of water resources management.

(11) Encourage that Environment Impact Assessment and protection requirements serve as part of the major criteria in all water resources projects.

2.4 Water Resource Development Projects

(1) Subject water resource development schemes to strict environmental and stakeholder considerations as well as meeting economic criteria.

(2) Establish code of practice for study and design of water resource development schemes adequately addressing technical, economic, environmental and stakeholders' issues.

(3) Promote local capacity building for professionals, consultants and contractors involved in water resource development.

(4) Promote regional industries to play increasing roles in the supply of material and equipment for water resource development.

(5) Develop regional capacity for activities extending from reconnaissance to supervision of implementation of water resource projects.

(6) Encourage the involvement of investors in the development of water resources.

3. Strategies Options Corresponding to Various Components

3.1 Technology and Engineering

A. Standards and Design Criteria

(1) Formulate and adopt basin-wide standards and criteria for the design, installation, construction, operation, maintenance, inspection and other activities in all water resources management undertakings.

B. Water Infrastructure Management

(2) Recognize large hydraulic structures like dams, major canals and the like as part of the overall development infrastructures and develop, administer operate and maintain them with costs to be covered from water sales.

(3) Promote involvement of the private sector in water resources infrastructure development and management including irrigation, hydropower, etc. with costs to be covered from the services rendered.

(4) Develop a comprehensive and optimum plan for the operation and management of interconnected water systems in the Basin.

(5) Provide guidelines concerning dams and reservoirs operations and safety procedures as well as promote community participation in the development and management of such schemes.

(6) Promote the development of interconnected systems of water reservoirs (as much as conditions permit) so as to make optimum distribution of water.

D. Technical Issues

(7) Develop standards and criteria for the planning, design, quality control, materials and technologies in water supply and for operation and maintenance procedures.

(8) Select and/or develop appropriate and affordable technologies for the design, construction, implementation, operation and maintenance of water supply and sanitation, irrigation, soil and water supply, etc. schemes.

(9) Develop guidelines, manuals and procedures for the sustainable operation and maintenance of water supply and sanitation systems, irrigated systems, soil and water conservation systems, etc.

(10) Develop the necessary technical guidelines and framework for

mechanisms, systems, materials and technologies for water use efficiency in irrigated agriculture.

3.2 Disasters and Public Safety

(1) Recognize and adopt that management of disasters associated with water, shall form an integral part of water resources management.

(2) Promote coordinated planning to combat drought and growing desertification through including, long-term water allocation and conservation measures and also rehabilitative actions on catchment management.

(3) Ensure and promote the safety of water retaining, transmission and diversion structures like weirs, barrages, dams, reservoirs and pipelines, against natural and man made disasters for the:-

- protection and conservation of the available water, the structures and all systems and equipment,
- protection of the environment, human settlements, flora and fauna, socio-economic infrastructures.

3.3 Financing

A. Funding for Water Resources

(1) Adopt as a principle, that all funding agencies including ESAs, Governments and private sectors, shall include in their funding provisions for water conservation and protection, operation and maintenance, rehabilitation and replacement costs, training and human resources development, adequate information and documentation as well as other means that enhance and ensure sustainability of systems.

(2) Promote credit facilities and bank loans for the development undertakings.

B. Economics and Financial Analysis

(1) Establish norms and procedures for financial sustainability and viability of water resource projects.

(2) Develop the appropriate cost recovery systems and mechanisms particularly for urban water supply, irrigation and hydropower projects.

C. Water Pricing

(1) Recognize water is a natural resource with an economic value and

ensure that fees are paid for services rendered.

(2) Recognize water as a vulnerable and scarce natural resource and ensure and promote that all pricing systems and mechanisms should be geared towards conservation, protection and efficient use of water as well as promote equity of access.

(3) Ensure that management of water resources shall be always addressed in conjunction with basic social equity norms.

(4) Ensure that the price for water should be neither too high (and discourage water use) nor too low (and encourage abuses and over use of water).

(5) Promote that tariff setting shall be site specific, depending on the particulars of the project, location, the users, the cost and other characteristics of the schemes.

(6) Ensure that the basic human needs of water for disadvantaged communities, who cannot afford to pay for development of water systems, shall be supported as appropriate, and in so far as the communities are able and willing to cover the operation and maintenance costs on their own.

3.4 Information Systems

A. Management of Water Resources Information

(1) Manage and administer water resources information on the basis of project and sector information, management information system, technical information and public information systems.

B. Development of Information Management System

(2) Develop a coherent, efficient and streamlined process of information management consisting of:-

- defining and incorporating:- data collection, processing, analysis and dissemination,
- determining the requirements of:- human, technology, financial resources data
- identifying the users typography, information requirements,
- defining information requirements of users,
- identifying sources of information

3.5 Enabling Environment

A. Institutional Framework.

	(1)	Promote appropriate linkage mechanisms for the coordination of water resources management and development activities between the riparian countries water resources related agencies.
	(2)	Establish phase-by-phase strong River Basin Organization (RBO), for efficient, successful and sustainable joint management of the water resources of Kagera basin through concerted efforts of the relevant stakeholders.
		B. Institutions and Stakeholders
	(3)	Ensure that the management of water supply systems to be at the lowest and most efficient level of institutional set up, which provides for the full participation of users and to promote effective decision making at the lowest practical level.
	(4)	Develop coherent and streamlined institutional frameworks for the management of water supply at the Kagera River Basin level and clearly define the relationships and interactions among line agencies of the riparian countries.
	(5)	Develop coherent and appropriate guidelines, standards, principles and norms for streamlining the intervention of ESAs, NGOs loans, grants and other donations.
	(6)	Develop a framework for the sustainable and effective collaboration amongst all stakeholders and legalize forum for the participation of all stakeholders.
	(7)	Define and implement the respective roles of the various institutions and stakeholders at all levels.
		D. Legislative Framework
	(8)	Provide the legal basis for active and meaningful participation of all stakeholders, including water users' associations, the community and particularly for women to play the central role in water resources management activities.
		C. Capacity Building
	(9)	Provide sustainable and objective oriented training on the relevant areas of water resources management as well as develop and implement effective means in order to efficiently utilize and sustainable retain trained manpower.
	(10	Device appropriate strategies for the development and enhancement of regional capacity in consultancy and construction through different incentive mechanisms.

(11) Build technical capacity in terms of water source investigation, design, engineering, water quality control, operation and maintenance, construction technology and facilities.

(12) Develop streamlined and coherent legislation and regulatory framework for improving water supply as well as to control pollution, degradation and depletion of water sources.

3.6 Monitoring and Evaluation

(1) Establish an efficient and effective Monitoring and Evaluation system dealing with the following parameters:

(a) Progress Monitoring (progress of projects and towards achievement of milestones and outputs);
(b) Compliance Monitoring (with rules, regulations, objectives and policies);
(c) Impact Monitoring and Evaluation (changes in baseline and fulfillment of objectives);
(d) Risk Monitoring (risk assessment, proposal of mitigation measures, and monitoring of the effectiveness of adopted mitigation measures).

E.2 General Background Information

A.	**Ensuring water, sanitation & hygiene for all**	
1.	**Qn.**	*Do you have major obstacles to a better coordination between water and health policies? If yes, what policy and concrete measures should be taken to bridge them?*
	Ans.	
2.	**Qn.**	*Do you educate the public on the need for improved sanitation & drainage, once domestic water supply is available?*
	Ans.	
3.	**Qn.**	*What is the current progress towards water and sanitation for all? How do you measure indicators and/or monitoring systems?*
	Ans.	
4.	**Qn.**	*How much water infrastructure development impacted positively the achievement of the MDGs?*
	Ans.	
5.	**Qn.**	*What approaches do you use to convince decision makers of the necessity of proper sanitation and water pollution control?*
	Ans.	
6.	**Qn.**	*What are the effects of urbanization in water catchments?*
	Ans.	
B.	**Water and food for reducing poverty and ending hunger**	
7.	**Qn.**	*How do you promote and develop supplementary irrigation/basic water management for small scale farming?*
	Ans.	
8.	**Qn.**	*Do you think your efforts towards water development for agricultural improvements sustainable and do they contribute to poverty reduction?*
	Ans.	
9.	**Qn.**	*Do you think your water infrastructure development contribute to ensuring access to water by the poor?*
	Ans.	
10.	**Qn.**	*How do you think water be managed more effectively for sustainable agriculture to continue to be a key pathway out of poverty and means to achieve food security, especially for the poor?*
	Ans.	

C.	**Water for energy, energy for water**	
11.	**Qn.**	*Do you have cases where water for energy became complementary to water for food?*
	Ans.	
12.	**Qn.**	*Do you think the idea of usage of water for energy/energy for water in ensuring sustainability is workable in your area?*
	Ans.	
13.	**Qn.**	*What are your experiences in reconciling environmental and developmental concerns in hydropower development?*
	Ans.	
D.	**Multiple uses of water (water supply, irrigation, hydropower, ...)**	
14.	**Qn.**	*How do you ensure an absolute priority to the satisfaction of vital domestic water needs in contexts of intense stress on water resources?*
	Ans.	
15.	**Qn.**	*What do you to curb ineffective use of water for irrigation and consequent overspending of water?*
	Ans.	
16.	**Qn.**	*What balance do you apply between irrigated agriculture and rainfed agriculture to optimize the protection of aquatic ecosystems and increase food production?*
	Ans.	
17.	**Qn.**	*Do you have any obstacle in applying an enhanced integration of demand- and supply-driven water management policies? If yes, what are they and how could they be overcome?*
	Ans.	
18.	**Qn.**	*Do you think climate change and climate variability affect rainfed agriculture? If yes, how?*
	Ans.	
19.	**Qn.**	*Do you encourage multiple use of water infrastructure for the benefit of the poor? If yes, how?*
	Ans.	
E.	**River Basin management**	
20.	**Qn.**	*What tools and decision making processes are used in different contexts for optimal water allocation to optimize the economic, social and environmental benefits?*

	Ans.	
21.	**Qn.** **Ans.**	*What processes have been developed and proven to help key stakeholders understand the issues relating to Kagera Basin and work with each other to resolve in a mutually agreeable and sustainable manner?*
22.	**Qn.** **Ans.**	*What processes have proven to be most successful in which situations, and which have proven to be failures? Why?*
23.	**Qn.** **Ans.**	*How do these shortcomings going to be addressed in the future?*
24.	**Qn.** **Ans.**	*How do others can learn from these successes and failures?*
25.	**Qn.** **Ans.**	*How do Kagera River Basin organizations intervene on basin water issues, such as allocating water for water users or resolving water conflicts?*
26.	**Qn.**	*Are there regulation efforts for basin management at an adequate level? If yes, what are difficulties encountered and solutions provided for implementation of the regulations concerned?*
	Ans.	
27.	**Qn.**	*Are there more ways of cooperation between riparian countries be created so to prevent conflicts over water-use?*
F.	**Ensuring adequate water resources and storage infrastructure to meet agricultural and other needs**	
28.	**Qn.** **Ans.**	*How do you plan to meet the increased demand for food particularly under increased scarcity of land and water, and what storages, infrastructure investments and processes are applied to achieve this, and where do you focus?*
29.	**Qn.** **Ans.**	*What storage and improvements in infrastructure are required to meet the food, energy and water needs of the population?*
30.	**Qn.** **Ans.**	*Should widespread household- and community-scale rainwater harvesting and storage be emphasized over larger centralized storage schemes?*
31.	**Qn.**	*How do you develop new water resources with minimizing negative environmental impact?*

	Ans.	
32.	**Qn.**	*How do you follow-up the livelihood of the relocated people in a reservoir area?*
	Ans.	
33.	**Qn.**	*Do you have practices of sharing experiences on water resources management with other basins, in order to achieve better water infrastructure management?*
	Ans.	
G.	**Preserving natural ecosystems**	
34.	**Qn.**	*What strategies and policies are taken to promote the consideration of ecosystems in water development, management and use?*
	Ans.	
35.	**Qn.**	*What is the reasonable balance between development and preservation of ecosystems to maintain healthy water and river environments in urban areas?*
	Ans.	
36.	**Qn.**	*What are the preliminary measures for defining the factors polluting water resources and preventing these factors? What is the level of adequateness of legal and penal sanctions against pollutants?*
	Ans.	
37.	**Qn.**	*How adequate is your monitoring practice in order to improve management and protection of water resources?*
	Ans.	
38.	**Qn.**	*How do you define adequacy of water, in terms of both quality and quantity, needed for the ecosystem?*
	Ans.	
H.	**Adapting to climate change**	
39.	**Qn.**	*Do you assist local decision makers in considering global change for long term infrastructure decisions? If yes, how?*
	Ans.	
40.	**Qn.**	*Do you think the development of more storage to ensure water security and to overcome future droughts and to mitigate impacts of floods a primary measure for climate adaptation?*
	Ans.	
41.	**Qn.**	*What measures should be designed so that both water utilities and water users receive appropriate incentives for water savings?*

	Ans.	
42.	**Qn.** **Ans.**	*Do you think transboundary water treaties should be revised in provision for climate change?*
43.	**Qn.** **Ans.**	*Do you think the water sector and other sectors planners work together to create better and adapted plans and strategies for the future? If yes, how?*
44.	**Qn.** **Ans.**	*What is your suggestion in raising the political will to implement strategy for adapting climate change?*
45.	**Qn.** **Ans.**	*What is your approach in promoting watershed development or restoration of degraded watersheds through forestation and soil & water conservation techniques so as to create a cushion, a buffer or a resilient interface between the forthcoming harsh climatic pattern and hydrology?*
I.	**Changing land uses, human settlements and water**	
46.	**Qn.** **Ans.**	*What measures do you think should be taken to improve the coordination between land use policies and water policies? (to serve what purpose?)*
47.	**Qn.** **Ans.**	*Do you think land and water rights for women will better the situation and create opportunities for better management? If yes, explain why?*
48.	**Qn.** **Ans.**	*What are the major determinants of domestic water consumption in the urban areas?*
49.	**Qn.** **Ans.**	*Managing and controlling urban development appear to lie beyond the parameters of a water demand management approach unless other policies (land use, etc.) are implemented in order to reduce tensions regarding water and other resources. In this sense, what do you think are the main indicators for better sectoral integration?*
J.	**Mitigating disasters**	
50.	**Qn.** **Ans.**	*How could structural and non-structural measures be adopted and best complement each other to mitigate impacts of disasters?*

51.	**Qn.** **Ans.**	*What are the community approaches that could be most effective in risk management and disaster reduction?*
52.	**Qn.** **Ans.**	*Do you think major risks be reduced by land use strategies, such as afforestation, forbidding building on flood plains, preventing new water uses in water-scarce areas, etc.?*
53.	**Qn.** **Ans.**	*What are your approaches of promoting watershed development or restoration of degraded watersheds through forestation and soil & water conservation techniques so as to create a cushion, a buffer or a resilient interface between the forthcoming harsh climatic pattern and hydrology?*
54.	**Qn.** **Ans.**	*What mechanisms do you use to raise awareness of risks among communities who are subject to disasters? How do you intend to build strong society and communities against water-related disasters?*
55.	**Qn.** **Ans.**	*Taking into account serious impacts on climate change, how do you cope with increasing water-related disaster risk? Furthermore, do you promote adaptation to climate change in the filed of water-related disaster?*
56.	**Qn.** **Ans.**	*Do you think the capacities of community-centered disaster management must be developed? If yes, how?*
K.	**Implementing the right to water and sanitation for improved access**	
57.	**Qn.** **Ans.**	*What strategies have you adopted to deal with water pollution in the face of increased urbanization?*
58.	**Qn.** **Ans.**	*Do you promote rights to safe drinking water? If yes, what can be done to achieve WHO Drinking Water Standards in underdeveloped nations?*
	Improving performance through regulatory approaches	
59.	**Qn.** **Ans.**	*Through which types of measures do you think non point source pollution of surface and groundwater be reduced?*
60.	**Qn.**	*What strategies can be adopted to deal with storm water volume and pollution in the face of more extreme weather events and increased urbanization?*

	Ans.	
61.	**Qn.**	*Do you consider changes to infrastructure design (gutters, culverts) or to engineering of pollution sources (cars and trucks, petrol and oil formulations) that would mitigate damage to natural systems?*
	Ans.	
62.	**Qn.**	*What strategies can be adopted to deal with water pollution in the face of increased urbanization?*
	Ans.	
L.	**Ethics, transparency, and empowerment of stakeholders**	
63.	**Qn.**	*In the case of costing and pricing water services: what priority measures do you apply to increase transparency?*
	Ans.	
64.	**Qn.**	*What are the different models of user participation (water user boards, water users association, etc.) and what are the different conditions for their effectiveness?*
	Ans.	
65.	**Qn.**	*What attempts do you carry out in order to strengthen local authorities for a better management of water services and water resources?*
	Ans.	
66.	**Qn.**	*What mechanism do you propose in order to share precise information on water resources among stakeholders in the Kagera River basin?*
	Ans.	
M.	**Institutional arrangements for efficient and effective water management**	
67.	**Qn.**	*What are the major obstacles to proper maintenance of infrastructure? What are the key policy measures to implement in order to ensure sustainability of various types of water infrastructure?*
	Ans.	
68.	**Qn.**	*What would be the best way of training local people to maintain their own systems (vocational training)? How to involve non-traditional groups?*
	Ans.	
69.	**Qn.**	*Are there any strategies that might sustain water and sanitation services when governments have failed due to conflict or disorganization?*
	Ans.	
70.	**Qn.**	*What gaps lie between water pollution control policies and their implementation to ensure safe water supply? What actions are necessary*

	Ans.	*to fill the gaps?*
71.	Qn.	*What is the current role and obligations of the central government in helping/stimulating better performance from decentralized water utilities? Do you think the current practice need to be improved?*
	Ans.	
N.	**Education and capacity-building strategies**	
72.	Qn.	*Do you use education partnerships (e.g. UNESCO IHP/IHE programs) as a basis for capacity development?*
	Ans.	
73.	Qn.	*Do you think training and/or education should start at the level of farmers? If so, how can it be transferred to those who are illiterate with no ICT infrastructure?*
	Ans.	
74.	Qn.	*What is the most effective method to improve farmers' capacities to practice Participatory Irrigation Management?*
	Ans.	
75.	Qn.	*What should be the capacity-building strategy?*
	Ans.	
O.	**Appropriate and innovative solutions**	
76.	Qn.	*How can traditional and local techniques be combined with advanced technology to produce the most effective solutions to water problems?*
	Ans.	
77.	Qn.	*Are decentralized, smaller-scale water and sanitation systems suitable alternatives, for which cities and at which time scale? What would be the technological gaps to overcome?*
	Ans.	
78.	Qn.	*How can religion and/or local ethics be incorporated in convincing farmers to use the most efficient way of irrigation?*
	Ans.	
79.	Qn.	*How should the effective monitoring and inspection methods be against pollutants in Kagera River basin?*
	Ans.	
P.	**Using professional networks and associations to strengthen the water sector**	
80.	Qn.	*How can institutions be encouraged to work together to cooperate on*

	Ans.	*monitoring issues?*
81.	**Qn.**	*How can we develop a knowledge-sharing mechanism among policy-makers, water experts and other stakeholders to effectively promote water quality management?*
	Ans.	
82.	**Qn.**	*In the context that agricultural water is the main user of water and is multi-function, how can experts' activities on irrigation and agriculture be enhanced to solve water problems as a whole?*
	Ans.	
Q.	**Sustainable means of financing local water authorities and systems**	
83.	**Qn.**	*According to your experience, under what circumstances is micro-financing an effective strategy for providing sustainable water and sanitation services?*
	Ans.	
84.	**Qn.**	*Do you apply cost-recovery? If yes, what are the pros and cons of water meters in different contexts? How to determine the appropriate level (house-holding, building...) for their installation?*
	Ans.	
85.	**Qn.**	*Should central and local governments allow local water authorities to access the private capital market to ensure investments in development and management of the systems?*
	Ans.	
86.	**Qn.**	*How could conflicts resulting from unequal distribution of water resources within local groups be prevented?*
	Ans.	
R.	**Pricing strategies to ensure fairness and sustainability**	
87.	**Qn.**	*How do you balance the cost of new expansion of water and sanitation systems between those who have and do not have access to the service?*
	Ans.	
88.	**Qn.**	*Could private water providers be associated with the development of public water services? How and to what extent?*
	Ans.	
89.	**Qn.**	*Can pricing strategies ever be fair if there is no transparency and reporting on real cost of service provision?*
	Ans.	

90.	**Qn.** **Ans.**	*How do you ensure payment of maintenance costs for infrastructure? Have you designed specific financial measures this purpose?*
91.	**Qn.** **Ans.**	*According to your experience and/or opinion, what are the best tarification or cost recovering practices for the poor or very poor persons or families?*
92.	**Qn.** **Ans.**	*Can proper pricing be available for water through market approaches, although the demand and supply of water is influenced greatly by weather?*
S.	**Pro-poor policies and strategies**	
93.	**Qn.** **Ans.**	*What should pro-poor policies and strategies concretely contain to give access to water and sanitation to poor people and especially the poorest (slums, villages, popular suburbs ...)?*
94.	**Qn.** **Ans.**	*What are the best financial measures or decisions (tarification, subsidies, etc.) that facilitate the access of the poorest people to water and sanitation? What are the best practices?*
95.	**Qn.** **Ans.**	*How can new policies be put in place combining investment and capacity development for management of systems?*
96.	**Qn.** **Ans.**	*What are the effects of pre-poor policies and for which level of cross-subsidy do they start to have perverse effects?*
97.	**Qn.** **Ans.**	*Do cross-subsidies mechanisms really have positive redistributive effects?*
98.	**Qn.** **Ans.**	*Are the pro-poor financing strategies really affecting the poor?*

E.3 Compilation of Project Profiles

The form presented in the next pages aims at suggesting on the type of project information that need be collected through the ***Key Stakeholders*** so as to serve as an ***Input*** for the preparation of ***Development of Kagera Integrated River Basin Management and Development Strategy (KIRBMDS).***

The complete Project Profile table is expected provide very useful summary mainly for the purpose of Prioritization of Projects in the process of formulating the Investment Strategy Component the KIRBMDS. It is expected to provide basic information on the projects, including the justification and objectives of the proposed project.

The "Description" column of the table can be compiled on the basis of existing project profile documents and additional information available in various water resource project planning documents.

In addition, more titles and respective descriptions can also be added if it can better define the specific project.

Summary profile of Project No. 1

Title	No.	Description
Country	1	
Project Name and Type[5]	2	
Location	3	
Owner of the project proposal	4	
Executing Agency	5	
Probable Start-Up Date	6	
Duration (Start-Up to End)	7	
Documentation[6] *available*	8	
Project description[7]	9	
Project components[8]	10	
Project status	11	
Relevance[9] *of the project*	12	
Project purpose	13	
Project outputs	14	
Basic activities	15	
Possible risks[10] *and assumptions*	16	
Environmental Classification	17	
Indicative total cost (in USD)	18	
Project benefits[11]	19	
Project implementation[12]	20	
Proposed sources[13] *of finance*	21	
	22	
	23	
	24	
	25	

[5] Such as: (a) Multipurpose water resource projects; (b) Water supply and sanitation projects (urban, rural); (c) Irrigation and drainage projects (small, medium, large); (d) Hydropower projects; (e) Flood control, fishery, navigation, etc. projects; (f) Catchement degradation control projects (terracing, rainwater harvesting, forestry, etc.)
[6] Such as pre-feasibility study, feasibility study, detail design, and other supporting studies.
[7] Including , background, size, population served, etc.
[8] Including such as: capacity building, protection and restoration of water catchments, establishing a monitoring and evaluation system., etc
[9] Including relevance to sectoral, regional and national objectives and priorities
[10] Including institutional, management, market, etc
[11] Including financial, economic, social and environmental benefits.
[12] Including responsible agencies, implementation schedule.
[13] Government, financing institution(s), beneficiaries, private sector, other sources

Summary profile of Project No. (2, 3, 4, 5, … and more)……Please duplicate this form for the additional projects

Title	No.	Description
Country	1	
Project Name	2	
Location	3	
Owner of the project proposal	4	
Executing Agency	5	
Probable Start-Up Date	6	
Duration (Start-Up to End)	7	
Documentation available	8	
Project description	9	
Project components	10	
Project status	11	
Relevance of the project	12	
Project purpose	13	
Project outputs	14	
Basic activities	15	
Possible risks and assumptions	16	
Environmental Classification	17	
Indicative total cost (in USD)	18	
Project benefits	19	
Project implementation	20	
Proposed sources of finance	21	
	22	
	23	
	24	
	25	

F. SELECTED PROJECT FEATURES OBTAINED FROM PREVIOUS STUDIES

F.1 Estimates of Irrigation Water Requirements

Table E.1.1: Regional classification with agro-meteorology from FAO

Regions	Main characteristics			5 zones
	Elevation (El. m	Average annual temperature (°C)	Average annual precipitation (mm)	
1. Imbo	< 1000	23 – 24	1100 – 1400	A: Western low land
2. Impala	1200 – 1400	20 – 21	1400 – 2000	
3. Lake Kivu	1470 – 1900	18 – 21.5	1100 – 1500	
4. Lava grounds	1800 – 2300	16 – 17	1500 – 1650	B: Congo-Nile peak
5. Congo-Nile peak	1900 – 2200	16 – 18	1400 – 1500	
6. Buberuka highland area	> 2200	17 – 18	1200	
7. Central plateau	1500 – 1900	18 – 19	1100 – 1300	C: Central plateau
8. Mayaga-Bugesera	1200 – 1600	> 20	1000	D: Eastern plateau
9. Eastern plateau	1200 – 1500	20	950 – 1050	
10. Eastern Savanna	< 1500	> 20	700 – 850	E: Eastern Savanna

Source: KWRC (2008)

Table E.1.2: Duration and crop coefficient for each phase of rice farming

Cultural cycles	Growth phases	Duration	Crop coefficient	Dates
Rice cycle 1	Total vegetative seasons (150 days)			
	- Seed bed	10	1.20	6.1-6.1
	- Soil preparation	20	1.15–1.05	6.11-6.30
	- Initial phase	20	1.00	7.1-7.20
	- Development phase	30	1.01-1.04	7.21-8.20
	- Mid-season phase	40	1.05	8.21-9.31
	- Phase of ending season	30	1.01-0.84	10.1-10.30
Rice cycle 2	Total vegetative seasons (150 days)			
	- Seed bed	10	1.20	12.1-12.1
	- Soil preparation	20	1.15–1.05	12.11-12.30
	- Initial phase	20	1.00	1.1-1.20
	- Development phase	30	1.01-1.04	1.21-2.20
	- Mid-season phase	40	1.05	2.21-3.30
	- Phase of ending season	30	1.01-0.84	4.1-4.30

Source: KWRC (2008)

Table E.1.3: Duration and growth coefficient fro each phase of bean

Growth phases	Duration	Crop coefficient	Dates
Total vegetative seasons (90 days)			
- Initial phase	20	0.35	7.1-7.20
- Development phase	30	0.48-1.02	7.21-8.20
- Mid-season phase	30	1.15	8.21-9,20
- Phase of ending season	10	0.92	9.21-9.30

Source: KWRC (2008)

Table E.1.4: Duration and growth coefficient fro each phase of maize

Growth phases	Duration	Crop coefficient	Dates
Total vegetative seasons (130 days)			
- Initial phase	25	0.45-0.50	7.1-7.25
- Development phase	35	0.64-1.01	7.26-8.31
- Mid-season phase	40	1.10	9.1-10.10
- Phase of ending season	30	1.01-0.64	10.11-11.10

Source: KWRC (2008)

Table E.1.5: Duration and growth coefficient fro each phase of soybean

Growth phases	Duration	Crop coefficient	Dates
Total vegetative seasons (140 days)			
- Initial phase	20	0.45	7.1-7.20
- Development phase	35	0.54-0.88	7.21-8.25
- Mid-season phase	60	1.01-1.05	8.26-10.25
- Phase of ending season	25	0.99-0.57	10.26-11.20

Source: KWRC (2008)

Table E.1.6: Duration and growth coefficient fro each phase of tomato

Growth phases	Duration	Crop coefficient	Dates
Total vegetative seasons (145 days)			
- Initial phase	30	0.70	7.1-7.31
- Development phase	40	0.75-1.05	8.1-9.10
- Mid-season phase	45	1.10-1.06	9.11-10.25
- Phase of ending season	30	0.93-0.60	10.26-11.25

Source: KWRC (2008)

Table E.1.7: Duration and growth coefficient fro each phase of potato

Growth phases	Duration	Crop coefficient	Dates
Total vegetative seasons (130 days)			
- Initial phase	25	0.55	10.1-10.25
- Development phase	30	0.60-0.92	10.26-11.25
- Mid-season phase	45	1.05-1.10	11.26-1.5
- Phase of ending season	30	1.03-0.77	1.6-2.5

Source: KWRC (2008)

Table E.1.8: Potential evapo-transpiration and effective rainfall *(in mm)*

Months	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Yearly
A. Western low land (Bugarama Station)													
ETo (mm/day)	4.4	4.3	4.2	3.8	3.9	4.7	5.5	5.9	5.4	4.8	4.1	4.4	**1684**
Rainfall (mm)	127	120	126	153	114	23	10	15	67	118	149	128	**1150**
Effective rf(mm)	94	91	94	106	88.0	22	10	15	58	90	105	95	**869**
B. Congo-Nile peak (Gikongoro Station)													
ETo (mm/day)	3.6	3.8	3.8	3.4	3.2	3.7	4.2	4.5	4.6	4.1	3.8	3.5	**1405**
Rainfall (mm)	104	129	145	225	144	62	13	49	92	116	132	108	**1319**
Effective rf(mm)	82	96	103	124	103	54	13	44	75	89	97	85	**965**
C. Central plateau (Rubona Station)													
ETo (mm/day)	3.6	3.8	3.8	3.4	3.2	3.7	4.2	4.5	4.6	4.1	3.8	3.5	**1405**
Rainfall (mm)	115	120	139	194	182	17	9	35	64	105	98	104	**1182**
Effective rf(mm)	82.4	97	108	134	129	17	9	33	57	87	83	87	**935**
D & E. Eastern plateau and Savanna (Gabiro Station)													
ETo (mm/day)	3.9	4.0	4.1	3.9	3.9	4.1	4.2	4.5	4.5	4.2	3.9	3.9	**1494**
Rainfall (mm)	65	78	95	155	78	18	19	19	68	82	72	75	**824**
Effective rf(mm)	58	68	81	117	68	17	18	18	61	71	64	66	**707**

Source: KWRC (2008)

Table E.1.10: Consumptive use of Bugasera Irrigation: *(in mm)*

Months	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Yearly
Rice field (double cropping)													
Rice 1						246	155	164	126				**764**
Rice 2	103	101	89.4	19.9								223	**537**
Effective rainfall	58.0	68.0	81.0	117	68.0	17.0	18.0	18.0	61.0	71.0	64.0	66.0	**707**
Water requirement	44.7	33.3	8.4	0.0	0.0	229	137	146	65.4	1.9	0.0	157	**823**
Upland													
Bean							32.9	110	84.9				**228**
Maize							41.7	89.8	88.1	54.0	3.6		**277**
Average (Jul-Sept)							37.3	100	86.5	54.0	3.6		**281**
Effective rainfall	58	68	81	117	68	17	18	18	61	71	64	66	**707**
Water requirement	0.0	0.0	0.0	0.0	0.0	0.0	19.3	82.0	25.5	0.0	0.0	0.0	**127**

*Using ET of the suitable crop planned from NWRMP, 2004. (As presented in KWRC, 2008)
*Using the average values of ETs of bean and maize in upland

Table E.1.9: Water requirements for each crop *(in mm)*

Months	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
	Season B					Season C			Season A			
C. Central plateau (Rubona Station)												
Rice 1						245	160	152	130	55		
Rice 2	60.1	64.9	53.6	5.7								208
Bean							38.7	98.0	88.8			
Maize							47.5	77.6	91.9	35.7	0.0	
Soybean							49.2	83.3	85.1	41.9	3.1	
Tomatoes							76.8	81.4	89.6	48.8	9.5	
Potato	15.9	0..0								0.0	18.3	29.0
Tomatoes							104	133	118	68.0	7.4	
Potato	37.6	2.4								1.0	13.5	46.2
D & E. Eastern plateau and Savanna (Gabiro Station)												
Rice 1						246	155	164	126	73		
Rice 2	103	101	89.4	19.9								323
Bean							32.9	110	84.9			
Maize							41.7	89.8	88.1	54.0	3.6	
Soybean							43.4	95.5	81.4	60.4	11.2	
Tomatoes							71.4	93.6	86.1	67.4	24.7	
Potato	58.7	8.9								2.3	41.2	63.8

* Reference: National Water Resources Management Plan (NWRMP) reported in 2004 (as presented in KWRC, 2008)

F.2 Dam and Reservoir Features of Nyabarongo Multipurpose Project

Phases	Unit	Specification
River Basin		
Drainage area	km2	**5750**
Average annual rainfall	Mm	**1307**
Average annual inflow	Mm3/yr	**2176**
Reservoir		
Maximum water level	m amsl	**1409,07**
Flood water level	m amsl	**1408,5**
Normal water level	m amsl	**1406**
rated water level		**1400,21**
Low water level	m amsl	**1389,9**
Total storage capacity	Mm3	**363,4**
Active storage capacity	Mm3	**221,1**
Dead storage	Mm3	**88,9**
Dam		
Type		**CGD**
Dam crest	m amsl	**1410**
Length	m	**228**
Height	m	**48,5**
Spillway		
Design flood (200 year frequency)	m3/s	406
Spillway crest	m amsl	1406
Width of spillway crest	m	27,5
Spillway type (non gated operation)		
Spillway type (non gated operation)		
Intake		
Design flow rate	m3/s	**60**
Multi-blade roller gate		
(B 5.5 m x H 5.5m x 4 leaves)	sets	**2**
Fixed roller gate		
(B 4 .0m x H 4.0m)	set	**1**
(length of hoisting)	m	**35**
Screen		
(B 6.0m x H 28.0m)	sets	**2**

(E.1….. Continued … 2/2)

Phases	Unit	Specification
Penstock		
Main Pipe		
Design flow rate	m3/s	**60**
Design flow velocity	m/s	**5,9**
Diameter	m	**3,6**
Length	m	**60**
Type (protective coating for steel pipe)		
Branched pipe		
Design flow rate	m3/s	**30**
Design flow velocity	m/s	**6**
Diameter	m	**2,8**
Length (2 rows)	m	**20**
Type (protective coating for steel pipe)		
Effect		
Water supply	Mm3/yr	**1460,6**
* Domestic (+Industrial) Water supply	Mm3/yr	**23,4**
* Irrigation water supply	Mm3/yr	**418,6**
* River maintenance flow	Mm3/yr	**1419,1**
Design flow (200 yr)	m3/s	**406**
Extreme flood flow (1000 yr)	m3/s	**530**
Hydropower		
Limited water level of generation	%	**65**
Tail water level	El. m	**1370**
Ground height	El. m	**1372,5**
Head		
* Minimum head	m	**18,9**
* Rated head	m	**28,7**
* Maximum head	m	**34,2**
Facility capacity Pt = 9,8 Yt.Qmax.Ht	kW	**17000**
Annual generation	GWh/yr	**135,6**
Cost		
Total project cost	million US$	**148,9**

Source: KWRC (Korea Water Resources Corporation), 2008: Feasibility Study of Water Resources Development in Nyabarongo River in Rwanda, Final report, MINIRENA (Rwanda) and Korea International Cooperation Agency, Final report, September 2008.

F.3 Estimated Costs of Nyabarongo Multipurpose Project Components

(Unit: US$)

Item	Unit	Quantity	L/C	L/C	Total	Remarks
1. Preparation and land acquisition			**4,667,254**	**48,067,197**	**52,734,451**	
1.1 Access & Construction road	Km	24	0	8,400,000	8,400,000	
1.2 Compensation & Resettlement	L.S	1	0	16,800,000	16,800,000	
1.3 Camp (offices, accommodation)	L.S	1	0	316,799	316,799	*Civil works *0.05*
1.4 Construction facilities	L.S	1	4,667,254	950,398	5,617,652	*Civil works *0.15*
1.5 Road relocation and replacement	Km		0	21,600,000	21,600,000	
(a) National road	Km	43	0	15,300,000	15,300,000	
(b) Village road	Km	21	0	6,300,000	6,300,000	
2. Environmental mitigation costs	**L.S**	**1**	**933,451**	**190,080**	**1,123,530**	*Civil works *0.03*
3. Civil Works			**31,115,029**	**6,335,985**	**37,451,014**	
3.1 Care of River	L.S	1	17,119	3,944	**21,062**	*3 – 2 *0.02*
3.2 River Diversion			855,955	197,183	**1,053,109**	
(a) Excavation	M^3	17,117	218,584	56,520	275,104	
(b) Embankment	M^3	26,811	139,417	42,174	181,591	
(c) Tunnel	M^3	5,818	326,739	59,053	385,792	
(d) Others	L.S	1	171,185	39,437	210,622	*(a+b+c)*0.25*
3.3 Concrete Gravity Dam			12,619,687	2,169,862	**14,796,886**	
(a) Excavation	M^3	41,674	471,750	132,173	604,023	
(b) Concrete	M^3	160,000	9,054,,400	1,529,120	10,583,520	
(c) Con'c carrage facility	M^3	160,000	712,000	93,120	805,120	
(d) Others	L.S	1	2,381,537	415,348	2,796,886	*(a+b)*0.25*

(F.3….. Continued … 2/4)

(Unit: US$)

Item	Unit	Quantity	L/C	L/C	Total	Remarks
3.4 Spillway			443,327	81,231	**524,558**	
(a) Excavation	M^3	8,880	100,522	28,185	128,707	
(b) Concrete	M^3	1,458	225,246	34,515	259,762	
(c) Reinforcement bar	ton	87	77,256	11,146	88,402	
(d) Others	L.S	1	40,302	7,385	47,687	*(a+b+c)*0.1*
3.5 Intake			3,186,620	484,783	**3,671,402**	
(a) Excavation	M^3	1,550	17,546	4,920	22,466	
(b) Concrete	M^3	12,745	1.968,975	301,712	2,270,687	
(c) Reinforcement bar	ton	637	562,775	81,194	643,968	
(d) Others	L.S	1	637,324	96,957	734,280	*(a+b+c)*0.25*
3.6 Penstock			337,631	56,371	**394,002**	
(a) Excavation	M^3	3,028	34,243	9,601	43,844	
(b) Concrete	M^3	1,244	192,186	29,449	221,635	
(c) Reinforcement bar	ton	62	54,931	7,925	62,856	
(d) Others	L.S	1	56,272	9,395	65,667	*(a+b+c)*0.2*
3.7 Power House			3,746,131	609,717	**4,355,848**	
(a) Excavation	M^3	10,020	115,130	24,810	139,939	
(b) Concrete	M^3	12,024	1,850,614	304,989	2,155,603	
(c) Reinforcement bar	ton	601	531,677	76,679	608,357	
(d) Others	L.S	1	1,248,710	203,239	1,451,949	*(a+b+c)*0.5*

(F.3….. Continued … 3/4)

(Unit: US$)

Item	Unit	Quantity	L/C	L/C	Total	Remarks
3.8 Tailrace Outlet			503,780	92,308	**596,088**	
(a) Excavation	m^3	8,880	100,522	28,135	128,707	
(b) Concrete	m^3	1,458	225,246	34,515	259,762	
(c) Reinforcement bar	ton	87	77,256	11,146	88,402	
(d) Others	L.S	1	100,756	18,462	119,218	*(a+b+c)*0.25*
3.9 Irrigation	L.S	1	6,606,864	1,821,507	**8,428,371**	
3.10 Miscellaneous	L.S	1	2,797,945	819,080	**3,617,025**	*Sum(3.1-3.9) *0.1*
4. Hydraulic Equipment			**7,844,297**	**103,190**	**7,947,488**	
4.1 Dam and spillway (including sand gate)			3,085,580	32,880	**3,118,461**	
(a) Sand gate (radial gate)	set	2	1,517,300	13,580	1,530,880	
(b) Flood control & outlet facility, maintenance gate (roller gate)	set	2	1,300,463	11,642	1,312,105	
(c) Outlet hood dibbled conduit pipe	ton	40	93,114	4,788	97,902	
(d) Stop-log	set	1	100,300	1,610	101,910	
(e) Gantry crane	set	1	74,403	1,260	75,663	
4.2 Intake			2,338,686	26,754	**2,365,440**	
(a) Multistage intake gate	set	2	1,082,603	13,608	1,096,211	
(b) Screen (trash rack)	ton	60	632,520	7,560	640,080	
(c) Intake regulating gate (roller gate)	set	1	623,564	5,586	629,150	
4.3 Penstock (steel pipe)			261,652	13,898	**275,549**	
(a) Steel penstock	ton	90	261,652	13,898	275,549	

(F.3….. Continued … 4/4)

(Unit: US$)

Item	Unit	Quantity	L/C	L/C	Total	Remarks
4.4 Power house			348,157	5,845	354,002	
(a) Inlet valve	set	2	117,314	1,680	118,994	
(b) Overhead crane	set	1	147,368	3,115	150,483	
(c) Tailrace gate	set	1	83,475	1,050	84,525	
4.5 Others	L.S	1	1,810,222	23,813	1,834,036	*Sum(3.1-3.9) *0.3*
5. Electro-mechanical Equipment	**L.S**	**1**	**16,676,287**	**0**	**16,676,287**	*Turbine, generator, etc.*
6. Transmission Line	**L.S**	**1**	**4,588,235**	**0**	**4,588,235**	
Direct Costs			**65,824,553**	**54,696,452**	**120,521,005**	
7. Administration and Engineering Service	**L.S**	**1**	**2,410,418**	**10,846,882**	**13,257,300**	*(Direct cost) *0.11*
8. Contingency	**L.S**	**1**	**6,582,500**	**5,469,600**	**12,052,100**	*(Direct cost) *0.10*
9. Interest during construction	**L.S**	**1**	**5,985,400**	**5,681,000**	**11,666,400**	*Sum(1-8)*4*T*
Total Costs			**80,802,872**	**76,693,933**	**157,496,805**	

Source: KWRC (Korea Water Resources Corporation), 2008: Feasibility Study of Water Resources Development in Nyabarongo River in Rwanda, Final report, MINIRENA (Rwanda) and Korea International Cooperation Agency, Final report, September 2008.

F.4 Summary of Investment Costs Estimated by Previous Studies

(Unit: Million US$)

Sector, Component and Activity	Minimum (BAU)	Maximum (Ambitious)
Potable Water Supply and Sanitation	**615,0**	**615,0**
Rehabilitation of non-functional water sources		
Rehabilitation of 16,500 sources, including community awareness	130,0	130,0
Construction of improved water sources		
Construction of 16,500 new boreholes, including community awareness	300,0	300,0
Sanitation and hygiene awareness campaign	110,0	110,0
Institutional strengthening, capacity building and sector management	75,0	75,0
Agriculture, Livestock and Forestry	**1027,3**	**1869,0**
Soil and water conservation	**194,8**	**400,8**
Terracing		
Radical terraces (40,000 ha)	71,2	213,6
Gradual terraces (40,000 ha)	33,6	67,2
Water harvesting	40,0	70,0
Reforestation/ agroforestry (100,000 ha)	50,0	50,0
Intensification of agricultural production	**574,9**	**1109,8**
Improved/ modern inputs	20,0	20,0
Plains irrigation schemes (20,000 ha)	50,0	100,0
Plains irrigation schemes linked to Rusumo falls dam (25,000 ha)	20,0	20,0
Marshlands irrigation schemes (40,000 ha)	200,0	400,0
Livestock development and rural income diversification	284,9	569,8
Policy support - training/ capacity building	**257,6**	**358,4**
Agricultural research	40,0	40,0
Agricultural extension	137,6	238,4
Agricultural market development, proximity services to producers	40,0	40,0
Rural financial systems and agriculture credit development	40,0	40,0

(F.4….. Continued … 2/3)

(Unit: Million US$)

Sector, Component and Activity	Minimum	Maximum
Energy and Hydropower	**186,0**	**888,0**
Kagera River Mainstream Hydroelectric projects	**114,0**	**200,0**
Rusumo Falls dam (61.5 MW)	114,0	114,0
Feasibility study	2,3	2,3
Detailed studies and preparatory actions	2,3	2,3
Works: dam + central	90,0	90,0
Environmental and social management plan	5,7	5,7
Resettlement plan	13,7	13,7
Kakono dam (53 MW)	0,0	86,0
Feasibility study	0,0	1,7
Detailed studies and preparatory actions	0,0	1,7
Works: dam + central	0,0	67,9
Environmental and social management plan	0,0	4,3
Resettlement plan	0,0	10,3
Nyabarongo dam (280 MW)		56,0
Kishanda valley scheme (180 MW)		360,0
Electric grid development		200,0
Small and mini hydropower development	**72,0**	**72**
Fishery and Aquaculture	**52,0**	**52,0**
Aquaculture development program	**50,0**	**50,0**
Aquaculture in natural lakes (1,000 ha)		
Multipurpose dam, fisheries management	**2,0**	**2,0**
Fisheries management on Rusumo falls dam		
Fisheries management on Kakono dam		
River Transport and Navigation	**0,5**	**0,5**
Lower Kagera River navigation		
Feasibility study	0,5	0,5
Pro-Poor Tourism	**1,0**	**94,0**
Pro-Poor Tourism Development Program - Feasibility Study	**1,0**	
Support to cottage industry and Pro-Poor Tourism		94,0

(F.4….. Continued … 3/3)

(Unit: Million US$)

Sector, Component and Activity	Minimum	Maximum
Environmental Resources	**21,5**	**21,5**
Kagera River Basin Environment Management Information System	**5,0**	**5,0**
Protected Areas - Inventory Study	**1,5**	**1,5**
Environmental Beneficial Uses - Valuation Study	**1,5**	**1,5**
Water Resources Development and Environmental Monitoring Program	**12,0**	**12,0**
Harmonization and Environmental Quality Standards	**1,5**	**1,5**
Kagera Basin IWRM – Institution and capacity Building	**17,5**	**17,5**
Kagera River Basin Management Unit		
Study	1,0	1,0
Implementation and capacity building	10,0	10,0
Support to LVBC in Elaborating Water management Rules	1,5	1,5
Kagera River Basin - Decision Support Modeling	1,0	1,0
Kagera Rive Basin Development Program	4,0	4,0
TOTAL	**5096,9**	**3557,5**

Source: BRLi, 2008: Kagera River Basin Monograph: Basin Development Report, BRL Engénierie

G. Hydrological Data Observed from Streamflow Gauging Station

Table G.1: Ruvubu (Burasira)

Year	Flow (Million m3)													Discharge (m3/s)		
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual	Mean	Min	Max
1976	8.98	8.01	8.23	10.48	13.15	8.80	5.37	5.58	6.58	7.35	8.94	8.73	**263**	8.35	4.30	29.23
1977	11.36	10.08	11.21	17.21	14.38	7.11	5.80	6.25	6.97	6.33	17.96	16.34	**344**	10.91	4.20	52.17
1978	11.25	13.38	30.56	30.19	21.77	10.33	8.24	8.33	8.04	9.39	14.46	15.19	**476**	15.10	5.93	70.11
1979	13.83	25.06	14.44	21.33	31.81	13.16	9.55	8.28	7.30	8.24	12.62	13.78	**469**	14.88	6.18	48.90
1980	13.00	13.07	14.15	15.43	14.39	8.01	7.03	6.00	7.43	14.26	19.78	22.07	**406**	12.89	5.38	38.12
1981	14.40	11.04	17.75	18.45	19.74	7.89	6.17	7.16	11.12	9.65	10.48	9.98	**378**	11.99	5.38	37.49
1982	11.54	8.79	11.61	28.08	24.13	9.87	7.19	6.08	7.05	10.12	10.48	9.98	**381**	12.08	5.38	69.47
1983	9.29	9.58	15.27	20.26	17.05	8.39	6.66	7.32	5.83	9.59	13.89	13.06	**358**	11.35	4.74	58.25
1984	12.33	9.53	12.93	15.82	8.76	5.89	5.98	5.47	5.12	8.15	13.27	11.44	**301**	9.55	3.74	34.13
1985	11.09	14.68	13.84	32.45	16.79	9.29	7.58	6.17	8.05	8.17	11.13	16.50	**408**	12.94	5.56	48.90
1986	15.79	51.05	41.57	63.82	55.39	9.94	8.84	7.58	7.10	9.72	21.08	16.06	**803**	25.46	5.68	89.24
1987	14.70	17.89	15.34	20.22	16.68	10.88	8.00	7.10	9.32	11.20	23.73	13.33	**441**	13.98	6.50	64.66
1988	14.57	17.10	22.35	31.92	23.69	11.12	9.35	9.81	9.57	14.89	20.20	17.95	**532**	16.86	7.52	82.15
1989	22.35	23.17	22.89	20.84	23.66	15.55	11.59	11.13	10.12	11.60	13.83	15.58	**531**	16.83	8.47	52.91
1990	12.35	17.23	28.59	20.73	17.86	9.73	8.20	7.43	10.31	12.10	14.10	21.84	**474**	15.04	3.49	48.54
1991	13.62	12.32	12.74	25.18	23.09	18.32	9.42	7.14	6.94	11.89	15.67	14.00	**447**	14.18	5.68	58.64
1992	13.23	15.50	13.93	18.20	20.04	9.06	7.22	5.59	5.49	8.98	12.21	14.00	**376**	11.93	4.52	48.54

1993	14.79	13.06	12.06	16.65	14.67	6.96	6.15	5.90	4.24	8.76	15.67	14.00	**349**	11.06	3.49	31.49
1994	11.28	12.68	13.43	11.85	11.56	6.28	5.01	4.05	7.38	15.00	22.06	21.79	**374**	11.85	3.49	33.53
1995	22.15	20.65	22.35	26.08	25.61	17.79	13.58	11.21	10.69	21.00	16.34	19.02	**595**	18.87	5.68	26.08
1996	29.27	29.82	25.83	25.88	17.82	17.46	19.95	12.77	17.06	19.05	19.84	19.98	**668**	21.17	7.25	29.82
1997	20.36	12.18	9.91	13.26	7.73	5.63	4.99	4.39	5.78	8.26	9.05	11.51	**297**	9.41	3.79	27.06
Average/Total													**440**	**13.94**		

Table G.2: Buyongwe (Kirimba)

Year	Flow (Million m3)													Discharge (m3/s)		
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual	Mean	Min	Max
1998	2.01	3.39	3.58	2.97	2.53	1.93	1.79	1.72	1.86	3.78	2.12	1.82	**77.4**	2.45	3.32	0.00
1999																
2000	1.38	1.55	1.93	1.72	2.09	1.08	1.03	0.97	1.03	1.79	1.75	2.09	**48.4**	1.54	0.00	0.00
2001	1.55	1.86	3.44	2.20	2.09	1.14	1.58	1.08	2.32	3.01	2.70	2.24	**66.3**	2.10	1.76	1.00
2002	3.10	3.44	2.74	3.99	3.20	2.40	2.01	1.58	1.51	2.70	1.38	3.15	**81.9**	2.60	3.17	1.03
2003	2.45	0.89	3.24	3.94	2.32	1.03	0.97	1.65	0.87	1.72	2.01	1.61	**59.9**	1.90	0.00	0.00
2004	2.53	4.04	4.53	4.10	2.70	1.93	1.72	1.38	3.34	3.20	1.82	1.58	**86.0**	2.73	0.00	0.00
2005	1.86	1.55	1.93	4.47	2.49	1.51	1.08	0.82	1.86	1.82	2.36	0.92	**59.5**	1.89	1.77	0.38
2005	0.84	1.48	3.68	3.68	2.16	1.65	1.51	1.82	1.79	2.70	3.15	2.70	**71.5**	2.27	1.50	0.55
2007	2.88	1.86	1.90	2.24	3.06	1.17	1.58	1.20	1.45	2.45	1.86	1.65	**61.3**	1.94	0.00	0.00
Average/Total													**68.0**	**2.16**		

Table G.3: Ruvyironza (Kibya)

Year	Flow (Million m3)													Discharge (m3/s)		
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual	Mean	Min	Max
1975	17.5	13.4	22.1	25.3	18.0	14.6	11.2	10.4	8.6	12.9	10.7	12.5	**466**	14.8	5.9	17.4
1976	22.1	12.1	21.3	19.0	30.1	21.6	12.6	10.5	9.4	9.1	9.1	29.6	**545**	17.3	6.6	20.9
1977	28.1	30.6	28.4	38.5	63.5	24.7	17.5	14.0	17.9	13.0	6.7	32.2	**829**	26.3	6.7	24.9
1978	22.1	15.0	30.4	53.8	43.5	22.1	17.8	14.6	12.5	11.4	19.5	22.1	**750**	23.8	10.7	22.4
1979	26.5	41.6	36.4	33.2	74.5	32.2	22.7	17.8	14.4	12.1	15.3	16.8	**901**	28.6	11.7	26.8
1980	33.4	26.5	32.2	21.3	17.5	18.9	13.6	11.0	9.7	13.2	11.7	15.1	**588**	18.6	8.7	24.6
1981	21.9	25.3	20.8	33.6	25.0	27.2	14.0	12.3	17.8	14.6	13.8	11.2	**621**	19.7	9.7	24.3
1982	30.8	25.6	27.8	25.9	52.8	26.8	18.5	14.4	11.9	11.4	22.1	51.2	**841**	26.7	10.3	24.4
1983	31.5	23.6	23.3	32.0	36.9	20.5	15.9	13.6	11.0	10.3	14.9	19.0	**663**	21.0	9.7	24.8
1984	20.3	25.9	32.5	24.7	28.8	15.7	12.8	12.8	13.6	10.5	9.4	25.0	**609**	19.3	8.2	29.7
1985	17.1	29.1	45.6	60.8	60.2	27.5	19.5	15.3	13.0	14.6	14.0	30.1	**911**	28.9	11.7	18.5
1986	21.9	25.6	31.8	30.1	62.9	32.2	20.5	16.6	13.1	14.4	24.1	37.3	**870**	27.6	12.5	32.1
1987	19.8	56.1	31.8	24.7	34.1	22.7	15.7	13.3	11.4	27.2	14.0	20.5	**759**	24.1	10.7	38.7
1988	13.2	38.9	21.3	44.8	83.4	22.7	17.1	14.9	14.0	13.8	17.8	16.2	**833**	26.4	11.4	24.8
1989	30.1	40.1	26.5	72.1	61.8	30.4	22.7	17.5	18.5	14.9	24.4	30.1	**1019**	32.3	13.6	37.0
1990	29.8	17.3	45.6	38.1	39.3	23.3	18.0	14.9	15.5	14.4	14.4	15.7	**755**	23.9	10.3	23.5
1991	13.6	23.0	32.5	23.3	33.2	48.8	17.1	14.4	11.0	12.6	15.9	19.3	**695**	22.0	10.3	21.3
1992	19.8	19.0	39.3	32.5	47.9	22.4	17.1	13.2	11.0	10.3	15.7	26.5	**724**	23.0	10.3	23.2
1993	20.3	19.0	33.6	39.3	22.7	21.6	14.4	11.7	10.3	8.2	12.6	20.0	**614**	19.5	5.2	22.1
1994	11.2	10.0	22.7	32.5	36.2	17.5	12.1	8.7	7.9	8.6	13.0	24.1	**539**	17.1	6.3	17.6

1995	21.3	25.3	35.1	27.8	53.1	23.3	15.3	11.7	9.0	8.2	25.6	38.1	**773**	24.5	7.6	19.4
1996	26.5	31.1	37.7	48.8	35.1	23.8	14.4	10.7	7.3	7.9	11.0	20.0	**719**	22.8	7.3	32.0
1997	23.6	35.4	19.5	26.2	49.3	26.2	15.3	10.7	7.3	8.4	18.5	58.1	**784**	24.8	7.1	35.1
1998	36.2	45.2	43.5	44.3	53.6	42.2	23.8	19.0	0.0	0.0	0.0	0.0	**805**	25.5	0.0	40.7
1999																
2000	27.5	43.5	18.3	23.6	14.2	10.8	8.7	7.5	6.4	6.1	10.2	29.4	**536**	17.0	6.1	21.4
2001	36.2	29.8	29.8	40.9	23.0	17.5	12.5	12.5	9.4	16.4	21.9	12.8	**688**	21.8	8.2	42.6
2002	3.5	32.2	18.0	21.6	75.1	30.4	19.0	11.2	9.4	6.1	10.5	18.8	**670**	21.3	3.5	36.1
2003	41.3	19.8	24.4	25.9	24.1	19.0	14.4	8.4	5.8	5.0	11.9	20.5	**581**	18.4	3.1	36.8
2004	13.6	14.2	21.3	23.8	42.6	14.2	10.7	8.4	13.4	13.4	18.5	21.9	**569**	18.1	6.4	17.5
2005	19.0	33.6	21.3	16.8	12.3	20.0	9.0	7.6	7.5	7.3	8.4	11.5	**454**	14.4	6.1	22.3
Average/Total													**704**	**22.3**		

Table G.4: Ruvubu (Gitega)

Year	Flow (Million m3)													Discharge (m3/s)		
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual	Mean	Min	Max
1973	79.2	85.2	94.1	110.9	85.3	51.7	58.0	33.1	42.8	43.1	57.0	61.5	**2103**	66.7		
1974	62.6	61.1	79.7	119.8	100.5	65.4	50.8	40.9	44.2	39.0	55.0	50.3	**2020**	64.1	33.2	143.8
1975	54.6	61.2	70.7	69.8	49.1	34.6	31.8	26.6	36.9	51.0	49.9	67.5	**1585**	50.3	23.0	93.3
1976	54.6	61.2	64.7	79.4	69.5	43.7	33.0	32.8	39.3	36.3	57.4	60.4	**1659**	52.6	27.3	113.9
1977	78.6	79.0	87.5	132.5	98.5	56.5	44.2	41.8	42.1	42.0	87.9	73.5	**2266**	71.9	29.2	179.2
1978	61.9	81.6	141.0	138.9	83.3	59.4	49.5	40.9	45.5	48.2	79.9	84.1	**2399**	76.1	34.0	192.1
1979	86.9	121.4	97.7	153.1	126.3	75.8	56.4	46.6	37.6	49.5	61.1	67.4	**2565**	81.3	33.2	232.9
1980	69.3	66.0	67.6	72.0	68.1	38.1	29.4	24.2	30.4	43.1	69.3	76.5	**1717**	54.4	20.7	115.4
1981	72.2	67.3	87.3	98.1	83.5	46.1	36.9	42.4	45.1	40.7	43.1	62.1	**1903**	60.4	31.2	128.9
1982	66.9	64.4	93.9	121.3	109.2	55.7	42.6	34.5	33.6	55.0	109.6	91.0	**2306**	73.1	28.4	207.5
1983	63.4	71.0	80.3	108.5	71.0	45.6	37.2	37.8	32.0	54.0	67.1	70.5	**1937**	61.4	26.1	178.6
1984	88.9	78.9	72.8	77.1	48.3	34.8	34.0	30.6	29.7	39.7	72.1	62.5	**1753**	55.6	19.2	101.4
1985	68.8	91.4	110.1	173.1	89.8	56.3	43.3	37.8	46.1	50.2	73.4	75.0	**2398**	76.1	32.8	273.1
1986	90.0	93.5	91.5	165.6	117.0	67.7	51.8	41.4	42.4	64.8	95.7	93.4	**2662**	84.4	36.4	198.3
1987	102.9	101.3	89.9	108.4	89.7	55.0	42.9	37.0	50.8	54.5	100.2	66.4	**2355**	74.7	32.4	160.1
1988	88.7	92.4	112.2	178.7	94.2	63.2	51.1	52.4	55.0	73.7	80.1	95.8	**2723**	86.3	41.2	245.6
1989	111.3	112.5	167.6	151.0	126.8	51.7	40.0	36.1	38.6	49.9	72.4	75.3	**2711**	86.0	20.7	261.7
1990	79.2	140.0	145.0	110.9	85.3	46.1	36.9	40.9	52.5	53.4	65.8	77.6	**2441**	77.4	31.2	177.0
1991	55.5	77.8	71.3	110.3	115.4	69.8	48.3	39.7	38.9	63.7	76.9	77.3	**2218**	70.3	32.3	165.5
1992	77.2	98.4	82.6	108.8	78.3	53.8	41.7	33.9	32.6	52.9	66.7	77.8	**2107**	66.8	28.4	156.9

1993	79.1	93.4	86.0	89.0	71.5	47.3	36.3	26.5	21.7	47.4	49.7	49.3	**1826**	57.9	19.9	124.4
1994	58.2	74.6	83.0	72.0	56.2	35.6	22.4	18.6	24.2	50.6	75.8	84.6	**1719**	54.5	18.4	168.8
1995	83.7	86.1	86.3	112.4	96.7	56.6	37.2	30.7	36.6	68.4	55.3	57.7	**2119**	67.2	27.6	151.6
1996	84.5	94.0	113.9	96.4	57.0	39.2	35.5	45.7	38.7	38.6	50.5	37.1	**1914**	60.7	27.0	137.0
1997																
1998	158.0	182.5	157.5	146.0	128.7	84.7	70.9	57.1	60.9	69.6	64.0	62.8	**3251**	103.1	52.0	231.7
1999	70.1	78.3	118.4	95.5	51.8	39.6	31.7	42.7	38.8	38.4	81.8	84.5	**2024**	64.2	24.9	143.8
2000	67.7	73.3	90.3	87.9	37.8	24.6	19.3	17.2	18.0	38.3	86.1	105.9	**1747**	55.4	16.9	143.8
2001	100.7	87.0	93.5	89.6	80.2	58.5	40.0	36.5	64.6	67.8	93.6	79.9	**2340**	74.2	28.8	161.2
2002	116.9	93.9	102.3	146.8	100.4	64.7	51.2	35.3	38.6	53.7	92.9	110.4	**2643**	83.8	30.8	192.1
2003	78.5	74.6	90.6	100.0	92.2	55.3	43.2	39.6	44.6	60.3	65.6	63.1	**2121**	67.2	34.0	144.8
2004	74.2	79.2	104.9	125.9	66.9	47.4	39.7	39.2	45.0	53.0	74.7	104.2	**2243**	71.1	28.4	172.6
2005	94.1	73.6	73.2	79.9	68.5	42.2	34.3	40.9	33.7	45.7	56.5	49.4	**1816**	57.6	2.6	131.4
2006	60.3	77.8	99.5	118.5	133.5	56.0	47.0	38.5	33.7	49.9	130.9	118.7	**2533**	80.3	26.1	242.6
2007	146.0	118.6	92.2	125.9	88.4	69.4	57.9	56.3	52.6	70.7	85.3	68.3	**2704**	85.7	23.0	158.0
Average/Total													**2201**	**69.8**		

Table G.5: Ruvubu (Myinga)

Year	Flow (Million m3)													Discharge (m3/s)		
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual	Mean	Min	Max
1975	63.0	66.6	82.0	100.0	67.7	45.8	39.4	34.1	40.1	61.1	52.7	73.2	**1906**	60.4	29.6	100.0
1976	79.6	69.9	81.9	91.9	91.9	68.7	43.4	38.0	41.3	48.4	53.8	66.3	**2036**	64.6	33.5	91.9
1977	96.8	107.1	105.5	157.6	197.0	99.3	65.1	53.7	54.9	46.5	90.9	109.6	**3109**	98.6	38.0	197.0
1978	95.8	88.2	164.5	198.3	169.8	95.2	70.4	61.6	56.5	60.3	88.5	136.0	**3382**	107.2	46.2	198.3
1979	108.1	173.6	159.1	179.7	214.3	133.1	89.7	71.7	58.3	58.8	85.0	87.3	**3715**	117.8	48.7	214.3
1980	90.8	82.3	102.6	95.2	97.5	62.6	46.8	39.1	42.4	49.5	82.0	95.2	**2327**	73.8	33.6	102.6
1981	96.3	82.7	105.0	135.5	130.8	76.3	53.1	50.1	59.7	54.8	56.6	73.8	**2561**	81.2	41.8	135.5
1982	89.7	85.3	89.8	148.0	183.3	96.1	64.2	51.4	46.7	60.1	94.5	167.3	**3096**	98.2	42.0	183.3
1983	105.6	104.1	112.5	119.8	146.4	76.9	56.6	56.9	50.1	67.8	79.8	89.7	**2800**	88.8	44.1	146.4
1984	118.5	127.0	103.6	111.3	82.1	52.5	48.6	42.0	41.0	67.8	79.8	93.7	**2535**	80.4	32.2	127.0
1985	71.5	122.7	129.5	217.4	167.6	91.9	68.6	54.3	66.0	65.5	84.7	93.0	**3230**	102.4	46.9	217.4
1986	123.5	129.5	126.7	143.8	214.7	118.3	68.6	66.1	56.8	68.9	123.5	144.8	**3639**	115.4	52.7	214.7
1987	151.4	166.4	154.9	147.3	143.9	99.1	67.7	56.6	55.2	61.7	119.5	110.4	**3494**	110.8	28.5	166.4
1988	73.8	89.8	89.4	141.4	178.5	64.6	42.5	37.8	71.1	91.2	111.4	105.5	**2881**	91.4	31.9	178.5
1989	166.2	182.1	191.8	239.4	196.1	148.0	101.1	80.7	48.5	43.9	54.3	79.3	**4012**	127.2	32.8	239.4
1990	65.3	90.8	144.1													
Average/Total													**2981**	**94.5**		

Table G.6: Kayave (Mparamirund)

Year	Flow (Million m3)													Discharge (m3/s)		
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual	Mean	Min	Max
1987	2.14	2.12	2.36	2.62	2.58	1.83	1.38	1.27	1.57	1.46	3.31	2.22	**65.2**	2.07	1.22	8.36
1988	2.29	3.08	3.66	5.65	3.55	1.93	1.62	1.68	1.57	2.01	2.20	2.06	**82.0**	2.60	1.46	17.19
1989	2.36	3.58	3.86	3.35	3.01	2.40	1.77	1.67	1.62	1.94	2.02	1.96	**77.4**	2.45	1.51	15.87
1990	1.72	2.03	3.50	3.53	2.68	1.82	1.49	1.40	1.75	1.71	2.09	2.40	**68.7**	2.18	1.37	11.79
1991	2.42	2.15	2.28	6.35	4.65	2.55	1.85	1.58	1.58	2.70	2.00	2.18	**84.9**	2.69	0.97	32.20
1992	1.93	2.79	2.54	3.91	4.76	1.87	1.56	1.43	1.63	2.65	3.49	2.15	**80.6**	2.56	1.37	18.86
1993	2.64	2.24	1.86	2.16	2.38	1.56	1.39	1.38	1.29	1.30	2.06	1.78	**57.8**	1.83	1.26	15.48
1994	2.20	2.42	1.92	2.22	1.92	1.37	1.23	1.24	1.23	3.71	4.24	3.57	**71.7**	2.27	1.22	44.47
1995	1.92	2.59	5.66	2.90	2.66	2.37	1.31	1.20	1.40	4.80	3.89	1.63	**85.0**	2.70	1.19	5.66
1996	2.87	6.23	7.14	6.10	2.06	1.58	1.43	1.34	2.09	2.64	3.19	3.98	**106.1**	3.37	1.26	7.14
1997	3.01	3.49	3.71	10.59	2.05	12.15	5.05	5.18	5.36	7.51	10.75	18.54	**229.8**	7.29	1.73	63.45
1998	29.50	26.82	15.49	10.13	8.97	5.95	5.58	5.58	6.93	6.91	6.83	6.32	**352.1**	11.17	5.44	72.51
1999	7.60	8.17	22.89	11.60	7.55	5.62	5.36	5.59	6.11	6.00	9.53	11.32	**282.5**	8.96	4.89	75.08
2000	7.09	6.53	11.12	9.24	7.27	6.30	5.88	5.88	6.48	6.88	13.34	12.00	**257.8**	8.17	1.82	60.82
2001	6.28	2.41	6.88	5.61	7.76	2.04	2.34	2.63	5.36	2.92	4.61	4.46	**140.6**	4.46	1.37	35.87
2002	11.32	1.83	4.97	11.30	5.99	1.07	1.00	1.01	1.00	1.82	12.08	3.56	**149.9**	4.75	0.97	68.86
2003	2.93	2.09	4.06	6.78	10.62	3.61	1.96	1.47	1.48	4.16	7.75	11.11	**153.2**	4.86	1.10	71.94
2004	9.10	5.41	8.75	17.91	2.17	1.49	1.07	1.05	1.01	1.57	2.61	4.70	**148.9**	4.72	0.97	86.16
2005	7.97	3.72	9.43	4.77	5.69	2.58	1.05	1.04	1.04	1.06	5.86	1.75	**120.9**	3.83	1.04	50.89
2006	3.83	5.48	7.98	13.19	18.54	2.27	2.18	3.53	1.76	2.09	2.93	2.14	**173.4**	5.50	1.04	65.59
Average/Total													**139.4**	**4.42**		

Table G.7: Kanyaru (Butare/Nigozi)

Year	Flow (Million m3)													Discharge (m3/s)		
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual	Mean	Min	Max
1971	17.6	13.3	15.4	64.1	44.5	12.0	9.5	10.2	8.6	12.5	12.3	13.9	**615**	19.5	5.6	227.0
1972	14.4	19.3	23.6	17.3	18.6	17.2	10.5	10.3	9.5	12.9	22.1	14.6	**498**	15.8	7.6	107.2
1973	19.3	16.5	13.2	24.2	35.5	15.4	12.2	9.8	17.8	15.3	24.4	15.5	**575**	18.2	8.6	186.8
1974	16.0	13.5	18.7	23.9	30.2	15.0	13.3	9.4	12.4	9.8	13.4	11.2	**491**	15.6	7.6	67.6
1975	14.2	13.6	12.7	29.4	12.1	9.0	7.9	6.6	10.8	12.9	9.5	19.6	**416**	13.2	6.2	141.3
1976	12.2	10.2	14.5	21.3	18.1	11.1	8.2	9.9	10.2	9.9	9.9	9.9	**382**	12.1	6.6	65.0
1977	16.4	15.1	16.8	22.4	21.9	10.3	8.0	9.1	10.7	8.3	21.9	17.5	**468**	14.9	5.8	76.9
1978	15.0	14.4	29.3	26.5	28.5	15.2	12.4	12.7	12.9	13.6	15.8	22.4	**576**	18.3	7.6	122.2
1979	15.7	31.1	25.6	34.5	48.5	25.4	19.9	16.1	15.8	17.8	24.4	22.6	**780**	24.7	8.8	180.1
1980	20.4	23.5	20.6	25.3	23.9	20.2	14.5	12.8	15.2	17.8	23.7	24.1	**635**	20.1	11.4	89.1
1981	19.3	19.8	20.0	33.0	38.2	16.8	13.0	16.7	14.9	15.4	17.8	18.4	**639**	20.3	10.9	223.1
1982	18.4	16.1	15.0	35.8	23.4	15.8	12.6	10.5	12.0	14.3	25.2	23.3	**584**	18.5	8.8	132.9
1983	11.3	14.4	16.3	36.6	22.0	11.9	10.5	10.5	11.4	16.0	15.2	16.0	**505**	16.0	9.0	183.4
1984	18.3	12.6	16.0	19.4	11.7	9.5	9.5	9.1	8.3	10.6	14.9	13.2	**403**	12.8	7.0	62.4
1985	18.1	16.2	13.7	43.7	28.7	15.3	11.1	9.5	9.7	12.2	16.7	16.8	**555**	17.6	8.6	148.6
1986	18.1	16.2	13.7	43.7	28.7	15.3	11.1	9.5	9.7	12.2	16.7	16.8	**555**	17.6	8.6	148.6
1987	18.6	16.6	21.2	18.8	37.6	13.7	10.1	9.5	13.6	14.4	32.2	16.8	**586**	18.6	8.6	163.8
1988	21.0	21.8	31.5	51.0	26.8	15.4	13.7	17.2	16.2	17.6	25.0	15.6	**715**	22.7	11.1	433.0
1989	22.0	27.9	26.5	21.5	24.7	17.4	14.4	11.7	14.2	15.2	16.4	19.2	**606**	19.2	10.9	97.9
1990	12.5	24.7	24.9	27.8	27.6	12.1	10.6	9.6	11.9	11.7	16.2	17.5	**542**	17.2	8.8	200.8
Average/Total													**556**	**17.6**		

Table G.8: Nyabarongo (Kigali)

Year	Flow (Million m3)													Discharge (m3/s)		
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual	Mean	Min	Max
1961	57.5	84.3	78.6	97.8	99.3	59.0	51.3	50.5	57.0	66.6	138.2	189.3	**2705**	85.8	43.7	240.0
1962	57.4	84.4	78.5	97.0	99.3	100.7	73.6	68.2	80.8	79.4	164.4	156.4	**2993**	94.9	51.6	234.3
1963	166.3	162.4	132.4	194.0	224.4	193.5	105.0	74.9	75.7	59.2	61.8	151.0	**4200**	133.2	51.6	275.5
1964	120.3	93.6	107.2	163.0	184.1	81.6	63.6	71.3	70.5	77.7	86.3	86.9	**3171**	100.6	55.2	276.3
1965	96.0	102.6	105.3	146.0	141.2	73.3	58.7	55.9	70.9	69.2	82.2	94.9	**2877**	91.2	52.4	207.2
1966	75.5	101.9	139.6	138.7	129.4	77.5	64.2	64.0	85.3	71.3	108.9	75.9	**2971**	94.2	33.0	180.0
1967	64.5	68.2	73.1	95.2	137.8	97.1	64.2	67.2	67.3	67.2	73.5	75.9	**2501**	79.3	57.2	198.4
1968	64.6	99.6	109.1	167.4	113.4	123.4	78.4	70.7	67.6	70.5	73.5	75.9	**2921**	92.6	63.1	258.2
1969	64.6	76.3	70.0	84.9	113.4	123.4	78.4	70.7	67.6	70.5	73.5	75.9	**2546**	80.7	54.9	188.3
1970	84.4	91.9	130.0	143.4	100.7	78.7	78.4	70.7	65.7	69.8	73.5	75.9	**2793**	88.5	58.4	198.4
1971	78.3	78.2	70.7	129.2	124.8	55.9	45.5	49.5	51.0	54.2	70.3	61.5	**2281**	72.3	41.5	198.4
1972	69.8	87.5	87.5	100.3	104.2	83.5	56.7	50.4	49.5	55.6	92.5	67.8	**2374**	75.3	45.9	162.0
1973	69.0	63.1	60.1	114.3	161.0	69.1	52.0	48.5	74.4	67.7	101.8	69.6	**2499**	79.2	45.0	199.8
1974	68.2	58.4	74.8	144.5	125.7	89.4	101.5	56.3	69.3	53.8	72.5	63.9	**2572**	81.6	50.3	198.4
1975	65.9	62.0	65.9	121.0	93.9	65.1	54.5	49.7	59.0	91.2	67.1	88.0	**2323**	73.6	47.1	188.3
1976	63.4	70.6	71.4	96.2	106.7	66.7	53.6	56.7	57.1	63.4	62.8	58.8	**2173**	68.9	48.5	186.2
1977	71.6	75.2	69.1	117.2	110.2	65.3	53.6	52.2	55.2	57.7	143.2	136.4	**2645**	83.9	47.1	275.5
1978	79.8	80.7	151.6	135.1	151.2	77.2	61.6	60.7	58.0	56.5	118.3	91.1	**2950**	93.5	48.5	231.1
1979	80.0	109.2	78.0	110.4	170.1	89.2	62.4	61.4	54.5	55.3	72.4	73.9	**2667**	84.6	50.0	291.5
1980	63.0	75.7	70.0	99.8	128.7	88.8	53.7	49.8	59.3	72.0	106.9	88.7	**2511**	79.6	47.3	200.6

1981	69.4	65.0	87.0	159.9	130.7	73.4	63.6	64.6	70.1	69.2	70.1	66.6	**2602**	82.5	50.8	256.5
1982	76.4	67.7	61.6	121.3	137.7	94.4	60.7	55.2	62.7	70.5	94.4	126.9	**2707**	85.8	48.0	211.0
1983	65.8	75.9	72.9	124.5	108.1	66.3	62.0	59.9	61.6	90.8	101.9	84.0	**2558**	81.1	53.5	249.8
1984	74.7	74.7	86.7	124.5	108.1	57.7	58.1	54.1	55.9	71.8	78.2	75.2	**2416**	76.6	47.8	249.8
1985	61.0	73.7	70.5	168.4	118.1	65.7	56.4	52.1	64.5	70.1	87.0	72.9	**2520**	79.9	49.8	281.7
1986	82.6	84.1	103.9	172.5	142.5	85.7	65.8	59.4	59.3	68.7	91.0	87.0	**2896**	91.8	56.0	246.5
1987	85.2	98.2	98.2	99.1	157.1	105.1	66.8	63.1	67.9	82.2	139.1	82.9	**3005**	95.3	58.7	268.5
1988	74.8	88.0	110.0	170.3	172.5	77.9	70.9	82.5	87.5	108.5	110.3	82.4	**3249**	103.0	66.1	266.8
1989	90.6	99.1	122.8	122.4	142.3	85.7	67.5	62.6	69.2	71.1	81.6	97.6	**2923**	92.7	57.2	213.2
1990	105.0	136.4	145.2	204.5	135.9	88.6	78.7	75.1	82.9	84.3	100.0	110.6	**3532**	112.0	72.4	315.6
1991	105.0	136.4	145.2	186.4	171.9	103.7	75.5	64.6	69.9	91.3	88.1	77.8	**3450**	109.4	82.9	315.6
1992	76.0	96.9	98.0	116.8	92.3	85.4	76.3	71.2	95.4	85.4	89.7	88.2	**2812**	89.2	60.6	186.2
1993	108.2	83.1	95.1	142.9	197.3	88.8	79.1	65.6	66.6	75.1	131.7	156.7	**3397**	107.7	60.5	261.6
1994	207.5	193.1	122.4	239.1	182.9	119.0	91.2	78.1	81.3	127.4	115.1	85.3	**4301**	136.4	71.0	353.4
1995	115.6	82.6	108.1	129.5	117.0	78.9	67.8	81.6	119.1	84.4	90.9	106.0	**3107**	98.5	63.7	201.3
1996	87.1	83.5	116.4	117.3	91.1	83.5	80.5	78.4	75.4	93.4	121.8	96.0	**2956**	93.7	33.0	177.7
Average/Total													**2864**	**90.8**		

Table G.9: Nyabarongo (Kanzenzi)

Year	Flow (Million m3)													Discharge (m3/s)		
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual	Mean	Min	Max
1972	94.2	109.8	142.6	148.1	160.5	138.0	91.5	65.3	70.5	82.3	114.6	107.6	**3479**	110.3	61.7	184.2
1973	100.8	95.9	93.5	142.6	221.1	172.4	87.7	70.3	95.8	104.7	141.8	115.2	**3790**	120.2	62.3	234.7
1974	97.1	89.4	92.6	199.6	199.1	166.6	151.1	80.1	87.1	73.0	96.7	94.1	**3750**	118.9	68.0	225.7
1975	91.7	85.7	91.3	142.9	140.4	98.8	71.8	64.4	77.2	109.6	93.9	114.6	**3109**	98.6	60.6	201.0
1976	93.4	93.2	88.1	120.3	125.8	110.6	69.3	69.0	74.8	75.5	76.3	75.3	**2813**	89.2	61.1	170.5
1977	90.7	106.5	98.2	151.2	173.1	110.0	70.1	65.9	75.5	72.4	131.5	141.5	**3378**	107.1	59.1	202.0
1978	120.6	97.0	177.7	192.4	222.3	81.2	73.0	83.4	89.5	110.1	100.2	153.0	**3953**	125.4	68.0	271.3
1979	127.8	156.2	247.1	172.6	93.7	80.3	72.0	73.9	105.2	100.1	86.9	100.2	**3714**	117.8	62.9	411.3
1980	96.3	120.5	178.6	144.3	73.9	63.7	73.6	91.3	98.5	128.8	99.8	86.4	**3297**	104.5	61.4	204.9
1981	104.2	189.6	186.9	119.4	79.4	80.9	90.6	84.6	95.8	89.0	91.1	87.6	**3397**	107.7	61.4	271.3
1982	73.1	131.5	195.4	156.5	80.6	53.0	43.7	101.1	121.1	187.0	220.8	159.0	**3997**	126.7	29.7	380.7
1983	165.0	271.1	382.8	191.3	125.5	131.4	130.2	195.6	249.9	199.8	127.2	125.6	**6017**	190.8	111.1	428.2
1984	199.1	185.8	200.7	251.4	193.1	119.9	117.1	97.5	95.4	129.7	171.6	199.9	**5149**	163.3	47.4	329.1
1985	133.4	176.0	154.1	358.6	395.5	159.9	81.4	44.3	57.4	78.0	160.6	162.9	**5146**	163.2	43.6	626.6
1986	197.4	184.4	184.0	224.0	233.9	219.1	77.5	64.3	61.6	73.4	107.3	105.7	**4539**	143.9	58.0	243.2
1987	103.7	126.7	141.0	146.2	153.9	140.0	81.7	69.7	73.7	100.7	176.9	161.4	**3873**	122.8	64.2	243.2
1988	106.9	132.5	154.0	222.4	260.2	120.4	94.2	102.8	109.3	154.8	151.0	127.0	**4562**	144.7	80.7	318.2
1989	133.4	176.0	154.1	358.6	395.5	159.9	81.4	44.3	57.4	78.0	160.6	162.9	**5146**	163.2	43.6	626.6
1990	197.4	184.4	184.0	224.0	233.9	219.9	77.5	64.3	61.6	73.4	107.3	105.7	**4541**	144.0	58.0	258.7
Average/Total													**4087**	**129.6**		

Table G.10: Kagera (Rusumo Falls)

Year	Flow (Million m3)													Discharge (m3/s)		
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual	Mean	Min	Max
1956	138.5	169.8	163.3	165.7	256.5	195.1	142.8	108.2	88.8	92.6	101.2	123.9	**4586**	145.4	76.0	285.7
1957	137.6	158.0	175.2	228.4	304.0	280.9	232.3	188.2	130.9	113.1	112.3	124.8	**5749**	182.3	76.9	339.4
1958	184.4	185.9	179.0	185.1	216.8	165.1	140.6	113.9	98.2	92.0	72.4	117.0	**4595**	145.7	63.2	239.3
1959	148.6	153.2	156.9	159.8	197.6	161.7	127.9	103.1	91.5	93.0	120.0	158.7	**4393**	139.3	77.9	208.1
1960	148.6	152.9	157.9	160.1	198.3	159.5	126.9	102.3	91.6	93.2	120.8	160.2	**4394**	139.3	77.9	208.1
1961	190.6	199.6	207.0	293.5	296.9	209.7	164.4	121.9	103.4	99.1	119.6	108.7	**5549**	175.9	83.9	438.7
1962	189.3	199.6	207.0	293.5	296.9	209.7	164.4	121.9	103.4	99.1	119.6	108.7	**5545**	175.8	83.9	438.7
1963	308.2	319.4	326.4	341.4	418.9	418.5	440.2	352.9	242.5	190.1	128.5	197.5	**9688**	307.2	100.1	605.2
1964	312.9	319.1	327.0	344.2	415.2	249.8	461.4	348.5	240.1	188.6	184.6	197.5	**9442**	299.4	170.0	622.0
1965	198.2	219.6	295.3	363.0	316.3	249.8	173.5	137.9	135.0	147.3	167.8	187.9	**6805**	215.8	119.3	391.0
1966	198.2	219.6	295.3	363.0	316.3	249.8	173.5	137.9	135.0	147.3	167.8	187.9	**6805**	215.8	119.3	391.0
1967	196.4	174.4	186.1	182.5	221.1	226.9	198.4	141.3	140.1	140.6	202.3	254.6	**5955**	188.8	119.3	285.7
1968	408.9	411.7	408.6	469.3	221.1	226.9	340.5	273.0	211.8	168.8	204.2	159.6	**9183**	291.2	140.5	480.9
1969	248.9	342.6	361.5	379.6	350.7	350.3	260.0	196.0	362.0	139.2	134.6	156.7	**8596**	272.6	121.8	403.9
1970	196.0	219.9	241.3	438.8	444.7	350.3	260.0	196.0	168.8	136.1	134.6	156.7	**7732**	245.2	121.8	547.2
1971	189.7	205.1	169.0	207.5	295.6	266.7	261.2	196.0	168.8	136.1	172.1	179.6	**6432**	203.9	123.1	327.7
1972	210.9	230.3	315.6	271.7	275.3	265.4	225.6	185.3	164.3	168.5	199.1	228.6	**7203**	228.4	144.7	348.9
1973	240.9	243.2	224.0	228.8	296.2	314.3	276.1	212.3	181.6	189.2	216.0	228.1	**7491**	237.5	173.1	327.7
1974	231.6	222.1	208.6	276.2	328.9	294.2	265.6	229.6	207.6	176.0	172.7	179.4	**7340**	232.7	159.3	337.0
1975	177.5	173.5	195.2	210.6	199.6	178.1	162.2	141.2	139.5	167.8	166.0	191.0	**5526**	175.2	128.3	241.2

1976	204.2	190.8	207.7	216.8	224.3	209.3	169.0	146.3	142.2	144.5	149.2	168.9	**5709**	181.0	127.0	254.9
1977	200.9	225.6	231.4	282.2	430.2	296.3	225.7	183.1	170.3	151.6	191.8	234.8	**7424**	235.4	137.8	498.5
1978	229.1	222.9	291.1	441.9	470.1	376.9	283.1	227.1	176.3	179.0	195.2	255.3	**8807**	279.3	160.8	525.6
1979	248.8	294.5	326.9	361.4	493.1	441.8	338.4	248.1	196.6	170.3	209.3	215.2	**9313**	295.3	156.3	544.1
1980	234.6	218.9	224.5	275.4	303.1	286.4	238.2	193.6	191.9	180.7	181.9	195.5	**7160**	227.0	166.9	346.5
1981	222.9	216.0	226.8	222.4	234.9	213.6	202.6	158.9	149.6	160.7	200.2	228.4	**6403**	203.0	129.7	252.9
1982	215.3	209.0	204.8	248.7	338.2	263.2	237.2	190.8	160.7	174.3	214.3	310.2	**7279**	230.8	149.0	373.3
1983	253.6	242.7	246.1	252.5	316.1	259.1	227.9	196.6	165.5	186.6	208.4	229.0	**7318**	232.0	154.8	363.4
1984	244.0	248.3	240.7	248.0	225.2	179.5	165.5	145.0	138.5	154.7	187.9	221.2	**6294**	199.6	125.7	262.9
1985	186.4	244.6	245.3	306.4	374.5	329.9	241.4	190.1	186.1	188.4	209.4	245.9	**7745**	245.6	166.9	398.7
1986	262.9	283.2	284.2	320.4	502.2	428.8	309.2	240.5	190.0	188.9	255.6	266.1	**9283**	294.4	171.6	547.2
1987	265.3	297.9	292.2	279.8	312.7	271.3	263.9	221.6	193.2	216.8	283.7	252.1	**8272**	262.3	184.4	361.0
1988	257.1	292.6	291.1	377.9	386.6	443.6	301.5	228.2	208.2	228.4	260.2	265.0	**9295**	294.7	194.3	516.4
1989	324.4	357.5	360.3	495.2	457.2	390.3	305.0	228.6	165.4	166.0	176.8	241.7	**9627**	305.3	157.8	522.5
1990	254.0	252.2	412.9	427.0	439.8	339.9	305.0	228.6	177.3	175.1	180.8	224.8	**8991**	285.1	159.3	486.8
Average/Total													**7928**	**251.4**		

Table G.11: Kagitumba (Kagitumba)

Year	Flow (Million m3)													Discharge (m3/s)		
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual	Mean	Min	Max
1974	8.00	5.75	6.78	20.55	18.12	11.50	15.62	4.80	7.11	4.77	6.66	6.03	**304**	9.65	2.93	32.81
1975	5.85	4.35	6.15	13.80	11.78	6.33	4.70	3.94	7.49	11.74	14.33	22.29	**297**	9.43	2.26	47.69
1976	9.59	8.81	8.14	11.41	14.30	8.28	5.07	6.58	7.04	8.96	13.04	11.14	**295**	9.36	2.70	26.45
1977	8.13	13.47	12.43	31.19	25.42	8.70	5.70	5.72	9.17	7.39	15.65	16.34	**418**	13.24	1.53	63.37
1979	18.01	35.90	20.22	31.02	39.05	22.63	14.91	13.16	11.21	11.04	13.70	14.94	**642**	20.36	9.35	74.14
1980	12.80	12.07	11.66	17.73	25.75	15.46	7.93	7.24	9.89	19.07	10.03	21.02	**449**	14.25	5.76	38.09
1981	10.95	8.50	11.91	44.16	30.39	12.12	9.09	11.22	9.62	10.68	9.77	8.25	**464**	14.73	6.16	73.05
1982	6.68	5.55	5.98	19.79	34.03	18.20	7.47	5.90	9.32	10.68	10.64	22.47	**413**	13.10	4.24	50.31
1983	7.56	7.63	7.58	19.38	16.65	6.82	5.03	5.89	7.89	16.14	15.16	14.32	**342**	10.85	3.87	48.29
1984	10.26	8.87	18.11	27.71	15.56	7.59	8.13	7.42	7.89	16.14	15.99	16.51	**422**	13.37	5.63	45.90
1985	11.21	11.88	10.39	39.43	29.06	12.31	9.84	7.93	11.20	11.03	15.97	12.29	**479**	15.19	7.10	73.05
1986	9.83	10.95	13.78	30.17	27.79	12.18	7.56	6.22	7.44	7.73	9.71	12.29	**409**	12.97	5.25	56.04
1987	10.03	9.44	15.93	16.18	25.49	15.36	7.56	6.51	8.77	12.93	29.75	13.94	**452**	14.33	5.63	56.25
1988	10.28	11.07	12.54	21.78	31.87	10.08	10.40	13.90	17.74	30.63	19.65	12.16	**532**	16.88	7.65	58.11
Average/Total													**423**	**13.41**		

Table G.12: Kagera (at Kyaka)

Year	Flow (Million m3)													Discharge (m3/s)		
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual	Mean	Min	Max
1950	91.2	95.9	99.1	116.8	126.1	115.8	114.1	112.5	111.5	105.5	102.7	105.7	**3410**	108.1	95.9	144.3
1951	107.0	111.0	114.5	132.4	143.4	199.0	252.2	228.1	194.8	169.8	166.4	186.5	**5282**	167.5	104.8	255.1
1952	189.7	190.2	227.8	239.4	251.5	241.9	233.9	246.8	236.9	212.1	190.1	172.0	**6923**	219.5	162.1	261.7
1953	158.2	148.0	143.8	152.4	170.0	159.7	144.7	140.3	143.6	138.6	136.9	144.7	**4681**	148.4	132.1	174.1
1954	123.0	117.7	129.4	133.8	138.1	165.7	167.3	167.2	159.3	152.2	145.6	140.0	**4576**	145.1	115.8	171.5
1955	130.9	123.9	128.1	134.1	139.2	135.4	143.0	144.9	139.4	138.5	135.8	137.9	**4290**	136.0	122.0	146.9
1956	133.8	126.6	124.6	136.8	174.4	196.7	220.7	214.2	198.9	178.5	168.8	159.7	**5354**	169.8	123.3	224.5
1957	152.5	146.3	148.2	160.8	220.0	273.8	277.2	267.2	243.0	221.0	198.1	183.3	**6560**	208.0	144.0	288.2
1958	165.9	161.3	168.8	183.2	215.1	207.7	195.9	196.2	173.2	160.4	143.8	147.6	**5573**	176.7	132.7	228.1
1959	139.5	130.6	132.9	141.5	174.9	162.2	160.3	157.7	151.8	149.0	144.6	143.8	**4705**	149.2	125.2	202.3
1960	145.2	142.3	159.3	234.1	286.2	338.2	321.6	259.4	220.8	188.0	171.5	153.9	**6899**	218.8	137.1	348.3
1961	136.6	141.0	138.7	145.7	161.5	162.6	169.8	157.5	145.5	135.3	160.2	200.1	**4878**	154.7	131.3	206.8
1962	180.9	272.3	380.9	405.8	441.9	461.9	460.5	408.1	330.5	272.6	253.9	226.4	**10774**	341.7	174.2	475.8
1963	236.9	285.3	342.7	370.9	493.6	503.5	581.3	572.0	498.9	376.7	290.1	276.4	**12715**	403.2	213.6	622.4
1964	321.4	363.4	371.7	438.6	500.9	545.0	526.2	432.9	331.0	242.2	180.4	172.1	**11631**	368.8	164.2	567.5
1965	164.1	160.6	177.4	208.4	266.2	328.4	321.4	247.5	169.9	155.4	199.5	205.1	**6854**	217.4	109.1	347.4
1966	198.1	219.1	263.7	339.0	427.5	447.3	385.8	301.8	256.1	217.3	212.4	194.9	**9110**	288.9	185.2	457.1
1967	178.8	179.4	182.0	191.7	235.3	227.2	231.4	228.9	210.6	191.3	195.7	204.8	**6463**	205.0	167.9	260.0
1968	272.7	270.9	317.6	420.3	581.4	650.8	628.8	537.2	433.7	338.1	294.9	309.5	**13316**	422.2	0.0	0.0
1981																

1982	175.6	179.9	180.8	182.9	209.4	291.7	292.3	265.5	223.1	240.1	284.6	299.7	**7437**	235.8	177.5	301.3
1983	294.7	288.6	297.3	389.1	398.5	320.0	307.5	287.6	245.4	215.6	213.6	273.0	**9282**	294.3	204.7	406.2
1984																
1985	165.4	169.1	166.2	194.9	234.0	285.2	296.7	261.0	228.6	202.2	166.7	171.0	**6687**	212.0	160.8	306.4
1986																
1987	198.5	209.3	232.8	266.2	288.5	288.8	289.4	272.5	237.2	206.6	211.5	201.5	**7634**	242.1	198.0	300.3
Average/Total													**7175**	**227.5**		

Table G.13: Kagera (at Masango or at Mouth)

Year	Flow (Million m3)													Discharge (m3/s)		
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual	Mean	Min	Max
1950	95.0	101.5	146.9	155.7	170.1	221.0	152.2	142.0	134.4	126.4	122.9	119.7	**4440**	140.8	114.1	154.8
1951	104.0	116.1	119.4	161.9	215.2	221.0	200.7	167.6	143.9	134.0	157.2	222.9	**5171**	164.0	96.1	275.6
1952	259.8	249.8	264.2	255.0	263.2	250.1	320.3	324.0	301.7	269.0	255.3	273.9	**8646**	274.2	242.2	330.6
1953	252.2	245.5	239.7	255.0	263.1	250.1	248.4	241.7	165.6	149.6	155.3	162.5	**6906**	219.0	229.5	263.1
2001	175.4	170.0	174.8	185.2	202.1	196.0	181.0	167.9	159.6	161.3	170.0	172.8	**5562**	176.4	155.1	208.5
2002	175.4	169.9	178.4	218.3	274.8	238.9	212.2	191.3	165.6	149.5	155.3	162.5	**6028**	191.1	144.4	298.0
2003	177.9	164.2	150.1	163.3	198.1	192.5	183.0	166.4	159.9	146.0	140.3	143.7	**5218**	165.5	136.1	207.7
2004	137.9	130.6	126.8	141.9	163.7	143.4	123.1	107.4	93.7	89.5	89.5	90.0	**3777**	119.8	89.3	169.3
2005	86.7	79.3	68.2	82.4	95.0	98.3	85.8	61.5	55.0	48.2	55.0	83.4	**2362**	74.9	65.8	104.1
2006	66.4	66.5	66.6	66.4	72.7	67.8	56.9	51.5	45.0	38.2	45.0	73.4	**1882**	59.7	34.3	85.2
2007	89.1	95.4	92.9	100.8	121.4	121.8	109.7	102.4	102.0	97.8	95.1	96.5	**3220**	102.1	84.8	124.9
2008	94.1	99.9	100.3	120.8	125.1	120.8	104.1	96.1	90.5	91.5	101.2	100.5	**3271**	103.7	86.2	141.7
2009	95.0	101.5	101.0	117.1	139.9											
Average/Total													**4707**	**149.3**		

Chart G.1: Record Length and Observed Data Situations of Gauge Heights at Streamflow Gauging Stations

	Streamflow Gauging Stations																				
Year	0020 Kagitumba at Kagitumba	70002 Sebeya at Nyundo	70003 Akagera at Rusumo	70004 Nyabarongo at Kanzenze	70005 Nyabarongo at Kigali rte Butare	70006 Nyabarongo at Mfune	70007 Nyabarongo at Mwaka	70008 Nyabarongo at Ngaru	70009 Akavuguto at Kibeho	70010 Akanyaru at Rte Butare/Nguzi	70011 Cyunuzi at Kibungo	70014 Mwogo at Nyabisinlu	70015 Nyabugogo at Kimisaragara	70016 Nyabugogo at Nemba	70017 Nyabugogo at Cymutara	70018 Mwange at Rusumo (2)	70020 Rukarara at Musebeya	70021 Karungeli at Nyagahanga	70026 Rusumo at Rugezi	70028 Kabeya at Kabeya-112	70029 Karungeli at Ngarama
1956			12																		
1957			11																		
1958			12																		
1959			12																		
1960																					
1961			12		12																
1962			12		11																
1963			8,5		11,5																
1964			8,5		10,5																
1965			12		10,5																
1966			12		12																
1967			11,5		9,5																
1968			8		8,5										4						
1969			7		3										8						
1970			11,5		6,5										11,5						
1971			9	8,5	10	12	3			12					11				12	11	12
1972			12	11,5	11	12	12		8	12		5,5	7	6	8				12	10	12
1973			12	12	12	12	12		12	12		12	12	12	11				12	12	12
1974	12	12	12	12	12	12	12	12	12	12		12	12	12	12				12	12	12
1975	12	12	12	12	12	12	12	12	12	12		12	12	12	12				12	12	12
1976	12	11	12	12	12	12	12	12	12	12		12	11,5	11,5	12				12	12	12
1977	12	12	12	12	12	12	12	12	12	12		12	11	11	11,5				12	12	12
1978	8,5	12	12	10	12	8	10	12	12	12		12	11,5	12	12				11	11	12
1979	12	10	12	12	12	12	12	12	12	12		12	4	12	11				12	12	12
1980	12	10,5	10	12	12	11,5	12	10	12	11,5		12	11,5	7	9				12	12	12

(Chart G.1: ….. Continued)

Year	.0020	70002	70003	70004	70005	70006	70007	70008	70009	70010	70011	70014	70015	70016	70017	70018	70020	70021	70026	70028	70029
1981	12	11	12	12		12	12	12	12	11,5		12	11,5	4	9,5				12	9	3
1982	9	12	12	12		11	12	12	12	12		5,5	12	10,5	12				12	12	5
1983	10	12	12	12		12	12	12	12	12		1		3,5	12			12	12	12	12
1984	12	12	12	10		12	12	12	12	12		12	12		12			12	12	11,5	12
1985	12	12	12	10,5	8,5	11,5	12		12	12		12	6		12			12	12	12	12
1986	11	12	12	12	12	11,5	12	12	12	12		12	11		12			12	12	12	12
1987	10	12	12	10	12	12	12	12	10	12		12	12		11		4	9	12	12	11,5
1988	12	10	12	12	12	9	12	11		12		11	12		8		12	12	12	12	
1989					12		12	9		12								12	12		
1990					12		12			12											
1991					12																
1992					12																
1993					12																
1994					12																
1995		7	2	5	12	7,5	11	12	3	7,5	2	5	8,5	8,5	6	9	3	9			
1996		12	6	10	12	12	12	12	12	12	12	12	12	12	11,5	11	12	11,5			
1997		6			12	12		12	11	12	12	12	12	12	12	12	11	11			
1998				5	12	12	2	11	12	12	12	12	12	12	11	5	12	10			
1999				3	12	11		9	12	12	12	12	7	7	12		8				
2000				3,5	12	2		4	5	6	2	3	4	4	4	7	4				
2001																					
2002																					
2003																					
2004																			2		
2005																			3		
2006																					
2007						6,5															
2008		4	1,5		2		4										9	9	10		
2009			4,5		3		2										3	4,5	3,5		
Recrd length (yrs)	15,0	19,0	37,0	23,0	38,0	27,0	25,0	21,0	25,0	26,0	6,0	23,0	20,0	18,0	27,0	5,0	10,0	13,0	23,0	18,0	16,0
Observed data (yrs)	13,3	15,9	31,3	19,3	33,8	22,5	21,7	19,5	20,0	25,0	4,3	19,6	18,7	14,1	23,2	3,7	6,5	11,3	20,5	17,4	15,6
Missing data (yrs)	1,7	3,1	5,8	3,8	4,2	4,5	3,3	1,5	5,0	1,0	1,7	3,4	1,3	3,9	3,8	1,3	3,5	1,7	2,5	0,6	0,4
Missing data (%)	11,1	16,2	15,5	16,3	11,1	16,8	13,3	7,1	20,0	3,7	27,8	14,9	6,5	21,8	14,2	26,7	35,0	12,8	11,1	3,5	2,3

12 Complete observations Incomplete observations

H. Terms of Reference for Development of a KIRBMD Strategy

H.1 Background to the Nile Basin Initiative

The Nile Basin Initiative: The Nile Basin Initiative (NBI) is a partnership of the riparian states [14] that seeks to develop the river in a cooperative manner, share substantial socioeconomic benefits, and promote regional peace and security through its shared vision of "sustainable socioeconomic development through the equitable utilization of, and benefit from, the common Nile Basin water resources". The NBI's *Strategic Action Program* is made up of two complementary programs: the basin wide *Shared Vision Program* to build confidence and capacity across the basin, and *Subsidiary Action Programs* to initiate concrete investments and action on the ground in the *Eastern Nile and Nile Equatorial Lakes sub-basins.* The programs are reinforcing in nature. The Shared Vision Program focuses on building regional institutions, capacity, and trust, to lay the foundation for unlocking the development potential of the Nile, which can be realized through concrete investments carried out under the subsidiary action programs.

The Nile Equatorial Lakes Subsidiary Action Program (NELSAP). The countries of the Nile Equatorial Lakes Subsidiary Action Program[15] have identified a number of projects to promote poverty alleviation, economic growth, and the reversal of environmental degradation in the sub-basin. The projects are grouped into two major areas: *Natural Resources Management and the Environment* and *Hydropower Development and Trade*, and target investments in agricultural development, fisheries development, water resources management, water hyacinth control, hydropower development and transmission interconnection. A small NELSAP Coordination Unit (NELSAP-CU) based in Kigali, Rwanda, in collaboration with the NBI Secretariat in Entebbe, Uganda, coordinates and facilitates the activities of the program.

The Kagera River Basin Management Project: The Kagera Transboundary Integrated Water Resource Management and development project is one of the three river basin projects implemented under the NELSAP. Others include the Mara River basin Project and the Sio-Malaba-Malakisi Transboundary IWRM Projects located in Kenya and Tanzania respectively. The Kagera region contains some of the world's poorest countries and is marred by conflict and civil strife. The basin is characterized by low productive peasant agriculture and endemic poverty. There is continuing land degradation and loss of soil fertility caused by population pressure and primitive farming methods. There is ongoing deforestation and an almost total absence of reforestation activities. Virtually the only source of energy is biomass, contributing to the deforestation. The soil erosion results in an increased nutrient load in the river and also in Lake Victoria, leading to problems with water hyacinth and eutrophication. In the basin area there is also insufficient water for household use and for grazing.

[14] Burundi, Democratic Republic of Congo, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda**.** Eritrea is participating actively in the NBI in an observer.

[15] **,** Burundi, D.R. Congo, Egypt, Kenya, Rwanda, Sudan, Tanzania, and Uganda

Wetlands are exploited and degraded, and there are unplanned migrations across borders of pastoralists with their cattle causing friction in the border zone.

Current Water Resources Situation in the River Basin: The Kagera basin is spread over Burundi, Rwanda, Tanzania and Uganda with a total area of 59,800 sq.km. The Kagera basin area in Tanzania conventionally includes the area draining to Lake Ikimba, although this is in fact a closed basin. Only the lowest reaches of the Kagera flow through Uganda, although the southern parts of several Ugandan districts drain into the river and therefore lie within the basin. The Kagera is the largest of the 23 rivers that drain into Lake Victoria and it carries 34% of the annual river inflow to the lake. This proportion drops to 24% when the input of rain less evaporation on the lake surface is taken into account. The Kagera basin has a general elevation of 1,200 – 1,600 m but rises above 2,500 m in the west, with peaks reaching 4,500 m. Rainfall is less than 1,000 mm over most of the eastern half of the basin but rises to over 1,800 mm in the west, where most of the runoff is generated. Although the west is partly forested, much of the basin has become intensively cultivated resulting in erosion and sediment loading of rivers in the high rainfall areas. The upper tributaries are generally steep but include flatter reaches, where swamps have formed. The middle course of the river and its tributaries above Rusumo Falls is extremely convoluted, this reach reflecting regional warping and drainage reversal, with some tributaries retaining the appearance of flowing towards the Congo. Several side valleys enter the river with their courses filled either with lakes or swamps. The river then turns east and flows across a plain in an incised channel before entering Lake Victoria through huge papyrus swamps.

The dense settlement and intensive cultivation in the Kagera River catchments has resulted in heavy pollution loads in tributary rivers. In addition, human encroachment on already fragile watersheds has led to loss of forests, soil erosion and high sediment load reaching the river systems. On the other hand, there are opportunities to develop the rivers of the Basin so that agriculture can be practiced more sustainably, forests protected from destruction and the water is shared equitably between different groups and countries.

1.1.Project Objectives

The project objective is to establish a sustainable framework for the joint management of the water resources of the Kagera river basin; in order to prepare for sustainable development oriented investments to improve the living conditions of the people and to protect the environment. Specific objectives include (i) establishment of a sustainable framework for joint management of the shared water resources of the Kagera River Basin (ii) development of an investment strategy and conducting pre-feasibility studies (iii) building capacity at all levels for sustainable management and development of Kagera River Basin and (iv) implementing small-scale investment projects.

Project components include (i) Creation a cooperative framework and development of a common strategy for the joint management of the water resources of the Kagera basin (ii) Development of an investment strategy and conducting pre-feasibility studies for the Kagera catchments (iii) Building capacity at national, catchment and local levels for the sustainable management and development of the sub basin and (iv) Implementing

small-scale investment projects to build early confidence in the sub basin river basin community.

Project Outputs: Project outputs include (i) A transboundary management framework including a management strategy established for the Kagera basin (ii) A monograph and information management database and a Simple model for assessing development scenarios and selection of a preferred development strategy. Conducting pre-feasibility studies (iii) Staff trained at national and sub basin levels and offices strengthened. (iv) Identified small-scale investment projects implemented (v) A common strategy for the joint management of the water resources of the Kagera river basin developed and pre-feasibility studies for proposed investments conducted and (v) A common strategy for the joint management of the water resources of the Kagera river basin developed and pre-feasibility studies for proposed investments conducted; (vi) Community awareness about environmental management issues and development options increased; and (vii) Basin-wide sustainable hydro-meteorological network and a water quality baseline established.

1.2.Implementation Mechanisms

The project which is jointly funded by Sida and NORAD is implemented within a period of four years as part of the NELSAP portfolio. Coordination is maintained between this and other NELSAP projects through the NELSAP-CU office in Kigali, Rwanda. The project is managed by a Project Management Unit based in Kigali in Rwanda and supervised by a Regional Project Steering Committee (RPSC) constituted by representatives of the national government agencies of Tanzania, Rwanda, Burundi and Uganda. The RPSC reports to the Nile Equatorial Lakes Technical Advisory Committee (NEL-TAC). In order to co-ordinate and facilitate the implementation of projects and activities at the national level, National Liaison Officers (NLOs) have been appointed by the respective governments. They devote 30% of their time to the project activities.

1.3.Ongoing Initiatives within the basin

- **The Kagera Cooperative Framework Development Consultancy.** The project is in the process of developing a framework for transboundary development and management of the water resources of the catchments; so that subsequent development oriented investments will be sustainable in the long-term. The framework proposed is important in anchoring the Kagera IWRM & D strategy.
- **Kagera Basin Monograph and information data base development Consultancy.** The project has developed a monograph and information database for the basin. The monograph contains information on the natural resources of the basin, land use activities, social and economic conditions, environment, and opportunities for growth. The Monograph will facilitate the creation of scenarios which will ultimately be formulated into a basin development strategy. As part of the deliverables, a common database has been developed in GIS format and includes consolidated and updated existing information on socio-economy, surface water resources, rainfall and climatological data, stream flow gauge records and their locations, estimates of stream flow for ungauged locations calculated using gauged records, drainage parameters, reservoir storage levels, volume-elevations

relationships, net monthly evaporation rates, groundwater resources, ground water recharge rates, gains from losses and rivers, instream flow requirements for downstream flow requirements, transmission link capacity and losses, waste water and effluent routing, data on chemical composition of surface water and groundwater and cost of delivery, small dams and other hydraulic works, water quality and sediment transport, pollution and impacts on the environment, water supply and sanitation, irrigation and forestry, industries and mining, fisheries, wildlife and tourism, environmental flow requirements, energy and infrastructure; cross-cutting issues that will be addressed including poverty alleviation, promotion of gender equality, capacity building and good governance.

- **Needs Assessment and Conceptual Design of NB Decision Support System Decision.** Under the Water Resources Planning and Management Project of the shared Visions program, a Consultancy was commissioned to perform an assessment of the needs of the potential users of the Nile DSS, document the requirements of the system, and prepare a detailed development plan, including a training plan. This consultancy was conducted as a collaborative effort with Nile riparians, with training and other capacity building activities fully integrated into the work program. The primary outputs of this consultancy included a detailed DSS development plans, including training plan; specifications for DSS Framework, database, models and interface software; and Terms of Reference (TORs) required for procuring the development teams. Outputs from the needs assessment will provide useful input into the Kagera Investment strategy formulation. It is expected that ultimately the Kagera basin simulation models will be integrated into the architecture of the wider Nile Basin DSS.

- **Development of a Nile Basin Decision Support System.** Under the aegis of the WRPM Project, NBI is in the process of establishing a Decision Support System to support water resources planning and investment decisions in the Nile Basin, especially those with cross-border or basin level ramifications. Its scope includes not only the Nile Basin DSS itself (comprising an information management system, a regional river basin modeling system, and a suite of analytical tools to support multi-objective analysis of investment alternatives) but also the development of core national capabilities to assist in the evaluation of alternative development paths and the identification of joint investment projects at the sub-regional and regional level. The basic purpose of the Nile Basin DSS is to provide a framework for sharing knowledge, understanding river system behavior, designing and evaluating alternative development scenarios, investment projects, and management strategies. The main goal is to support an informed, scientifically based rational cooperative decision making. The objective is to improve the overall net benefit from harnessing the Nile River, and to develop economically efficient, equitable, environmentally compatible and sustainable strategies for sharing the benefits. The DSS should help to "enhance the capacity to support basin wide communication and information exchange, and identifying trans-boundary opportunities for cooperative development of the Nile Basin water resources". This assignment, which will commence in February 2009, is an important input into the Kagera Basin IWRM & D strategy.

- **Development of a Nile Basin Initiative Data Sharing Protocol**. Under the water resources planning and management project, a consultancy was commissioned to assist the WRPM Project in developing a road map leading to the drafting of the Nile Basin Data and Information Sharing Protocol. The work includes desk study of relevant literature, technical analysis of data types and relevant issues, consultations with relevant stakeholders and documentation of outcomes, drafting of final report on the findings and finalizing it through the cycle of reviews and enhancements. Development of Interim data and information procedures under this consultancy will be important for this consultancy.

- **FAO Lake Victoria Water Resources Project** aims at development of water resources information systems, mathematical models and tools in support of harmonized, regionally coordinated Water Resources management in the Lake Victoria basin. Outputs of this consultancy would be important to development of the Kagera models and ensuing strategy.

- **FAO, Agricultural Scenario Development Project.** FAO is involved in development of scenarios for agricultural water use in the Nile Basin. Outputs of this consultancy will provide useful inputs into the Kagera development and management strategy.

1.4. **Development of an Integrated River Basin Management Strategy for the Kagera Basin.** This consultancy will build onto the ongoing two consultancies and regional initiatives to develop an Integrated Water Resources Management Strategy for the Kagera river basin. A small number of large-scale investment projects that can be implemented under the framework will be prepared. The strategy is expected to comprise a set of measures that promote the coordinated development and management of water, and related resources in the basin in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. The strategy will indicate ways in which the riparian countries (acting together) aim to achieve IWRM in the Kagera river Basin. The IWRM Strategy will take into account and use data and information generated from the ongoing Monograph and cooperative framework consultancies as well as national and regional initiatives mentioned above. A trans-boundary development strategy and ToR for pre-feasibility studies of investment opportunities for some of the identified long-term investment opportunities in the basin will be produced as well. The strategy will enhance the abilities of managers and communities in the river basin to engage in trans-boundary development activities. The four countries with the basin are committed to joint management of the river basin, including joint exploration of transboundary development projects. Joint management will entail assessment of credible alternatives and joint management options so that the benefits from development are shared. Transboundary projects will require analysis of the river system at status-quo, without project and with project, before they can be approved. Such analysis as well as general transboundary planning and management can only be performed, if hydro-environmental and socio-economic information can be shared between the countries, accessed and analyzed. The strategy will elaborate mechanisms for transboundary development and management of the water resources of the Kagera basin to be established at basin and community levels.

H.2 Objective of the Consultancy

The primary objective of this consultancy is to develop an integrated river basin management and development strategy for the Kagera basin. This entails development of scenarios for integrated river basin management, a simple model for assessing and processing of drivers for various scenarios leading to development of an integrated river basin management and Development Strategy based on internationally agreed principles of integrated water resources management. The specific objectives of this consultancy will include the following:

i) To develop scenarios for water resources development in the Kagera basin based on review of the Kagera River Basin Monograph and Information database
ii) Develop a simple model or decision support system to support integrated planning and management of the Kagera River Basin The model will be used to assess the drivers for change that influence the scenarios and ranking the future development scenarios in the basin. This component will also include training and skill transfer to the PMU as well as regional and national staff.
iii) Develop a Kagera Basin Integrated river basin management and Development Strategy based on international best practice in IWRM.
iv) Prepare Terms of Reference for pre-feasibility and feasibility studies for viable investment opportunities arising from the development strategy.

H.3 Scope of Work

3-1 General outline. The Consultant is expected to develop scenarios, by reviewing the monograph and information data base consultancy outputs. This will also include but not limited to updating the data bases pertinent to formulation of development scenarios, construction of a simple simulation model for assessing the scenarios and transforming viable scenarios into a development strategy. The developed simple model should be a decision support tool capable of generating temporal and spatial visualization to guide water managers and policy maker in their decision making.

3-2 Task Assignments

Task1 Stakeholder analysis and Development of Kagera Basin Scenarios

The Consultant is expected to develop scenarios for water resources development by reviewing and updating the Monograph and information data base study as well as carrying out a stakeholder analysis. Activities under this task include the following:

a) *Review and update of the monograph and information data base*. The database which is GIS based will be updated in terms of filling the gaps and ensuring compatibility with the models to be built for water resources assessment and management. This may include but not limited to gathering additional basic information (through rapid surveys/assessments) and data on water resources development in the basin on IWRM depending on the gaps identified and performing quality checks on the data and information through appropriate methods

b) *Stakeholder Analysis*. It is essential to know the users, so that constraints and measures are in line with the strategic purpose of the decision making within the framework of the investment strategy. The stakeholder analysis will identify the general and specific requirements of the stakeholders for the simulation model use, identify and rank key water management issues, identify and rank decisions, appraise data availability and facilitate consensus building among the Kagera basin stakeholders. A specific output of this activity will be a needs assessment report as annex to the inception report.
c) Examine current and future processes and procedures adopted for decision making in the four riparian countries on planning and management of water resources and Identify key decisions and information requirements for the Kagera simulation model
d) Identify specific issues to be supported with respect to integrated river basin management
e) Identify a set of core criteria and indicators that will be used as performance measures in evaluation of options for development scenarios
f) *Kagera development scenarios*. Development of scenarios requires an understanding of the current economic and demographic conditions in the basin. The identification of historic changes and trends in the river basin, plus the evaluation of the most important sectors from an economic and water use point of view will help define the focus of future economic and demographic scenarios. The scenarios will be based on projections of the future state of the environment and specific assumptions key determinants such as economic and social development, technological change or public policies.

Outputs: Key issues at sub basin levels identified in connection with existing and future decision making procedures and processes for integrated river basin management, an inventory of overall decisions to be supported by the Kagera simulation model and list of core criteria and indicators identified and development scenarios agreed upon by stakeholders

Task 2: Develop a Kagera Simple Model

On basis on outcome in task 1 above, the consultant will develop a simple model for the Kagera basin to support decision makers in the planning and management of the Kagera basin water resources. The model will aid decision making for strategic planning in the context of the economic and environmental sustainability objectives, with special emphasis on the water problems encountered in the Kagera basin. The model should be able to simulate relationships between qualitative and quantitative, between availability and uses of water and their societal causes. This should help in the analysis of plausible scenarios according to various development options including their implications on withdrawals and storage. It should also provide for evaluation of ecological, economic and social impacts of each scenario. The following activities are envisaged.

g) *Quantitative design of the Simulation models*: The Consultant is expected after task 1 above to recommend an ensemble of existing models and prepare and adapt data appropriately based on the issues and needs identified during the stakeholder analysis. It is essential to base the design of the simulation models on existing models available both at National and regional level and data as much as possible.

This will result in suitable model architecture to be agreed with the stakeholders. The consultant should plan to integrate users as project partners in aspects such as data deliveries and design of the user interface in order to ensure acceptance, ownership for eventual maintenance of the simulation models. It is envisaged that communication with users will take place regularly during the consultancy to ensure alignment of expectations and make the design adaptive. The design and consultation process should follow an iterative rather than a sequential process. The model will be developed and calibrated using data available in the data base. During the model development, strengths and constraints/limitation of the model and propose future activities to improve the model should be clearly highlighted.

h) *Training for stakeholders*. Under this task the consultant will assess the training needs for implementation of the Kagera simulation model and based on the training needs assessment document, use the document to carry out the training.

Outputs: A prototype simulation model for assisting decision making under a GIS environment for strategic planning in the context of the economic and environmental sustainability objectives, with special emphasis on the water and water related problems encountered in the Kagera River basin and users trained .

Task 3: Develop a Kagera integrated river basin management strategy.

The consultant will be required to use the model developed in task 2 above to review and analyze the development scenarios with input from a wide range of stakeholders. Through this task, the consultant will assess the river basin development scenarios, identify investment opportunities and ranking the future investments projects which will include water resources development. The consultant will evaluate the scenarios formulated with due consideration of environmental and social assessment in an integrated manner to ensure sustainable development. The Strategy should be made in a systematic process including assessment of data and information, engagement of key stakeholders, consultation, identification of resources required, and finalization of the IRBM Strategy. The process of developing the river basin IWRM strategy will include the following:

(a) *Development of strategic options*. Based on the scenarios developed and assessed using the simple model, the consultant will formulate options to address identified issues and challenges. Strategies will be identified and consolidated into a system of interlinked and interdependent basin-wide strategy using water resources systems analysis where possible. Issues of equity, environmental sustainability and efficiency will need to be brought to bear upon the development of strategic options. The systematic evaluation of water management interventions should be performed for a long time horizon, simulating long-run accumulative effects and anticipating potential future changes and uncertainties.

(b) *Analysis and evaluation of performance of options*. The consultant will come up with a detailed recommendation of a set of options that they consider best suited to address the water resources management and development issues and challenges in the Kagera River basin. The Consultant will be expected to clearly articulate the criteria used in evaluating options including among other issues environmental criteria. The best recommended options and investment projects

will be presented to stakeholders for evaluation through a regional strategy definition workshop for comments and input.

(c) *Development of Kagera IRBM & Development Strategy*. The consultant will prepare an Integrated River Basin Management and Development strategy and implementation plan including the role of various players in the strategy, the risks, further investigations required for the smooth implementation of the strategy, etc. The Consultant is expected to provide a strategic action and investment program for the basin, which will be agreed by the riparian countries. The SAIP will include terms of reference for the pre-feasibility study for the long-term investment projects.

Outputs: A Kagera river basin Integrated River Basin Management and Development Strategy (including an investment plan) and terms of reference for pre-feasibility/feasibility studies for potential investment.

H.4 Expected Outputs of the Consultancy

The specific outputs of this consultancy include the following:

i) River Basin Monograph and information data base reviewed and Scenarios developed

ii) Simple model for assessing water development scenarios in the Kagera river basin developed
   a. Kagera simulation model developed
   b. PMU Staff and riparian staff trained in use of simple model.

iii) An integrated River basin management and development strategy and Implementation Plan for the Kagera River Basin incorporating, the following:
   a. A clear prioritization and articulation of issues and corresponding approaches, including indicative equitable water allocation approaches
   b. Basin-wide context with regard to demands on the resource in relation to available water resources for the various scenarios and development options
   c. Identified sets of tools for integrated project planning, monitoring and evaluation
   d. An Integrated River Basin Management and Development Program for the Kagera river basin. This will also include an outline of projects addressing priority problem areas including indicative joint project development and financing approaches. The programs and projects should address priority IWRM programs in the context of regional development and integration.
   e. Terms of reference for pre-feasibility and feasibility studies

H.5 Study Duration

The duration of the consultancy will be for 7 calendar months and shall start in March 2009 and is expected to be completed by the end of October 2009. A small number of international consultants will work with regional experts under the leadership of a lead international consultant to develop a simple the river basin model to assess river basin development scenarios and consequently compile the Kagera River Basin Development Strategy.

H.6 Organization and Co-operation Arrangements

The Consultant will be directly supervised by the Kagera Project Management Unit. A Regional Project Steering Committee which consists of 12 high ranking Government Officers from the Governments of Rwanda, Burundi, Uganda and Tanzania will oversee the work of the consultant, while 4 National Liaison Officers (one from each riparian country) will coordinate the consultations at the national levels and liaison with the relevant institutions. The outputs from the study will be regularly communicated to the funding agencies (Sida NORAD and the EU) through the NELSAP-CU. The PMU will hold discussions with the consultants at certain stages in the consultancy to ensure that work is proceeding along acceptable lines. For the purpose of these meetings the consultant will produce brief progress reports on the status of his/her work, which will be incorporated into formal records of the meeting.

6.1 Responsibility of the Consultant

- Study and review of all documents relevant to the assignment and the NBI.
- Consultations with PMU staff, NELSAP-CU staff and staff of the national governments of Burundi, Rwanda, Tanzania, Uganda and NGOs/CBOs operating within the project area.
- Hold discussions with relevant institutions in the 4 riparian countries.
- Hold stakeholders meeting at national and local level to validate the collected information.
- Review the Kagera River Basin Monograph, content of the database and collect any additional data to construct the simple model
- Training of the PMU and other stakeholders in operation of the simple model
- Formulation of simple model and basin-wide distribution to stakeholders.
- Formulation of regional river basin development strategy;

6.2 Responsibilities of the Client

- Provide relevant reference documents where available
- Facilitation of the consultant through arranging consultative meetings.
- Organize meetings of the RPSC and other stakeholders for validation of reports.
- Identification and invitation of different stakeholders for training
- Reproduction of regional river basin development strategy and basin-wide distribution to stakeholders
- Reproduction of simple model and basin-wide distribution to stakeholders.

6.3 Facilities and Services

The Consultant will operate his/her own project office, accommodation, local transportation, visas, interpretations services and similar costs as may be deemed to suit the assignment. The PMU will provide a temporary office space in Kigali at the PMU Offices for consultation purposes.

H.7 Reporting and Documentation

The Consultant will report to the Project Manager Kagera TIWRM Project who will be responsible for approving the outputs. The following reports will be submitted by the Consultant.

(a) Inception report four weeks after signing the contract containing a clearly articulated work plan and elucidating the methodology to be is employed. The report will be presented to the PMU and riparian stakeholders for discussions, comments and approval.
(b) Monthly progress reports during the entire duration of the assignment.
(c) Simple Model at Month 4
(d) Draft Kagera integrated river basin management strategy 5 months after signing the contract. The consultant shall present the draft Report to the PMU and other stakeholders including RPSC, development partners (SIDA and NORAD), etc
(e) Final Kagera integrated river basin management strategy after 7 months
(f) All reports and communication materials developed by the consultant during this assignment shall revert to Project Management Unit. The reports will be submitted in 15 copies. In addition, soft copies (MS Word and Ms Excel) of the reports will be submitted on 2 CDs when submitting the draft and final reports of this assignment. All the reports shall be in the English language, neatly bound, and shall contain the main text and annexure, with figures/frameworks, illustrations and/or logical flow diagrams. The executive summary of all the reports shall be in both English and French.

H.8 Linkage to Regional Initiatives

In carrying out this consultancy, the consultant should review and make use of results of related initiatives to avoid duplication or occurrence of parallel developments on the same subject matter. Initiatives or reports of particular interest include among others:

- Lake Victoria Decision Support Tool
- Nile Decision Support Tool
- Nile DSS under the Water Resources Planning and Management Project under the SVP of NBI
- Draft Protocol on Environment and Natural Resources of the East African Community
- Strategic Action and Investment Plans for Rural and Urban Water Sectors in Burundi, Rwanda , Tanzania and Uganda (2000-2015)
- EIA Guidelines for Shared Ecosystems under the East African Community
- Report on harmonization of environmental laws and regulations under the Lake Victoria Environment Management Program
- Cross border Biodiversity Component under the National Environment Management Authorities (NEMA).
- Protocol on sustainable management and development of the Lake Victoria Basin
- The Espoo Convention on the implementation of Transboundary Environmental Impact assessment.

H.9 Reference Materials

- Nile Equatorial Lakes Subsidiary Action Program (NELSAP) Project Document
- Water Sector Reform Documents
- National Water Policy Documents
- Land Use Policy Documents,
- Wetlands Policy Documents
- Forestry Policy Documents
- Eco-Tourism and Environmental Policy Documents
- National Planning Policy Documents
- Poverty Eradication Policy Documents
- Protocol for the Lake Victoria Basin Commission
- Lake Victoria Environmental Management Program
- Recommendations of international conventions like the Rio-Declaration (1992), the Dublin Principles and the World Summit on Sustainable Development
- Legislations relevant to Integrated Water Resources Management
- UN Convention on non-navigable uses of water 1997
- Relevant Treaties of the East African Community

H.10 Profile of the Consultant and Staffing Requirements

The Consultant shall demonstrate past experience in integrated river basin management, developing river basin models and working within the water resources management sector in the past fifteen years. The level of effort is estimated at 20 man months. The estimated man months input into the assignment for each of the specialist consultants identified is estimated as follows:

a) **Water Resources Management Expert/Team Leader 6 man months.** The Team Leader shall have a minimum of an MSc degree in water resources engineering , hydrology, hydraulic engineering or similar; with a minimum of 20 years of professional experience including management of software development projects, international experience including developing countries. The team leader shall have a minimum of 15 years relevant experience. He/she will be required to have broad water resources management knowledge and skills, in addition to well-developed water resources modeling skills so that he/she can also successfully undertake the role of Team Leader. He/she should also have skills in project planning, institutional and capacity development, and stakeholder facilitation, coupled with technical understanding gained through a career working in the water resources modeling sector as well.

b) **Water Resources/River Basin Modeler- 6-Man Months**. The water resources Modeler shall have a minimum Msc in Hydrology or Hydraulic Engineering/ River Engineering as well as relevant postgraduate qualifications in computer science, programming or hydro informatics. He/she shall have a minimum of 15 years overall experience and 10 years relevant experience in river basin modeling development/operation. The expert should also have working experience in design, development and administration of databases, preferably related to water resources engineering projects; Experience in managing large-scale database

projects; demonstrated experience with relational database, data structures, and database query languages, especially SQL; experience with large and complex database applications as part of a decision support system. Demonstrated experience in relational database design or equivalent and demonstrated programming experience.

c) **Hydrologist/Hydrometereologist – 2 man-months**. A hydrologist shall have a minimum Msc in Hydrology/Water Resources Engineering or River Engineering as well as relevant postgraduate qualifications. He/she shall have a minimum of 15 years overall experience and 10 years relevant experience in water quantity and quality monitoring and assessments.

d) **Natural Resources Economist – 3 man-months.** The Economist shall have a minimum MSc degree in Natural Resources or Environmental Economics. He/she shall have a minimum of 10 years overall experience and 7 years relevant experience in investment planning, and development management economics or a related field with recognized technical expertise in economic simulation and optimization modeling efforts; Demonstrated understanding of procedures and techniques for estimating economic benefits and costs for public infrastructure investments; experience in applied water economics and agricultural economics modeling, with technical experience in: (i) the economic evaluation of hydroelectric power generation facilities, (ii) modeling farm production decisions, and (iii) economic evaluation of flood management program.

e) **Biologist/Environmental Management Specialist – 2man-months**. The specialist shall have MSc degree in Natural Resources or Environmental Sciences or MSc degree in Biology/ Ecology as well as relevant postgraduate qualifications. He/she shall have minimum of 10 years of overall experience and 7 years relevant experience as a Biologist/Ecologist. He/she shall have working experience in developing inventories of environmental assets and aquatic ecosystems, development and applications of environmental indicators, assessing environmental impacts of water resources management and development interventions, and preparing environmental management plans, including water quality monitoring; develop quantitative linkages between alternatives and social and environmental indicators.

f) **Rural Sociologist/ Social Economist – 1 man-month**. The Social-Economist shall have a minimum MA degree qualification in Sociology or Social Science. He/she shall have a minimum of 10 years overall experience and 10 years relevant experience in economic planning and development management.

H.11 Quality Assurance and Quality Control

The Consultant will be required to demonstrate in their proposal, evidence of adoption of use of a Quality Assurance System (ISO 9001 or equivalent) as well as to describe how quality control will be implemented in the course of the project.

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