

Table S1: The UNWC Factors and list of indicators adopted from Gari et al (2020)

Code	Relevant Factors	Sub-factors	Indicators	Indicators relationship with allocation	
F1	Natural features	Geography	Basin area in each country [Km ²]	Direct	
SF1			The whole area in each country [Km ²]	Direct	
SF2		Hydrography	River length in each country [Km]	Direct	
SF3			Climate conditions	Köppen Aridity Index in each country	Reverse
SF4		Hydrology	Median Drought vulnerability index	Direct	
			Water-food-energy risk index or [Resilience Index]	Reverse	
			Annual surface water contribution of each countries [Bm ³ /year]	Direct	
			Water stress index[%] in each country	Direct	
SF5		Ecology and Environment	95% time flow exceeded minimum environmental flow with moderate management class [Mm ³ /year]	Direct	
			Total greenhouse gas emissions (kt of CO2 equivalent) in each country	Reverse	
	EnvirnomentaI performance index in each country		Direct		
F2	Social and economic needs of the watercourse States	Economic and trade Status	GDP per capita in each country [Current \$]	Reverse	
SF6			Gross National income per capita in each country [\$]	Reverse	
			Exports and imports trade (% of GDP)	Reverse	
			Income index	Reverse	
SF7		Work employment and vurnerability	Unemployment in the basin in each country [%]	Direct	
			Vulnerable employment (% of total employment)	Direct	
SF8		Social and economic sustainability	Population with access to electricity [%]	Reverse	
			Relative significance of hydropower in each Nile basin countries[%]	Direct	
			Population using basic drinking-water supply [%]	Reverse	
			People with access to clean cooking [%]	Reverse	
SF9		Human development	Water supply and sanitation index	Reverse	
			Infrastructure development index	Reverse	
			Human Development Index (HDI) in each country [%]	Reverse	
			SF10	Poverty status	Multidimensional Poverty index
Population living below income poverty line [%]		Direct			
SF11		Education status	Hunger Index	Direct	
			Education index	Reverse	
			Health status	Life expectancy Index	Reverse
SF12		Gender status	Gender Development Index (GDI) in each country [%]	Reverse	
The population dependent on the watercourse in each watercourse state	Existing dependency		Population in the Nile basin countries [in millions] in 2019	Direct	
			Population living in the basin in each country [%]	Direct	
		Employment in agriculture (% of total employment)	Direct		
		Employment in marine and inland fisheries [No]	Direct		
		Agriculture, forestry, and fishing, value added (% of GDP)	Direct		
	SF15	Future dependency	Population growth rate [%]	Direct	
	F4	The effects of the use or uses of the watercourses in one watercourse State on other watercourse states	Effects on land degradation	Fertile soil loss by erosion or sediment yield per year [M tons/year]	Direct
	Effects on water security			Average annual surface water volumetric reliability index [%]	Reverse
	SF17		Effect on Environment and human being on downstream neighbor	Water quality index	Direct
	SF18				
F5	Existing and potential uses of the watercourse	Existing uses	Gross Irrigation water demand in each basin countires [Bm3/yr]	Direct	
Existing domestic and industrial water demand in each basin countries [Bm3/year]			Direct		
SF19		Energy Consumption per Capita (Kg of oil equivalent per capita)	Direct		
		Future Uses	Existing Hydropower production in the basin in each country[MW]	Direct	
Potential irrigation remaining area in each basin country [ha]	Direct				
Projected domestic water demand by 2050 in each basin countires [Bm3/year]	Direct				
Remaining potential Hydropower production in the basin in each country[MW]	Direct				
F6	Conservation, protection, development and economy of uses and the costs of measures taken	Environmental Protection and Conservation	Areas exposed for severe soil erosion in each countrywith a rate of (>80kg/ha/yr) [Km2]	Direct	
SF21			Wetland area [Km2]	Direct	
SF22			Cereal yield (kg per hectare)	Direct	
SF23		Economy of uses	Gross investment made on hydraulic stuctures or Dams [million USD]	Direct	
			Total agricultural export value (1000)	Reverse	
			Loss of water by evaporation from dams in each basin countries [BCM/year]	Reverse	
			Water use efficiency [USD/m3]	Direct	
F7		The availability of alternatives, of comparable value	Alternative sources	Alternative energy source from Solar(both PV and CSP) [TWh/year]	Reverse
Alternative energy source from Wind [TWh/year]				Reverse	
Alternative energy source from Geothermal [MW]				Reverse	
Alternative energy source from oil [proved oil reserves in thousand million barrels]	Reverse				
SF24	Alternative uses and methods		Alternative energy source from natural gas [proved reserves trillion cubic metres]	Reverse	
			Alternative energy source from generated waste via incineration method [GWh]	Reverse	
			Total Renewable ground water resource[BCM/yr]	Reverse	
			Average income from Tourism [Million US\$]	Reverse	
			Alternative source of food and income from Livestook resource		
			Average fish and aquaculture production [metric ton/yr]	Reverse	
SF25		Industry value added (%GDP)- including construction industry	Reverse		
		Employment in service provision sector [% of total employment]	Reverse		

Table S2 Factors weight using Sequential ranking method

Sequential Ranking weight scenario #	Factors						
	F1	F2	F3	F4	F5	F6	F7
1	3.57	7.14	10.71	14.29	17.86	21.43	25.00
2	3.57	10.71	14.29	17.86	21.43	25.00	7.14
3	3.57	14.29	17.86	21.43	25.00	7.14	10.71
4	3.57	17.86	21.43	25.00	7.14	10.71	14.29
5	3.57	21.43	25.00	7.14	10.71	14.29	17.86
6	3.57	25.00	7.14	10.71	14.29	17.86	21.43
7	7.14	3.57	10.71	14.29	17.86	21.43	25.00
8	7.14	10.71	14.29	17.86	21.43	25.00	3.57
9	7.14	14.29	17.86	21.43	25.00	3.57	10.71
10	7.14	17.86	21.43	25.00	3.57	10.71	14.29
11	7.14	21.43	25.00	3.57	10.71	14.29	17.86
12	7.14	25.00	3.57	10.71	14.29	17.86	21.43
13	10.71	3.57	7.14	14.29	17.86	21.43	25.00
14	10.71	7.14	14.29	17.86	21.43	25.00	3.57
15	10.71	14.29	17.86	21.43	25.00	3.57	7.14
16	10.71	17.86	21.43	25.00	3.57	7.14	14.29
17	10.71	21.43	25.00	3.57	7.14	14.29	17.86
18	10.71	25.00	3.57	7.14	14.29	17.86	21.43
19	14.29	3.57	7.14	10.71	17.86	21.43	25.00
20	14.29	7.14	10.71	17.86	21.43	25.00	3.57
21	14.29	10.71	17.86	21.43	25.00	3.57	7.14
22	14.29	17.86	21.43	25.00	3.57	7.14	10.71
23	14.29	21.43	25.00	3.57	7.14	10.71	17.86
24	14.29	25.00	3.57	7.14	10.71	17.86	21.43
25	17.86	3.57	7.14	10.71	14.29	21.43	25.00
26	17.86	7.14	10.71	14.29	21.43	25.00	3.57
27	17.86	10.71	14.29	21.43	25.00	3.57	7.14
28	17.86	14.29	21.43	25.00	3.57	7.14	10.71
29	17.86	21.43	25.00	3.57	7.14	10.71	14.29
30	17.86	25.00	3.57	7.14	10.71	14.29	21.43
31	21.43	3.57	7.14	10.71	14.29	17.86	25.00
32	21.43	7.14	10.71	14.29	17.86	25.00	3.57
33	21.43	10.71	14.29	17.86	25.00	3.57	7.14
34	21.43	14.29	17.86	25.00	3.57	7.14	10.71
35	21.43	17.86	25.00	3.57	7.14	10.71	14.29
36	21.43	25.00	3.57	7.14	10.71	14.29	17.86
37	25.00	3.57	7.14	10.71	14.29	17.86	21.43
38	25.00	7.14	10.71	14.29	17.86	21.43	3.57
39	25.00	10.71	14.29	17.86	21.43	3.57	7.14
40	25.00	14.29	17.86	21.43	3.57	7.14	10.71
41	25.00	17.86	21.43	3.57	7.14	10.71	14.29
42	25.00	21.43	3.57	7.14	10.71	14.29	17.86

Table S3: Weight scenarios in which Factors were weighted by FAHP, Equal and sequential ranking method, and sub-factors and indicators weight is distributed equally

Factor #	Relevant factors and Sub-Factors	Indicators	Weights of Factors, Sub factors and indicators using different approach (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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					Seq-1	Seq-2	Seq-3	Seq-4	Seq-5	Seq-6	Seq-7	Seq-8	Seq-9	Seq-10	Seq-11	Seq-12	Seq-13	Seq-14	Seq-15	Seq-16	Seq-17	Seq-18	Seq-19	Seq-20	Seq-21	Seq-22	Seq-23	Seq-24	Seq-25	Seq-26	Seq-27	Seq-28	Seq-29	Seq-30	Seq-31	Seq-32	Seq-33	Seq-34	Seq-35	Seq-36	Seq-37	Seq-38	Seq-39	Seq-40	Seq-41	Seq-42																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
1	Natural features		24.92%	14.29%	3.57%	3.57%	3.57%	3.57%	3.57%	3.57%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%	7.14%

			Table S4: Weight scenarios in which Factors were weighted by FAHP, Equal and sequential ranking method, and sub-factors were weighted using FAHP and indicators with equal weights																																									
Factor #	Relevant factors and Sub-Factors	Indicators	FAHP	Equal	Weights of Factors, Sub factors and indicators (%)																																							
					Sequential Ranking approach																												Seq-29	Seq-30	Seq-31	Seq-32	Seq-33	Seq-34	Seq-35	Seq-36	Seq-37	Seq-38	Seq-39	Seq-40
1	Natural features		24.92%	14.29%	3.57%	3.57%	3.57%	3.57%	3.57%	3.57%	7.14%	7.14%	7.14%	7.14%	7.14%	10.71%	10.71%	10.71%	10.71%	14.29%	14.29%	14.29%	14.29%	14.29%	17.86%	17.86%	17.86%	17.86%	17.86%	17.86%	21.43%	21.43%	21.43%	21.43%	21.43%	21.43%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%		
	Geography		2.18%	1.25%	0.31%	0.31%	0.31%	0.31%	0.31%	0.62%	0.62%	0.62%	0.62%	0.62%	0.94%	0.94%	0.94%	0.94%	0.94%	1.25%	1.25%	1.25%	1.25%	1.25%	1.56%	1.56%	1.56%	1.56%	1.56%	1.87%	1.87%	1.87%	1.87%	1.87%	1.87%	2.18%	2.18%	2.18%	2.18%	2.18%	2.18%			
		Basin area in each country [Km2]	1.09%	0.62%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%	0.47%	0.47%	0.47%	0.47%	0.47%	0.62%	0.62%	0.62%	0.62%	0.62%	0.78%	0.78%	0.78%	0.78%	0.78%	0.94%	0.94%	0.94%	0.94%	0.94%	0.94%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	
	Hydrography		1.09%	0.62%	0.16%	0.16%	0.16%	0.16%	0.16%	0.16%	0.31%	0.31%	0.31%	0.31%	0.31%	0.47%	0.47%	0.47%	0.47%	0.47%	0.62%	0.62%	0.62%	0.62%	0.62%	0.78%	0.78%	0.78%	0.78%	0.78%	0.94%	0.94%	0.94%	0.94%	0.94%	0.94%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%		
		The whole area in each country [Km2]	1.41%	0.81%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.40%	0.40%	0.40%	0.40%	0.40%	0.60%	0.60%	0.60%	0.60%	0.60%	0.81%	0.81%	0.81%	0.81%	0.81%	1.01%	1.01%	1.01%	1.01%	1.01%	1.21%	1.21%	1.21%	1.21%	1.21%	1.21%	1.41%	1.41%	1.41%	1.41%	1.41%	1.41%		
	Climate		1.41%	0.81%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.40%	0.40%	0.40%	0.40%	0.40%	0.60%	0.60%	0.60%	0.60%	0.60%	0.81%	0.81%	0.81%	0.81%	0.81%	1.01%	1.01%	1.01%	1.01%	1.01%	1.21%	1.21%	1.21%	1.21%	1.21%	1.21%	1.41%	1.41%	1.41%	1.41%	1.41%	1.41%		
		River length in each country [Km]	7.67%	4.40%	1.10%	1.10%	1.10%	1.10%	1.10%	1.10%	2.20%	2.20%	2.20%	2.20%	2.20%	3.30%	3.30%	3.30%	3.30%	3.30%	4.40%	4.40%	4.40%	4.40%	4.40%	5.50%	5.50%	5.50%	5.50%	5.50%	6.60%	6.60%	6.60%	6.60%	6.60%	6.60%	7.70%	7.70%	7.70%	7.70%	7.70%	7.70%		
	Hydrology		2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	
		Köppen Aridity Index	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	
	Ecology		2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%
		Median Drought vulnerability index Resilience Index]	7.67%	4.40%	1.10%	1.10%	1.10%	1.10%	1.10%	1.10%	2.20%	2.20%	2.20%	2.20%	2.20%	3.30%	3.30%	3.30%	3.30%	3.30%	4.40%	4.40%	4.40%	4.40%	4.40%	5.50%	5.50%	5.50%	5.50%	5.50%	6.60%	6.60%	6.60%	6.60%	6.60%	6.60%	7.70%	7.70%	7.70%	7.70%	7.70%	7.70%		
	Ecology		3.84%	2.20%	0.55%	0.55%	0.55%	0.55%	0.55%	0.55%	1.10%	1.10%	1.10%	1.10%	1.10%	1.65%	1.65%	1.65%	1.65%	1.65%	2.20%	2.20%	2.20%	2.20%	2.20%	2.75%	2.75%	2.75%	2.75%	2.75%	3.30%	3.30%	3.30%	3.30%	3.30%	3.30%	3.85%	3.85%	3.85%	3.85%	3.85%	3.85%		
		Annualwater contribution [Bm3/yr]	3.84%	2.20%	0.55%	0.55%	0.55%	0.55%	0.55%	0.55%	1.10%	1.10%	1.10%	1.10%	1.10%	1.65%	1.65%	1.65%	1.65%	1.65%	2.20%	2.20%	2.20%	2.20%	2.20%	2.75%	2.75%	2.75%	2.75%	2.75%	3.30%	3.30%	3.30%	3.30%	3.30%	3.30%	3.85%	3.85%	3.85%	3.85%	3.85%	3.85%		
	Ecology		5.99%	3.43%	0.86%	0.86%	0.86%	0.86%	0.86%	0.86%	1.72%	1.72%	1.72%	1.72%	1.72%	2.58%	2.58%	2.58%	2.58%	2.58%	3.43%	3.43%	3.43%	3.43%	3.43%	4.29%	4.29%	4.29%	4.29%	4.29%	5.15%	5.15%	5.15%	5.15%	5.15%	5.15%	6.01%	6.01%	6.01%	6.01%	6.01%	6.01%		
		Water stress index[%]	2.00%	1.14%	0.29%	0.29%	0.29%	0.29%	0.29%	0.29%	0.57%	0.57%	0.57%	0.57%	0.57%	0.86%	0.86%	0.86%	0.86%	0.86%	1.14%	1.14%	1.14%	1.14%	1.14%	1.43%	1.43%	1.43%	1.43%	1.43%	1.72%	1.72%	1.72%	1.72%	1.72%	1.72%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%		
	Ecology		2.00%	1.14%	0.29%	0.29%	0.29%	0.29%	0.29%	0.29%	0.57%	0.57%	0.57%	0.57%	0.57%	0.86%	0.86%	0.86%	0.86%	0.86%	1.14%	1.14%	1.14%	1.14%	1.14%	1.43%	1.43%	1.43%	1.43%	1.43%	1.72%	1.72%	1.72%	1.72%	1.72%	1.72%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%		
		Minimum environmental flow with moderate mgt class [Mm3/year]	2.00%	1.14%	0.29%	0.29%	0.29%	0.29%	0.29%	0.29%	0.57%	0.57%	0.57%	0.57%	0.57%	0.86%	0.86%	0.86%	0.86%	0.86%	1.14%	1.14%	1.14%	1.14%	1.14%	1.43%	1.43%	1.43%	1.43%	1.43%	1.72%	1.72%	1.72%	1.72%	1.72%	1.72%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%		
	Ecology		2.00%	1.14%	0.29%	0.29%	0.29%	0.29%	0.29%	0.29%	0.57%	0.57%	0.57%	0.57%	0.57%	0.86%	0.86%	0.86%	0.86%	0.86%	1.14%	1.14%	1.14%	1.14%	1.14%	1.43%	1.43%	1.43%	1.43%	1.43%	1.72%	1.72%	1.72%	1.72%	1.72%	1.72%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%		
		Greenhouse gas emissions(kt of CO2 eq)	2.00%	1.14%	0.29%	0.29%	0.29%	0.29%	0.29%	0.29%	0.57%	0.57%	0.57%	0.57%	0.57%	0.86%	0.86%	0.86%	0.86%	0.86%	1.14%	1.14%	1.14%	1.14%	1.14%	1.43%	1.43%	1.43%	1.43%	1.43%	1.72%	1.72%	1.72%	1.72%	1.72%	1.72%	2.00%	2.00%						

Table S5: A sample calculation of riparian countries water apportionment from the Blue Nile sub-basin in which factors are weighted by FAHP and sub-factors weight was distributed equally

Factor #	Relevant factors and Indicators under them	Indicator relationship with score	Weight (%)	Score of individual watercourse states				Estimate of countries weighted share from each indicators			
				Egypt	Ethiopia	Sudan	Total	Egypt	Ethiopia	Sudan	Total
1	Natural features		24.92%								
	SF1 - Basin area in each country [Km2]	Direct	2.49%	302,452	365,318	1,396,230	2,064,000	0.004	0.004	0.017	0.025
	SF1 - The whole area in each country [Km2]	Direct	2.49%	996,960	1,144,035	1,864,049	4,005,044	0.006	0.007	0.012	0.025
	SF2 - River length in each country [Km]	Direct	4.98%	1,747	1,321	2,827	5,895	0.015	0.011	0.024	0.050
	SF3 - Köppen Aridity Index (Precipitation/Temperature+33) in each country	Reverse	1.66%	0.49	20.97	4.26	25.72	0.015	0.000	0.002	0.017
	SF3 - Median Drought vulnerability index	Direct	1.66%	0.20	0.72	0.61	1.53	0.002	0.008	0.007	0.017
	SF3 - Water-food-energy risk index or [Resilience Index]	Reverse	1.66%	1.51	2.94	2.26	6.71	0.008	0.004	0.005	0.017
	SF4 - Annual surface water contribution of each countries [Bm3/year]	Direct	2.49%	0.00	53.22	0.00	53.22	0.000	0.025	0.000	0.025
	SF4 - Water stress index[%] in each country	Direct	2.49%	117.30	32.26	118.60	268.16	0.011	0.003	0.011	0.025
	SF5 - 95% time flow exceeded minimum environmental flow with moderate management class [Mm3/year]	Direct	1.66%	1,233.07	652.00	988.58	2,873.65	0.007	0.004	0.006	0.017
	SF5 - Total greenhouse gas emissions (kt of CO2 equivalent) in each country	Reverse	1.66%	295,500	185,292	491,982	972,774	0.005	0.008	0.003	0.017
	SF5 - Environmental performance index in each country	Direct	1.66%	43.30	34.40	34.80	112.50	0.006	0.005	0.005	0.017
2	Social and economic needs of the watercourse States concerned		15.57%								
	SF8 - GDP per capita in each country [Current \$]	Reverse	0.49%	3,020.00	857.50	780.60	4,658.10	0.001	0.002	0.002	0.005
	SF8 - Gross National income per capita in each country [\$]	Reverse	0.49%	11,350.00	2,140.00	4,430.00	17,920.00	0.001	0.003	0.001	0.005
	SF8 - Exports and imports trade (% of GDP)	Reverse	0.49%	48.28	31.17	22.59	102.04	0.001	0.002	0.002	0.005
	SF8 - Income index	Reverse	0.49%	0.71	0.44	0.56	1.70	0.001	0.002	0.002	0.005
	SF9 - Unemployment in the basin in each country [%]	Direct	0.97%	10.80	2.10	16.50	29.40	0.004	0.001	0.005	0.010
	SF9 - Vulnerable employment (% of total employment)	Direct	0.97%	21.00	86.00	50.00	157.00	0.001	0.005	0.003	0.010
	SF10 - Population with access to electricity [%]	Reverse	0.32%	100.00	45.00	59.80	204.80	0.001	0.001	0.001	0.003
	SF10 - Relative significance of hydropower in each Nile basin countries[%]	Direct	0.32%	12.00	95.00	49.00	156.00	0.000	0.002	0.001	0.003
	SF10 - Population using basic drinking-water supply [%]	Reverse	0.32%	99.00	41.00	60.00	200.00	0.001	0.002	0.001	0.003
	SF10 - People with access to clean cooking [%]	Reverse	0.32%	98.00	4.00	41.00	143.00	0.000	0.003	0.000	0.003
	SF10 - Water supply and sanitation index	Reverse	0.32%	98.90	39.74	66.80	205.43	0.001	0.002	0.001	0.003
	SF10 - Infrastructure development index	Reverse	0.32%	88.39	10.49	17.16	116.04	0.000	0.002	0.001	0.003
	SF11 - Human Development Index (HDI) in each country [%]	Reverse	1.95%	0.70	0.47	0.51	1.68	0.005	0.007	0.007	0.019
	SF12 - Multidimensional Poverty index	Direct	0.65%	0.02	0.49	0.28	0.79	0.000	0.004	0.002	0.006
	SF12 - Population living below income poverty line [%]	Direct	0.65%	1.30	27.30	14.90	43.50	0.000	0.004	0.002	0.006
	SF12 - Hunger Index	Direct	0.65%	14.60	28.90	32.80	76.30	0.001	0.002	0.003	0.006
	SF13 - Education index	Reverse	1.95%	0.61	0.34	0.34	1.28	0.004	0.008	0.008	0.019
	SF14 - Life expectancy Index	Reverse	1.95%	71.66	65.87	64.70	202.23	0.006	0.007	0.007	0.019
	SF15 - Gender Development Index (GDI) in each country [%]	Reverse	1.95%	0.88	0.84	0.84	2.56	0.006	0.007	0.007	0.019
3	The population dependent on the watercourse in each watercourse state		11.21%								
	SF16 - Population in the Nile basin countries [in millions] in 2019	Direct	1.12%	100.39	112.08	42.81	255.28	0.004	0.005	0.002	0.011
	SF16 - Population living in the basin in each country [%]	Direct	1.12%	93.77	37.83	86.98	218.58	0.005	0.002	0.004	0.011
	SF16 - Population growth rate [%]	Direct	5.60%	2.03	2.62	2.39	7.05	0.016	0.021	0.019	0.056
	SF16 - Employment in agriculture (% of total employment)	Direct	1.12%	24.00	66.00	40.00	130.00	0.002	0.006	0.003	0.011
	SF16 - Employment in marine and inland fisheries [No]	Direct	1.12%	796,400	23,365	17,400	837,165	0.011	0.000	0.000	0.011
	SF16 - Agriculture, forestry, and fishing, value added (% of GDP)	Direct	1.12%	11.00	33.90	28.40	73.30	0.002	0.005	0.004	0.011
4	The effects of the use or uses of the watercourses in one watercourse State on other watercourse states		25.62%								
	SF17 - Fertile soil loss by erosion or sediment yield per year [Million tons/year]	Direct	8.54%	-91.68	140.00	-50.09	140.00	0.000	0.085	0.000	0.085
	SF18 - Average annual surface water volumetric reliability index [%]	Reverse	8.54%	0.81	1.00	1.00	2.81	0.033	0.026	0.026	0.085
	SF19 - Water quality index	Direct	8.54%	77.98	55.27	67.04	200.29	0.033	0.024	0.029	0.085
5	Existing and potential uses of the watercourse		10.57%								
	SF20 - Gross Irrigation water demand in each basin countries [Bm3/yr]	Direct	1.32%	57.07	2.02	13.32	72.41	0.010	0.000	0.002	0.013
	SF20 - Potential irrigation remaining area in each basin country [Hectare]	Direct	1.76%	820,000	2,566,000	735,000	4,121,000	0.004	0.011	0.003	0.018
	SF20 - Existing domestic and industrial water demand in each basin countries [Bm3/year]	Direct	1.32%	10.20	0.19	0.29	10.68	0.013	0.000	0.000	0.013
	SF20 - Projected domestic water demand by 2050 in each basin countries [Bm3/year]	Direct	1.76%	13.14	2.43	2.87	18.44	0.013	0.002	0.003	0.018
	SF20 - Energy Consumption per Capita (Kg of oil equivalent per capita)	Direct	1.32%	913.06	493.47	342.13	1,748.66	0.007	0.004	0.003	0.013
	SF20 - Existing Hydropower production in the basin in each country[MW]	Direct	1.32%	2,862.00	1,946.00	1,593.00	6,401.00	0.006	0.004	0.003	0.013
	SF20 - Remaining potential Hydropower production in the basin in each country[MW]	Direct	1.76%	40.00	11,583.00	3,280.00	14,903.00	0.000	0.014	0.004	0.018
6	Conservation, protection, development and economy of uses and the costs of measures taken		8.16%								
	SF21 - Areas exposed for severe soil erosion in each country with a rate of (>80kg/ha/yr) [Km2]	Direct	2.04%	0.00	39,375.00	0.00	39,375.00	0.000	0.020	0.000	0.020
	SF22 - Loss of water by evaporation from dams in each basin countries [BCM/year]	Reverse	1.02%	12.58	0.18	4.56	17.32	0.000	0.010	0.000	0.010
	SF22 - Water use efficiency [USD/m3]	Direct	1.02%	3.80	1.90	1.60	7.30	0.005	0.003	0.002	0.010
	SF22 - Wetland area [Km2]	Direct	1.02%	426.00	2,828.70	10,846.00	14,100.70	0.000	0.002	0.008	0.010
	SF22 - Cereal yield (kg per hectare)	Direct	1.02%	72,525.00	22,167.00	5,895.00	100,587.00	0.007	0.002	0.001	0.010
	SF23 - Gross investment made on hydraulic structures or Dams [million USD]	Direct	1.02%	1.00	7.39	4.38	12.77	0.001	0.006	0.003	0.010
	SF23 - Total agricultural export value (1000)	Reverse	1.02%	4,056,931	2,373,603	551,613	6,982,147	0.001	0.002	0.007	0.010
7	The availability of alternatives, of comparable value		3.95%								
	SF24 - Alternative energy source from Solar(both PV and CSP) [TWh/year]	Reverse	0.003	58,823.00	50,113.00	165,239.00	274,175.00	0.001	0.001	0.000	0.003
	SF24 - Alternative energy source from Wind [TWh/year]	Reverse	0.003	36,601.00	14,838.00	61,661.00	113,100.00	0.001	0.002	0.000	0.003
	SF24 - Alternative energy source from Geothermal [MW]	Reverse	0.003	0.00	10,000.00	0.00	10,000.00	0.001	0.000	0.001	0.003
	SF24 - Alternative energy source from oil [proved oil reserves in thousand million barrels]	Reverse	0.003	3.47	0.00	1.50	4.97	0.000	0.002	0.001	0.003
	SF24 - Alternative energy source from natural gas [proved reserves trillion cubic metres]	Reverse	0.003	1.85	0.00	0.00	1.85	0.000	0.001	0.001	0.003
	SF24 - Alternative energy source from generated waste via incineration method [GWh]	Reverse	0.003	287,088.00	49,946.00	107,020.00	444,054.00	0.000	0.002	0.001	0.003
	SF24 - Total Renewable ground water resource[BCM/yr]	Reverse	0.003	1.50	20.00	3.00	24.50	0.002	0.000	0.001	0.003
	SF25 - Average income from Tourism [Million US\$]	Reverse	0.004	6,900.35	1,010.87	1,029.00	8,940.22	0.000	0.002	0.002	0.004
	SF25 - Alternative source of food and income from Livestock resource	-	0.004					0.000	0.000	0.000	0.000
	- Cattle [Head]	Reverse	0.001	5,064,509	60,926,913	30,734,061	96,725,483	0.001	0.000	0.000	0.001
	- Sheep [Head]	Reverse	0.001	5,697,716	31,836,701	40,573,686	78,108,103	0.001	0.000	0.000	0.001
	- Chicken [1000 Head]	Reverse	0.001	156,453	59,489	48,299	264,241	0.000	0.000	0.000	0.001
	- Goat [Head]	Reverse	0.001	4,351,545	30,719,382	31,443,790	66,514,712	0.001	0.000	0.000	0.001
	- Beehives[No]	Reverse	0.001	877,637	6,139,990	76,095	7,093,722	0.000	0.000	0.001	0.001
	SF25 - 55 years average fish and aquaculture production [metric ton/yr]	Reverse	0.004	732,455.61	12,313.83	38,079.64	782,849.08	0.000	0.003	0.001	0.004
	SF25 - Industry value added (%GDP)- including construction industry	Reverse	0.004	35.08	27.26	2.38	64.72	0.000	0.000	0.003	0.004
	SF25 - Employment in service provision sector [% of total employment]	Reverse	0.004	48.55	21.80	41.86	112.21	0.001	0.002	0.001	0.004
Total share								0.294	0.415	0.291	1.000

Table S6: A sample calculation of riparian countries water apportionment from the Tekeze-Atbara sub-basin in which factors are weighted by FAHP and sub-factors weight was distributed equally

Factors #	Relevant factors and Indicators under them	Indicator relationship with score	Weight (%)	Score of individual watercourse states				Estimate of countries weighted share from each indicators			
				Egypt	Ethiopia	Sudan	Total	Egypt	Ethiopia	Sudan	Total
1	Natural features		24.92%								
	SF1 - Basin area in each country [Km2]	Direct	2.49%	302,452	365,318	1,396,230	2,064,000	0.004	0.004	0.017	0.025
	SF1 - The whole area in each country [Km2]	Direct	2.49%	996,960	1,144,035	1,864,049	4,005,044	0.006	0.007	0.012	0.025
	SF2 - River length in each country [Km]	Direct	4.98%	1,747	1,146	2,307	5,200	0.017	0.011	0.022	0.050
	SF3 - Köppen Aridity Index (Precipitation/Temperature+33) in each country	Reverse	1.66%	0.49	12.89	4.26	17.64	0.014	0.001	0.002	0.017
	SF3 - Median Drought vulnerability index	Direct	1.66%	0.20	0.72	0.61	1.53	0.002	0.008	0.007	0.017
	SF3 - Water-food-energy risk index or [Resilience Index]	Reverse	1.66%	1.51	2.33	2.26	6.10	0.007	0.005	0.005	0.017
	SF4 - Annual surface water contribution of each countries [Bm3/year]	Direct	2.49%	0.00	13.70	0.00	13.70	0.000	0.025	0.000	0.025
	SF4 - Water stress index[%] in each country	Direct	2.49%	117.30	21.72	118.60	257.62	0.011	0.002	0.011	0.025
	SF5 - 95% time flow exceeded minimum environmental flow with moderate management class [Mm3/year]	Direct	1.66%	1,233.07	402.00	988.58	2,623.65	0.008	0.003	0.006	0.017
	SF5 - Total greenhouse gas emissions (kt of CO2 equivalent) in each country	Reverse	1.66%	295,500	185,292	491,982	972,774	0.005	0.008	0.003	0.017
	SF5 - Environmental performance index in each country	Direct	1.66%	43.30	34.40	34.80	112.50	0.006	0.005	0.005	0.017
2	Social and economic needs of the watercourse States concerned		15.57%								0.000
	SF8 - GDP per capita in each country [Current \$]	Reverse	0.49%	3,020.00	750.00	780.60	4,550.60	0.001	0.002	0.002	0.005
	SF8 - Gross National income per capita in each country [\$]	Reverse	0.49%	11,350.00	2,110.00	4,430.00	17,890.00	0.001	0.003	0.001	0.005
	SF8 - Exports and imports trade (% of GDP)	Reverse	0.49%	48.28	34.35	22.59	105.22	0.001	0.002	0.002	0.005
	SF8 - Income index	Reverse	0.49%	0.71	0.43	0.56	1.69	0.001	0.002	0.002	0.005
	SF9 - Unemployment in the basin in each country [%]	Direct	0.97%	10.80	4.32	16.50	31.62	0.003	0.001	0.005	0.010
	SF9 - Vulnerable employment (% of total employment)	Direct	0.97%	21.00	86.00	50.00	157.00	0.001	0.005	0.003	0.010
	SF10 - Population with access to electricity [%]	Reverse	0.32%	100.00	47.30	59.80	207.10	0.001	0.001	0.001	0.003
	SF10 - Relative significance of hydropower in each Nile basin countries[%]	Direct	0.32%	12.00	95.00	49.00	156.00	0.000	0.002	0.001	0.003
	SF10 - Population using basic drinking-water supply [%]	Reverse	0.32%	99.00	46.50	60.00	205.50	0.001	0.001	0.001	0.003
	SF10 - People with access to clean cooking [%]	Reverse	0.32%	98.00	10.16	41.00	149.16	0.000	0.002	0.001	0.003
	SF10 - Water supply and sanitation index	Reverse	0.32%	98.90	41.39	66.80	207.08	0.001	0.002	0.001	0.003
	SF10 - Infrastructure development index	Reverse	0.32%	88.39	9.63	17.16	115.18	0.000	0.002	0.001	0.003
	SF11 - Human Development Index (HDI) in each country [%]	Reverse	1.95%	0.70	0.45	0.51	1.66	0.005	0.008	0.007	0.019
	SF12 - Multidimensional Poverty index	Direct	0.65%	0.02	0.49	0.28	0.79	0.000	0.004	0.002	0.006
	SF12 - Population living below income poverty line [%]	Direct	0.65%	1.30	27.30	14.90	43.50	0.000	0.004	0.002	0.006
	SF12 - Hunger Index	Direct	0.65%	14.60	26.05	32.80	73.45	0.001	0.002	0.003	0.006
	SF13 - Education index	Reverse	1.95%	0.61	0.30	0.34	1.25	0.004	0.008	0.007	0.019
	SF14 - Life expectancy Index	Reverse	1.95%	71.66	65.71	64.70	202.06	0.006	0.007	0.007	0.019
	SF15 - Gender Development Index (GDI) in each country [%]	Reverse	1.95%	0.88	0.84	0.84	2.56	0.006	0.007	0.007	0.019
3	The population dependent on the watercourse in each watercourse state		11.21%								0.000
	SF16 - Population in the Nile basin countries [in millions] in 2019	Direct	1.87%	100.39	115.29	42.81	258.49	0.007	0.008	0.003	0.019
	SF16 - Population living in the basin in each country [%]	Direct	1.87%	93.77	0.40	86.98	181.15	0.010	0.000	0.009	0.019
	SF16 - Population growth rate [%]	Direct	1.87%	2.03	1.99	2.39	6.42	0.006	0.006	0.007	0.019
	SF16 - Employment in agriculture (% of total employment)	Direct	1.87%	24.00	63.50	40.00	127.50	0.004	0.009	0.006	0.019
	SF16 - Employment in marine and inland fisheries [No]	Direct	1.87%	796,400.0	23,365.00	17,400.00	837,165.00	0.018	0.001	0.000	0.019
	SF16 - Agriculture, forestry, and fishing, value added (% of GDP)	Direct	1.87%	11.00	24.01	28.40	63.41	0.003	0.007	0.008	0.019
4	The effects of the use or uses of the watercourses in one watercourse State on other watercourse states		25.62%								0.000
	SF17 - Fertile soil loss by erosion or sediment yield per year [Million tons/year]	Direct	8.54%	0.00	145.37	0.00	145.37	0.000	0.085	0.000	0.085
	SF18 - Average annual surface water volumetric reliability index [%]	Reverse	8.54%	0.80	1.00	1.00	2.80	0.033	0.026	0.026	0.085
	SF19 - Water quality index	Direct	8.54%	77.98	55.27	67.04	200.29	0.033	0.024	0.029	0.085
5	Existing and potential uses of the watercourse		10.57%								0.000
	SF20 - Gross Irrigation water demand in each basin countries [Bm3/yr]	Direct	1.32%	57.07	2.02	13.32	72.41	0.010	0.000	0.002	0.013
	SF20 - Potential irrigation remaining area in each basin country [Hectare]	Direct	1.76%	820,000	2,566,000	735,000	4,121,000	0.004	0.011	0.003	0.018
	[Bm3/year]	Direct	1.32%	10.20	0.19	0.29	10.68	0.013	0.000	0.000	0.013
	SF20 - Projected domestic water demand by 2050 in each basin countries [Bm3/year]	Direct	1.76%	13.14	2.43	2.87	18.44	0.013	0.002	0.003	0.018
	SF20 - Energy Consumption per Capita (Kg of oil equivalent per capita)	Direct	1.32%	913.06	328.17	342.13	1,583.36	0.008	0.003	0.003	0.013
	SF20 - Existing Hydropower production in the basin in each country[MW]	Direct	1.32%	2,862.00	1,946.00	1,593.00	6,401.00	0.006	0.004	0.003	0.013
	country[MW]	Direct	1.76%	40.00	455.00	3,280.00	3,775.00	0.000	0.002	0.015	0.018
6	Conservation, protection, development and economy of uses and the costs of measures taken		8.16%								0.000
	SF21 - Areas exposed for severe soil erosion in each country with a rate of (>80kg/ha/yr) [Km2]	Direct	2.04%	0.00	39,375.00	0.00	39,375.00	0.000	0.020	0.000	0.020
	SF22 - Loss of water by evaporation from dams in each basin countries [BCM/year]	Reverse	1.02%	12.58	0.18	4.56	17.32	0.000	0.010	0.000	0.010
	SF22 - Water use efficiency [USD/m3]	Direct	1.02%	3.80	1.90	1.60	7.30	0.005	0.003	0.002	0.010
	SF22 - Wetland area [Km2]	Direct	1.02%	426.00	2,828.70	10,846.00	14,100.70	0.000	0.002	0.008	0.010
	SF22 - Cereal yield (kg per hectare)	Direct	1.02%	72,525.00	14,095.00	5,895.00	92,515.00	0.008	0.002	0.001	0.010
	SF23 - Gross investment made on hydraulic structures or Dams [million USD]	Direct	1.02%	1.00	7.39	4.38	12.77	0.001	0.006	0.003	0.010
	SF23 - Total agricultural export value (1000)	Reverse	1.02%	4,056,931	1,187,241	551,613	5,795,785	0.001	0.003	0.006	0.010
7	The availability of alternatives, of comparable value		3.95%								0.000
	SF24 - Alternative energy source from Solar(both PV and CSP) [TWh/year]	Reverse	0.003	58,823.0	33,973.5	165,239.0	258,035.5	0.001	0.002	0.000	0.003
	SF24 - Alternative energy source from Wind [TWh/year]	Reverse	0.003	36,601.0	19,877.5	61,661.0	118,139.5	0.001	0.002	0.000	0.003
	SF24 - Alternative energy source from Geothermal [MW]	Reverse	0.003	0.00	5,000.00	0.00	5,000.00	0.001	0.000	0.001	0.003
	SF24 - Alternative energy source from oil [proved oil reserves in thousand million barrels]	Reverse	0.003	3.47	0.00	1.50	4.97	0.000	0.002	0.001	0.003
	SF24 - Alternative energy source from natural gas [proved reserves trillion cubic metres]	Reverse	0.003	1.85	0.00	0.00	1.85	0.000	0.001	0.001	0.003
	[GWh]	Reverse	0.003	287,088.0	27,670.5	107,020.0	421,778.5	0.000	0.002	0.001	0.003
	SF24 - Total Renewable ground water resource[BCM/yr]	Reverse	0.003	1.50	10.25	3.00	14.75	0.002	0.000	0.001	0.003
	SF25 - Average income from Tourism [Million US\$]	Reverse	0.004	6,900.35	534.06	1,029.00	8,463.41	0.000	0.002	0.001	0.004
	SF25 - Alternative source of food and income from Livestock resource	-	0.004					0.000	0.000	0.000	0.000
	- Cattle [Head]	Reverse	0.001	5,064,509	31,516,797	30,734,061	67,315,367	0.001	0.000	0.000	0.001
	- Sheep [Head]	Reverse	0.001	5,697,716	17,122,966	40,573,686	63,394,368	0.001	0.000	0.000	0.001
	- Chicken [1000 Head]	Reverse	0.001	156,453	30,420	48,299	235,172	0.000	0.000	0.000	0.001
	- Goat [Head]	Reverse	0.001	4,351,545	16,261,299	31,443,790	52,056,634	0.001	0.000	0.000	0.001
	- Beehives[No]	Reverse	0.001	877,637	3,069,995	76,095	4,023,727	0.000	0.000	0.001	0.001
	SF25 - 55 years average fish and aquaculture production [metric ton/yr]	Reverse	0.004	732,456	8,496	38,080	779,032	0.000	0.003	0.001	0.004
	SF25 - Industry value added (%GDP)- including construction industry	Reverse	0.004	35.08	24.54	2.38	62.00	0.000	0.000	0.003	0.004
	SF25 - Employment in service provision sector [% of total employment]	Reverse	0.004	48.55	25.41	41.86	115.82	0.001	0.002	0.001	0.004
Total share								0.305	0.396	0.299	1.000

Table S7: A sample calculation of riparian countries water apportionment from the Baro-Akobo-Sobat sub-basin in which factors are weighted by FAHP and sub-factors weight was distributed equally

Factor #	Relevant factors and Indicators under them	Indicator relationship with score	Weight (%)	Score of individual watercourse states				Estimate of countries weighted share from each indicators			
				Egypt	Ethiopia	Sudans	Total	Egypt	Ethiopia	Sudans	Total
1	Natural features		24.92%								
	SF1 - Basin area in each country [Km2]	Direct	2 49%	302,452 0	365,318 0	2,016,856 0	2,684,626 0	0 003	0 003	0 019	0 025
	SF1 - The whole area in each country [Km2]	Direct	2 49%	996,960 0	1,144,035 0	2,508,378 0	4,649,373 0	0 005	0 006	0 013	0 025
	SF2 - River length in each country [Km]	Direct	4 98%	1,746 82	838 34	1,427 72	4,012 88	0 022	0 010	0 018	0 050
	SF3 - Köppen Aridity Index (Precipitation/Temperature+33) in each country	Reverse	1 66%	0 49	20 97	10 43	31 89	0 016	0 000	0 001	0 017
	SF3 - Median Drought vulnerability index	Direct	1 66%	0 20	0 72	0 61	1 53	0 002	0 008	0 007	0 017
	SF3 - Water-food-energy risk index or [Resilience Index]	Reverse	1 66%	1 51	2 94	2 06	6 51	0 007	0 004	0 005	0 017
	SF4 - Annual surface water contribution of each countries [Bm3/year]	Direct	2 49%	0 00	12 43	0 00	12 43	0 000	0 025	0 000	0 025
	SF4 - Water stress index[%] in each country	Direct	2 49%	117 30	32 26	118 60	268 16	0 011	0 003	0 011	0 025
	management class [Mm3/year]	Direct	1 66%	1,233 07	423 50	497 51	2,154 08	0 010	0 003	0 004	0 017
	SF5 - Total greenhouse gas emissions (kt of CO2 equivalent) in each country	Reverse	1 66%	295,499 75	185,292 17	491,982 27	972,774 18	0 005	0 008	0 003	0 017
	SF5 - Environmental performance index in each country	Direct	1 66%	43 30	34 40	34 80	112 50	0 006	0 005	0 005	0 017
2	Social and economic needs of the watercourse States concerned		15.57%								
	SF8 - GDP per capita in each country [Current \$]	Reverse	0 49%	3,020 00	857 50	780 60	4,658 10	0 001	0 002	0 002	0 005
	SF8 - Gross National income per capita in each country [\$]	Reverse	0 49%	11,350 00	2,140 00	2,885 00	16,375 00	0 000	0 003	0 002	0 005
	SF8 - Exports and imports trade (% of GDP)	Reverse	0 49%	48 28	31 17	38 38	117 82	0 001	0 002	0 002	0 005
	SF8 - Income index	Reverse	0 49%	0 71	0 44	0 48	1 62	0 001	0 002	0 002	0 005
	SF9 - Unemployment in the basin in each country [%]	Direct	0 97%	10 80	2 10	14 35	27 25	0 004	0 001	0 005	0 010
	SF9 - Vulnerable employment (% of total employment)	Direct	0 97%	21 00	86 00	67 50	174 50	0 001	0 005	0 004	0 010
	SF10 - Population with access to electricity [%]	Reverse	0 32%	100 00	45 00	44 00	189 00	0 001	0 001	0 001	0 003
	SF10 - Relative significance of hydropower in each Nile basin countries[%]	Direct	0 32%	12 00	95 00	49 00	156 00	0 000	0 002	0 001	0 003
	SF10 - Population using basic drinking-water supply [%]	Reverse	0 32%	99 00	41 00	50 50	190 50	0 001	0 001	0 001	0 003
	SF10 - People with access to clean cooking [%]	Reverse	0 32%	98 00	4 00	21 00	123 00	0 000	0 003	0 001	0 003
	SF10 - Water supply and sanitation index	Reverse	0 32%	98 90	39 74	56 35	194 98	0 001	0 002	0 001	0 003
	SF10 - Infrastructure development index	Reverse	0 32%	88 39	10 49	11 22	110 10	0 000	0 002	0 001	0 003
	SF11 - Human Development Index (HDI) in each country [%]	Reverse	1 95%	0 70	0 47	0 46	1 63	0 005	0 007	0 007	0 019
	SF12 - Multidimensional Poverty index	Direct	0 65%	0 02	0 49	0 43	0 94	0 000	0 003	0 003	0 006
	SF12 - Population living below income poverty line [%]	Direct	0 65%	1 30	27 30	28 80	57 40	0 000	0 003	0 003	0 006
	SF12 - Hunger Index	Direct	0 65%	14 60	28 90	32 80	76 30	0 001	0 002	0 003	0 006
	SF13 - Education index	Reverse	1 95%	0 61	0 34	0 32	1 26	0 004	0 007	0 008	0 019
	SF14 - Life expectancy Index	Reverse	1 95%	71 66	65 87	60 99	198 53	0 006	0 006	0 007	0 019
	SF15 - Gender Development Index (GDI) in each country [%]	Reverse	1 95%	0 88	0 84	0 84	2 56	0 006	0 007	0 007	0 019
3	The population dependent on the watercourse in each watercourse state		11.21%								
	SF16 - Population in the Nile basin countries [in millions] in 2019	Direct	1 87%	100 39	112 08	53 88	266 34	0 007	0 008	0 004	0 019
	SF16 - Population living in the basin in each country [%]	Direct	1 87%	93 77	37 83	0 93	132 53	0 013	0 005	0 000	0 019
	SF16 - Population growth rate [%]	Direct	1 87%	2 03	2 62	1 49	6 15	0 006	0 008	0 005	0 019
	SF16 - Employment in agriculture (% of total employment)	Direct	1 87%	24 00	66 00	48 50	138 50	0 003	0 009	0 007	0 019
	SF16 - Employment in marine and inland fisheries [No]	Direct	1 87%	796,400 00	23,365 00	20,880 00	840,645 00	0 018	0 001	0 000	0 019
	SF16 - Agriculture, forestry, and fishing, value added (% of GDP)	Direct	1 87%	11 00	33 90	20 15	65 05	0 003	0 010	0 006	0 019
4	The effects of the use or uses of the watercourses in one watercourse State on other watercourse states		25.62%								
	SF17 - Fertile soil loss by erosion or sediment yield per year [Million tons/year]	Direct	8 54%	0 00	14 60	0 00	14 60	0 000	0 085	0 000	0 085
	SF18 - Average annual surface water volumetric reliability index [%]	Reverse	8 54%	0 81	1 00	1 00	2 81	0 033	0 026	0 026	0 085
	SF19 - Water quality index	Direct	8 54%	77 98	55 27	67 04	200 29	0 033	0 024	0 029	0 085
5	Existing and potential uses of the watercourse		10.57%								
	SF20 - Gross Irrigation water demand in each basin countries [Bm3/yr]	Direct	1 32%	57 07	2 02	13 33	72 42	0 010	0 000	0 002	0 013
	SF20 - Potential irrigation remaining area in each basin country [Hectare]	Direct	1 76%	820,000	2,566,000	2,234,500	5,620,500	0 004	0 012	0 002	0 018
	[Bm3/year]	Direct	1 32%	10 20	0 19	2 98	13 37	0 010	0 000	0 003	0 013
	SF20 - Projected domestic water demand by 2050 in each basin countries [Bm3/year]	Direct	1 76%	13 14	2 43	3 10	18 67	0 012	0 002	0 003	0 018
	SF20 - Energy Consumption per Capita (Kg of oil equivalent per capita)	Direct	1 32%	913 06	493 47	342 13	1,748 66	0 007	0 004	0 003	0 013
	SF20 - Existing Hydropower production in the basin in each country[MW]	Direct	1 32%	2,862 00	1,946 00	1,591 60	6,399 60	0 006	0 004	0 003	0 013
	SF20 - Remaining potential Hydropower production in the basin in each country[MW]	Direct	1 76%	40 00	3,371 00	5,851 40	9,262 40	0 000	0 006	0 011	0 018
6	Conservation, protection, development and economy of uses and the costs of measures taken		8.16%								
	SF21 - Areas exposed for severe soil erosion in each country with a rate of (>80kg/ha/yr) [Km2]	Direct	2 04%	0 00	39,375 00	0 00	39,375 00	0 000	0 020	0 000	0 020
	SF22 - Loss of water by evaporation from dams in each basin countries [BCM/year]	Reverse	1 02%	12 58	0 18	4 56	17 32	0 000	0 006	0 004	0 010
	SF22 - Water use efficiency [USD/m3]	Direct	1 02%	3 80	1 90	1 60	7 30	0 005	0 003	0 002	0 010
	SF22 - Wetland area [Km2]	Direct	1 02%	426 00	2,828 70	69,058 30	72,313 00	0 000	0 000	0 010	0 010
	SF22 - Cereal yield (kg per hectare)	Direct	1 02%	72,525 00	22,167 00	5,895 00	100,587 00	0 007	0 002	0 001	0 010
	SF23 - Gross investment made on hydraulic structures or Dams [million USD]	Direct	1 02%	1 00	7 39	4 38	12 77	0 001	0 006	0 003	0 010
	SF23 - Total agricultural export value (1000)	Reverse	1 02%	4,056,931	2,373,603	551,613,000	558,043,534	0 004	0 006	0 000	0 010
7	The availability of alternatives, of comparable value		3.95%								
	SF24 - Alternative energy source from Solar(both PV and CSP) [TWh/year]	Reverse	0 003	58,823 00	50,113 00	165,239 00	274,175 00	0 001	0 001	0 000	0 003
	SF24 - Alternative energy source from Wind [TWh/year]	Reverse	0 003	36,601 00	14,838 00	61,661 00	113,100 00	0 001	0 002	0 000	0 003
	SF24 - Alternative energy source from Geothermal [MW]	Reverse	0 003	0 00	10,000 00	0 00	10,000 00	0 001	0 000	0 001	0 003
	SF24 - Alternative energy source from oil [proved oil reserves in thousand million barrels]	Reverse	0 003	3 47	0 00	5 00	8 47	0 001	0 002	0 000	0 003
	SF24 - Alternative energy source from natural gas [proved reserves trillion cubic m tres]	Reverse	0 003	1 85	0 00	0 00	1 85	0 000	0 001	0 001	0 003
	[GWh]	Reverse	0 003	287,088 00	49,946 00	107,020 00	444,054 00	0 000	0 002	0 001	0 003
	SF24 - Total Renewable ground water resource[BCM/yr]	Reverse	0 003	1 50	20 00	3 50	25 00	0 002	0 000	0 001	0 003
	SF25 - Average income from Tourism [Million US\$]	Reverse	0 004	6,900 35	1,010 87	527 50	8,438 72	0 000	0 001	0 002	0 004
	SF25 - Alternative source of food and income from Livestock resource	0 004	0	0	0	0	0	0 000	0 000	0 000	0 000
	- Cattle [Head]	Reverse	0 001	5,064,509	60,926,913	21,285,781	87,277,203	0 001	0 000	0 000	0 001
	- Sheep [Head]	Reverse	0 001	5,697,716	31,836,701	29,198,500	66,732,917	0 001	0 000	0 000	0 001
	- Chicken [1000 Head]	Reverse	0 001	156,453	59,489	31,650	247,592	0 000	0 000	0 000	0 001
	- Goat [Head]	Reverse	0 001	4,351,545	30,719,382	22,504,212	57,575,139	0 001	0 000	0 000	0 001
	- Beehives[No]	Reverse	0 001	877,637	6,139,990	76,095	7,093,722	0 000	0 000	0 001	0 001
	SF25 - 55 years average fish and aquaculture production [metric ton/yr]	Reverse	0 004	732,456	12,314	37,360	782,129	0 000	0 003	0 001	0 004
	SF25 - Industry value added (%GDP)- including construction industry	Reverse	0 004	35 08	27 26	11 50	73 84	0 001	0 001	0 002	0 004
	SF25 - Employment in service provision sector [% of total employment]	Reverse	0 004	48 55	21 80	38 43	108 78	0 001	0 002	0 001	0 004
Total share								0.314	0.402	0.284	1.000

Table S8: A sample calculation of Riparian countries water apportionment from the White Nile Sub-Basin in which factors are weighted by FAHP and sub-factor weight was distributed equally

Factors #	Relevant factors and Indicators	Indicator relationship with score	Weights (%)	Score of individual watercourse states				Estimate of countries weighted water share from each indicators			
				Egypt	Sudan & South Sudan	Equatorial states	Total	Egypt	Sudan & South Sudan	Equatorial states	Total
1	Natural features		24.92%								
	Basin area in each country [Km2]	Direct	2.49%	302,452.0	2,016,856.00	466,218.00	2,785,526.0	0.003	0.018	0.004	0.025
	The whole area in each country [Km2]	Direct	2.49%	996,960.0	2,508,378.00	4,178,946.0	7,684,284.0	0.003	0.008	0.014	0.025
	River length in each country [Km]	Direct	4.98%	1,746.82	3,657.14	969.36	6,373.32	0.014	0.029	0.008	0.050
	Köppen Aridity Index (Precipitation/Temperature+33) in each country	Reverse	1.66%	0.49	10.43	20.46	31.38	0.016	0.001	0.000	0.017
	Median Drought vulnerability index	Direct	1.66%	0.20	0.61	0.65	1.46	0.002	0.007	0.007	0.017
	Water-food-energy risk index or [Resilience Index]	Reverse	1.66%	1.51	2.06	2.76	6.34	0.007	0.005	0.004	0.017
	Annual surface water contribution of each countries [Bm3/year]	Direct	2.49%	0.00	0.00	31.30	31.30	0.000	0.000	0.025	0.025
	Water stress index[%] in each country	Direct	2.49%	117.30	61.41	10.16	188.88	0.015	0.008	0.001	0.025
	95% time flow exceeded minimum environmental flow with moderate management class [Mm3/year]	Direct	1.66%	620.55	497.51	292.00	1,410.06	0.007	0.006	0.003	0.017
	Total greenhouse gas emissions (kt of CO2 equivalent) in each country	Reverse	1.66%	295,499.7	491,982.27	197,599.32	985,081.33	0.005	0.003	0.008	0.017
	Environmental performance index in each country	Direct	1.66%	43.30	34.80	33.31	111.41	0.006	0.005	0.005	0.017
2	Social and economic needs of the watercourse States concerned		15.57%								0.000
	GDP per capita in each country [Current \$]	Reverse	0.49%	3,020.00	780.60	887.25	4,687.85	0.001	0.002	0.002	0.005
	Gross National income per capita in each country [\$]	Reverse	0.49%	11,350.00	2,885.00	2,183.33	16,418.33	0.000	0.002	0.002	0.005
	Exports and imports trade (% of GDP)	Reverse	0.49%	48.28	38.38	46.28	132.94	0.001	0.002	0.002	0.005
	Income index	Reverse	0.49%	0.71	0.48	0.42	1.60	0.001	0.002	0.002	0.005
	Unemployment in the basin in each country [%]	Direct	0.97%	10.80	14.35	2.17	27.32	0.004	0.005	0.001	0.010
	Vulnerable employment (% of total employment)	Direct	0.97%	21.00	67.50	75.33	163.83	0.001	0.004	0.004	0.010
	Population with access to electricity [%]	Reverse	0.32%	100.00	44.00	36.32	180.32	0.001	0.001	0.001	0.003
	Relative significance of hydropower in each Nile basin countries[%]	Direct	0.32%	12.00	49.00	67.17	128.17	0.000	0.001	0.002	0.003
	Population using basic drinking-water supply [%]	Reverse	0.32%	99.00	50.50	54.50	204.00	0.001	0.001	0.001	0.003
	People with access to clean cooking [%]	Reverse	0.32%	98.00	21.00	3.70	122.70	0.000	0.000	0.003	0.003
	Water supply and sanitation index	Reverse	0.32%	98.90	56.35	57.78	213.03	0.001	0.001	0.001	0.003
	Infrastructure development index	Reverse	0.32%	88.39	11.22	18.20	117.81	0.000	0.002	0.001	0.003
	Human Development Index (HDI) in each country [%]	Reverse	1.95%	0.70	0.46	0.51	1.67	0.005	0.008	0.007	0.019
	Multidimensional Poverty index	Direct	0.65%	0.02	0.43	0.30	0.74	0.000	0.004	0.003	0.006
	Population living below income poverty line [%]	Direct	0.65%	1.30	28.80	55.25	85.35	0.000	0.002	0.004	0.006
	Hunger Index	Direct	0.65%	14.60	32.80	28.38	75.78	0.001	0.003	0.002	0.006
	Education index	Reverse	1.95%	0.61	0.32	0.47	1.40	0.005	0.009	0.006	0.019
	Life expectancy Index	Reverse	1.95%	71.66	60.99	63.19	195.85	0.006	0.007	0.007	0.019
	Gender Development Index (GDI) in each country [%]	Reverse	1.95%	0.88	0.84	0.92	2.64	0.006	0.007	0.006	0.019
3	The population dependent on the watercourse in each watercourse state		11.21%								0.000
	Population in the Nile basin countries [in millions]-2019	Direct	1.12%	100.39	53.88	265.80	420.06	0.003	0.001	0.007	0.011
	Population living in the basin in each country [%]	Direct	1.12%	93.77	0.93	0.50	95.20	0.011	0.000	0.000	0.011
	Population growth rate [%]	Direct	5.60%	2.03	1.49	3.01	6.53	0.017	0.013	0.026	0.056
	Employment in agriculture (% of total employment)	Direct	1.12%	24.00	48.50	68.50	141.00	0.002	0.004	0.005	0.011
	Employment in marine and inland fisheries [No]	Direct	1.12%	796,400.0	20,880.00	114,613.17	931,893.17	0.010	0.000	0.001	0.011
	Agriculture, forestry, and fishing, value added (% of GDP)	Direct	1.12%	11.00	20.15	26.28	57.44	0.002	0.004	0.005	0.011
	The effects of the use or uses of the watercourses in one watercourse State on other watercourse states		25.62%								
4	Fertile soil loss by erosion or sediment yield per year [Million tons/year]	Direct	8.54%	0.00	0.87	0.47	1.34	0.000	0.056	0.030	0.085
	Average annual surface water volumetric reliability index [%]	Reverse	8.54%	0.80	1.00	1.00	2.80	0.033	0.026	0.026	0.085
	Water quality index	Direct	8.54%	77.98	67.04	62.84	207.86	0.032	0.028	0.026	0.085
5	Existing and potential uses of the watercourse		10.57%								0.000
	Gross Irrigation water demand in each basin countries [Bm3/yr]	Direct	1.32%	57.07	13.33	0.79	71.19	0.011	0.002	0.000	0.013
	Potential irrigation area in each basin country [Hectare]	Direct	1.76%	820,000	2,234,500	9,855,400	12,909,900	0.001	0.003	0.013	0.018
	Existing domestic water demand in each basin countries [Bm3/year]	Direct	1.32%	10.20	2.98	0.13	13.31	0.010	0.003	0.000	0.013
	Projected domestic water demand by 2050 in each basin countries [Bm3/year]	Direct	1.76%	13.14	3.10	11.43	27.67	0.008	0.002	0.007	0.018
	Energy Consumption per Capita (Kg of oil equivalent per capita)	Direct	1.32%	913.06	342.13	410.27	1,665.46	0.007	0.003	0.003	0.013
	Existing Hydropower production in the basin in each country[MW]	Direct	1.32%	2,862.00	1,591.60	713.00	5,166.60	0.007	0.004	0.002	0.013
	Remaining potential Hydropower production in the basin in each country[MW]	Direct	1.76%	40.00	5,851.40	4,651.00	10,542.40	0.000	0.010	0.008	0.018
	Conservation, protection, development and economy of uses and the costs of measures taken		8.16%								
6	Areas exposed for severe soil erosion in each country with a rate of (>80kg/ha/yr) [Km2]	Direct	2.04%	0.00	0.00	16,875.00	16,875.00	0.000	0.000	0.020	0.020
	Loss of water by evaporation from dams in each basin countries [BCM/year]	Reverse	1.02%	12.30	4.56	0.00	16.86	0.000	0.004	0.006	0.010
	Water use efficiency [USD/m3]	Direct	1.02%	3.80	1.60	11.56	16.96	0.002	0.001	0.007	0.010
	Wetland area [Km2]	Direct	1.02%	426.00	69,058.30	12,624.00	82,108.30	0.000	0.009	0.002	0.010
	Cereal yield (kg per hectare)	Direct	1.02%	72,525.00	5,895.00	15,671.50	94,091.50	0.008	0.001	0.002	0.010
	Gross investment made on hydraulic structures or Dams [million USD]	Direct	1.02%	1.00	4.38	0.88	6.27	0.002	0.007	0.001	0.010
	Total agricultural export value (1000)	Reverse	1.02%	4,056,931	551,613,000	878,435	556,548,366	0.002	0.000	0.008	0.010
7	The availability of alternatives, of comparable value		3.95%								0.000
	Alternative energy source from Solar(both PV and CSP) [TWh/year]	Reverse	0.003	58,823.00	165,239.00	27,573.17	251,635.17	0.001	0.000	0.002	0.003
	Alternative energy source from Wind [TWh/year]	Reverse	0.003	36,601.00	61,661.00	7,320.00	105,582.00	0.000	0.000	0.002	0.003
	Alternative energy source from oil [proved oil reserves in thousand million barrels]	Reverse	0.003	3.33	5.00	0.00	8.33	0.001	0.000	0.002	0.003
	Alternative energy source from natural gas [proved reserves trillion cubic feet]	Reverse	0.003	1.78	0.00	0.00	1.78	0.000	0.002	0.002	0.003
	Alternative energy source from generated waste via incineration method	Reverse	0.003	287,088.0	107,020.00	37,087.00	431,195.00	0.000	0.001	0.002	0.003
	Total Renewable ground water resource[BCM/yr]	Reverse	0.003	1.50	3.50	83.00	88.00	0.002	0.001	0.000	0.003
	Average income from Tourism [Million US\$]	Reverse	0.004	6,900.35	527.50	902.17	8,330.01	0.000	0.002	0.001	0.004
	Alternative source of food and income from Livestock resource	-	0.004	0	0	0	0				0.000
	- Cattle [Head]	Reverse	0.001	5,064,509	21,285,781	10,480,925	36,831,214	0.000	0.000	0.000	0.001
	- Sheep [Head]	Reverse	0.001	5,697,716	29,198,500	5,043,718	39,939,933	0.000	0.000	0.000	0.001
	- Chicken [1000 Head]	Reverse	0.001	156,453	31,650	24,672	212,775	0.000	0.000	0.000	0.001
	- Goat [Head]	Reverse	0.001	4,351,545	22,504,212	11,158,130	38,013,887	0.000	0.000	0.000	0.001
	- Beehives[No]	Reverse	0.001	877,637	76,095	982,531	1,936,263	0.000	0.001	0.000	0.001
	55 years average fish and aquaculture production [metric ton/yr]	Reverse	0.004	732,455.6	37,359.82	139,481.89	909,297.32	0.000	0.003	0.001	0.004
	Industry value added (%GDP)- including construction industry	Reverse	0.004	35.08	11.50	22.21	68.80	0.001	0.002	0.001	0.004
	Employment in service provision sector [% of total employment]	Reverse	0.004	48.55	38.43	22.47	109.45	0.001	0.001	0.002	0.004
Total share								0.290	0.347	0.362	1.000

Table S9: A Summary of Blue Nile Sub- basin Water Entitlement Scenarios and outputs

Scenario #	Relevant Factors Weight	Indicators weight	Indicators weight	Fraction of Share			Total
				Egypt	Ethiopia	Sudans	
1	FAHP	Equal	Equal	0.2941	0.4146	0.2913	1.00
2	Equal	Equal	Equal	0.2920	0.4132	0.2948	1.00
3	Sequential Ranking-1	Equal	Equal	0.2843	0.4305	0.2852	1.00
4	Sequential Ranking-2	Equal	Equal	0.2983	0.4369	0.2648	1.00
5	Sequential Ranking-3	Equal	Equal	0.3209	0.4115	0.2677	1.00
6	Sequential Ranking-4	Equal	Equal	0.2773	0.4317	0.2910	1.00
7	Sequential Ranking-5	Equal	Equal	0.2839	0.4104	0.3058	1.00
8	Sequential Ranking-6	Equal	Equal	0.2695	0.4279	0.3026	1.00
9	Sequential Ranking-7	Equal	Equal	0.2878	0.4271	0.2852	1.00
10	Sequential Ranking-8	Equal	Equal	0.3017	0.4341	0.2643	1.00
11	Sequential Ranking-9	Equal	Equal	0.3256	0.4034	0.2710	1.00
12	Sequential Ranking-10	Equal	Equal	0.2710	0.4312	0.2978	1.00
13	Sequential Ranking-11	Equal	Equal	0.2859	0.4030	0.3111	1.00
14	Sequential Ranking-12	Equal	Equal	0.2681	0.4269	0.3050	1.00
15	Sequential Ranking-13	Equal	Equal	0.2863	0.4261	0.2876	1.00
16	Sequential Ranking-14	Equal	Equal	0.3051	0.4307	0.2642	1.00
17	Sequential Ranking-15	Equal	Equal	0.3289	0.4006	0.2705	1.00
18	Sequential Ranking-16	Equal	Equal	0.2757	0.4231	0.3012	1.00
19	Sequential Ranking-17	Equal	Equal	0.2796	0.4025	0.3179	1.00
20	Sequential Ranking-18	Equal	Equal	0.2701	0.4195	0.3103	1.00
21	Sequential Ranking-19	Equal	Equal	0.2884	0.4187	0.2929	1.00
22	Sequential Ranking-20	Equal	Equal	0.3037	0.4297	0.2666	1.00
23	Sequential Ranking-21	Equal	Equal	0.3324	0.3971	0.2705	1.00
24	Sequential Ranking-22	Equal	Equal	0.2791	0.4203	0.3007	1.00
25	Sequential Ranking-23	Equal	Equal	0.2844	0.3943	0.3213	1.00
26	Sequential Ranking-24	Equal	Equal	0.2639	0.4190	0.3171	1.00
27	Sequential Ranking-25	Equal	Equal	0.2821	0.4182	0.2997	1.00
28	Sequential Ranking-26	Equal	Equal	0.3058	0.4223	0.2720	1.00
29	Sequential Ranking-27	Equal	Equal	0.3310	0.3962	0.2729	1.00
30	Sequential Ranking-28	Equal	Equal	0.2825	0.4169	0.3006	1.00
31	Sequential Ranking-29	Equal	Equal	0.2877	0.3915	0.3208	1.00
32	Sequential Ranking-30	Equal	Equal	0.2686	0.4109	0.3205	1.00
33	Sequential Ranking-31	Equal	Equal	0.2869	0.4101	0.3031	1.00
34	Sequential Ranking-32	Equal	Equal	0.2995	0.4218	0.2787	1.00
35	Sequential Ranking-33	Equal	Equal	0.3330	0.3888	0.2782	1.00
36	Sequential Ranking-34	Equal	Equal	0.2811	0.4159	0.3030	1.00
37	Sequential Ranking-35	Equal	Equal	0.2911	0.3881	0.3207	1.00
38	Sequential Ranking-36	Equal	Equal	0.2719	0.4081	0.3200	1.00
39	Sequential Ranking-37	Equal	Equal	0.2902	0.4073	0.3025	1.00
40	Sequential Ranking-38	Equal	Equal	0.3042	0.4137	0.2821	1.00
41	Sequential Ranking-39	Equal	Equal	0.3267	0.3883	0.2850	1.00
42	Sequential Ranking-40	Equal	Equal	0.2832	0.4085	0.3084	1.00
43	Sequential Ranking-41	Equal	Equal	0.2897	0.3872	0.3231	1.00
44	Sequential Ranking-42	Equal	Equal	0.2754	0.4047	0.3200	1.00
45	FAHP	FAHP	Equal	0.3018	0.4353	0.2629	1.00
46	Equal	FAHP	Equal	0.2999	0.4288	0.2713	1.00
47	Sequential Ranking-1	FAHP	Equal	0.2901	0.4425	0.2675	1.00
48	Sequential Ranking-2	FAHP	Equal	0.3051	0.4513	0.2436	1.00
49	Sequential Ranking-3	FAHP	Equal	0.3304	0.4166	0.2530	1.00
50	Sequential Ranking-4	FAHP	Equal	0.2821	0.4446	0.2732	1.00
51	Sequential Ranking-5	FAHP	Equal	0.2913	0.4221	0.2866	1.00
52	Sequential Ranking-6	FAHP	Equal	0.2685	0.4456	0.2859	1.00
53	Sequential Ranking-7	FAHP	Equal	0.2954	0.4392	0.2654	1.00
54	Sequential Ranking-8	FAHP	Equal	0.3094	0.4500	0.2406	1.00
55	Sequential Ranking-9	FAHP	Equal	0.3364	0.4081	0.2555	1.00
56	Sequential Ranking-10	FAHP	Equal	0.2759	0.4466	0.2776	1.00
57	Sequential Ranking-11	FAHP	Equal	0.2946	0.4156	0.2898	1.00
58	Sequential Ranking-12	FAHP	Equal	0.2664	0.4468	0.2868	1.00
59	Sequential Ranking-13	FAHP	Equal	0.2934	0.4404	0.2663	1.00
60	Sequential Ranking-14	FAHP	Equal	0.3147	0.4467	0.2385	1.00
61	Sequential Ranking-15	FAHP	Equal	0.3407	0.4068	0.2526	1.00
62	Sequential Ranking-16	FAHP	Equal	0.2818	0.4380	0.2802	1.00
63	Sequential Ranking-17	FAHP	Equal	0.2883	0.4175	0.2942	1.00
64	Sequential Ranking-18	FAHP	Equal	0.2697	0.4402	0.2901	1.00
65	Sequential Ranking-19	FAHP	Equal	0.2967	0.4338	0.2695	1.00
66	Sequential Ranking-20	FAHP	Equal	0.3127	0.4479	0.2394	1.00
67	Sequential Ranking-21	FAHP	Equal	0.3460	0.4035	0.2505	1.00
68	Sequential Ranking-22	FAHP	Equal	0.2861	0.4367	0.2772	1.00
69	Sequential Ranking-23	FAHP	Equal	0.2943	0.4090	0.2967	1.00
70	Sequential Ranking-24	FAHP	Equal	0.2634	0.4422	0.2944	1.00
71	Sequential Ranking-25	FAHP	Equal	0.2904	0.4358	0.2739	1.00
72	Sequential Ranking-26	FAHP	Equal	0.3160	0.4413	0.2427	1.00
73	Sequential Ranking-27	FAHP	Equal	0.3440	0.4047	0.2514	1.00
74	Sequential Ranking-28	FAHP	Equal	0.2915	0.4334	0.2751	1.00
75	Sequential Ranking-29	FAHP	Equal	0.2986	0.4077	0.2937	1.00
76	Sequential Ranking-30	FAHP	Equal	0.2694	0.4336	0.2970	1.00
77	Sequential Ranking-31	FAHP	Equal	0.2964	0.4272	0.2764	1.00
78	Sequential Ranking-32	FAHP	Equal	0.3097	0.4433	0.2470	1.00
79	Sequential Ranking-33	FAHP	Equal	0.3473	0.3981	0.2546	1.00
80	Sequential Ranking-34	FAHP	Equal	0.2894	0.4346	0.2760	1.00
81	Sequential Ranking-35	FAHP	Equal	0.3039	0.4044	0.2916	1.00
82	Sequential Ranking-36	FAHP	Equal	0.2737	0.4323	0.2940	1.00
83	Sequential Ranking-37	FAHP	Equal	0.3006	0.4259	0.2734	1.00
84	Sequential Ranking-38	FAHP	Equal	0.3157	0.4347	0.2496	1.00
85	Sequential Ranking-39	FAHP	Equal	0.3410	0.4001	0.2590	1.00
86	Sequential Ranking-40	FAHP	Equal	0.2927	0.4281	0.2792	1.00
87	Sequential Ranking-41	FAHP	Equal	0.3019	0.4056	0.2925	1.00
88	Sequential Ranking-42	FAHP	Equal	0.2790	0.4290	0.2919	1.00
Minimum Share				0.2634	0.3872	0.2385	
Maximum Share				0.3473	0.4513	0.3231	

Table S10: A Summary of Baro-akobo-Sobat Sub- basin Water Entitlement Scenarios and outputs

Scenario #	Relevant Factors weighting method	Sub-factors Weighting method	Indicators Weighting method	Fraction of share			
				Sudan & South			Total
				Egypt	Ethiopia	Sudan	
1	FAHP	Equal	Equal	0.314	0.402	0.284	1.000
2	Equal	Equal	Equal	0.308	0.405	0.287	1.000
3	Sequential Ranking-1	Equal	Equal	0.299	0.422	0.279	1.000
4	Sequential Ranking-2	Equal	Equal	0.310	0.425	0.264	1.000
5	Sequential Ranking-3	Equal	Equal	0.329	0.400	0.271	1.000
6	Sequential Ranking-4	Equal	Equal	0.293	0.432	0.275	1.000
7	Sequential Ranking-5	Equal	Equal	0.303	0.409	0.289	1.000
8	Sequential Ranking-6	Equal	Equal	0.281	0.416	0.303	1.000
9	Sequential Ranking-7	Equal	Equal	0.304	0.419	0.277	1.000
10	Sequential Ranking-8	Equal	Equal	0.314	0.422	0.264	1.000
11	Sequential Ranking-9	Equal	Equal	0.334	0.391	0.275	1.000
12	Sequential Ranking-10	Equal	Equal	0.289	0.433	0.278	1.000
13	Sequential Ranking-11	Equal	Equal	0.306	0.401	0.293	1.000
14	Sequential Ranking-12	Equal	Equal	0.279	0.413	0.308	1.000
15	Sequential Ranking-13	Equal	Equal	0.302	0.416	0.282	1.000
16	Sequential Ranking-14	Equal	Equal	0.319	0.419	0.263	1.000
17	Sequential Ranking-15	Equal	Equal	0.338	0.388	0.275	1.000
18	Sequential Ranking-16	Equal	Equal	0.294	0.424	0.281	1.000
19	Sequential Ranking-17	Equal	Equal	0.302	0.402	0.296	1.000
20	Sequential Ranking-18	Equal	Equal	0.282	0.405	0.312	1.000
21	Sequential Ranking-19	Equal	Equal	0.305	0.408	0.286	1.000
22	Sequential Ranking-20	Equal	Equal	0.317	0.416	0.268	1.000
23	Sequential Ranking-21	Equal	Equal	0.343	0.384	0.273	1.000
24	Sequential Ranking-22	Equal	Equal	0.298	0.421	0.281	1.000
25	Sequential Ranking-23	Equal	Equal	0.307	0.394	0.300	1.000
26	Sequential Ranking-24	Equal	Equal	0.278	0.407	0.315	1.000
27	Sequential Ranking-25	Equal	Equal	0.301	0.410	0.289	1.000
28	Sequential Ranking-26	Equal	Equal	0.320	0.408	0.272	1.000
29	Sequential Ranking-27	Equal	Equal	0.341	0.382	0.278	1.000
30	Sequential Ranking-28	Equal	Equal	0.302	0.418	0.280	1.000
31	Sequential Ranking-29	Equal	Equal	0.310	0.390	0.300	1.000
32	Sequential Ranking-30	Equal	Equal	0.283	0.398	0.319	1.000
33	Sequential Ranking-31	Equal	Equal	0.306	0.401	0.293	1.000
34	Sequential Ranking-32	Equal	Equal	0.316	0.409	0.275	1.000
35	Sequential Ranking-33	Equal	Equal	0.344	0.374	0.282	1.000
36	Sequential Ranking-34	Equal	Equal	0.300	0.415	0.285	1.000
37	Sequential Ranking-35	Equal	Equal	0.315	0.387	0.298	1.000
38	Sequential Ranking-36	Equal	Equal	0.286	0.395	0.319	1.000
39	Sequential Ranking-37	Equal	Equal	0.309	0.398	0.293	1.000
40	Sequential Ranking-38	Equal	Equal	0.321	0.401	0.279	1.000
41	Sequential Ranking-39	Equal	Equal	0.340	0.375	0.285	1.000
42	Sequential Ranking-40	Equal	Equal	0.304	0.407	0.289	1.000
43	Sequential Ranking-41	Equal	Equal	0.313	0.384	0.303	1.000
44	Sequential Ranking-42	Equal	Equal	0.291	0.392	0.317	1.000
45	FAHP	FAHP	Equal	0.312	0.425	0.264	1.000
46	Equal	FAHP	Equal	0.312	0.418	0.270	1.000
47	Sequential Ranking-1	FAHP	Equal	0.302	0.430	0.268	1.000
48	Sequential Ranking-2	FAHP	Equal	0.313	0.435	0.252	1.000
49	Sequential Ranking-3	FAHP	Equal	0.337	0.403	0.260	1.000
50	Sequential Ranking-4	FAHP	Equal	0.297	0.440	0.263	1.000
51	Sequential Ranking-5	FAHP	Equal	0.308	0.415	0.277	1.000
52	Sequential Ranking-6	FAHP	Equal	0.277	0.430	0.294	1.000
53	Sequential Ranking-7	FAHP	Equal	0.308	0.428	0.264	1.000
54	Sequential Ranking-8	FAHP	Equal	0.317	0.433	0.250	1.000
55	Sequential Ranking-9	FAHP	Equal	0.343	0.395	0.262	1.000
56	Sequential Ranking-10	FAHP	Equal	0.292	0.443	0.264	1.000
57	Sequential Ranking-11	FAHP	Equal	0.313	0.408	0.279	1.000
58	Sequential Ranking-12	FAHP	Equal	0.274	0.429	0.297	1.000
59	Sequential Ranking-13	FAHP	Equal	0.305	0.428	0.268	1.000
60	Sequential Ranking-14	FAHP	Equal	0.324	0.431	0.246	1.000
61	Sequential Ranking-15	FAHP	Equal	0.347	0.393	0.259	1.000
62	Sequential Ranking-16	FAHP	Equal	0.298	0.436	0.266	1.000
63	Sequential Ranking-17	FAHP	Equal	0.308	0.412	0.280	1.000
64	Sequential Ranking-18	FAHP	Equal	0.278	0.423	0.300	1.000
65	Sequential Ranking-19	FAHP	Equal	0.309	0.421	0.270	1.000
66	Sequential Ranking-20	FAHP	Equal	0.321	0.430	0.249	1.000
67	Sequential Ranking-21	FAHP	Equal	0.354	0.391	0.256	1.000
68	Sequential Ranking-22	FAHP	Equal	0.303	0.434	0.264	1.000
69	Sequential Ranking-23	FAHP	Equal	0.314	0.404	0.282	1.000
70	Sequential Ranking-24	FAHP	Equal	0.273	0.426	0.301	1.000
71	Sequential Ranking-25	FAHP	Equal	0.304	0.425	0.271	1.000
72	Sequential Ranking-26	FAHP	Equal	0.325	0.424	0.252	1.000
73	Sequential Ranking-27	FAHP	Equal	0.351	0.391	0.259	1.000
74	Sequential Ranking-28	FAHP	Equal	0.309	0.431	0.260	1.000
75	Sequential Ranking-29	FAHP	Equal	0.318	0.402	0.280	1.000
76	Sequential Ranking-30	FAHP	Equal	0.279	0.418	0.302	1.000
77	Sequential Ranking-31	FAHP	Equal	0.310	0.417	0.273	1.000
78	Sequential Ranking-32	FAHP	Equal	0.320	0.427	0.253	1.000
79	Sequential Ranking-33	FAHP	Equal	0.355	0.384	0.262	1.000
80	Sequential Ranking-34	FAHP	Equal	0.306	0.431	0.263	1.000
81	Sequential Ranking-35	FAHP	Equal	0.324	0.399	0.276	1.000
82	Sequential Ranking-36	FAHP	Equal	0.283	0.416	0.300	1.000
83	Sequential Ranking-37	FAHP	Equal	0.314	0.415	0.271	1.000
84	Sequential Ranking-38	FAHP	Equal	0.326	0.419	0.255	1.000
85	Sequential Ranking-39	FAHP	Equal	0.350	0.387	0.263	1.000
86	Sequential Ranking-40	FAHP	Equal	0.310	0.424	0.266	1.000
87	Sequential Ranking-41	FAHP	Equal	0.321	0.399	0.280	1.000
88	Sequential Ranking-42	FAHP	Equal	0.290	0.414	0.296	1.000
Minimum Share				0.273	0.374	0.246	
Maximum Share				0.355	0.443	0.319	

Table S11: A Summary of Tekeze-Atbara Sub- basin Water Entitlement Scenarios and Outputs

Scenario	Relevant Factors weighting method	Sub-factors Weighting method	Indicators Weighting method	Fraction of Share			Total
				Egypt	Ethiopia	Sudans	
1	FAHP	Equal	Equal	0.305	0.396	0.299	1.000
2	Equal	Equal	Equal	0.297	0.395	0.308	1.000
3	Sequential Ranking-1	Equal	Equal	0.287	0.415	0.298	1.000
4	Sequential Ranking-2	Equal	Equal	0.305	0.408	0.287	1.000
5	Sequential Ranking-3	Equal	Equal	0.327	0.377	0.296	1.000
6	Sequential Ranking-4	Equal	Equal	0.282	0.418	0.299	1.000
7	Sequential Ranking-5	Equal	Equal	0.290	0.393	0.318	1.000
8	Sequential Ranking-6	Equal	Equal	0.271	0.418	0.311	1.000
9	Sequential Ranking-7	Equal	Equal	0.291	0.411	0.298	1.000
10	Sequential Ranking-8	Equal	Equal	0.309	0.404	0.288	1.000
11	Sequential Ranking-9	Equal	Equal	0.332	0.368	0.300	1.000
12	Sequential Ranking-10	Equal	Equal	0.276	0.422	0.302	1.000
13	Sequential Ranking-11	Equal	Equal	0.292	0.385	0.323	1.000
14	Sequential Ranking-12	Equal	Equal	0.269	0.419	0.312	1.000
15	Sequential Ranking-13	Equal	Equal	0.289	0.412	0.299	1.000
16	Sequential Ranking-14	Equal	Equal	0.313	0.400	0.288	1.000
17	Sequential Ranking-15	Equal	Equal	0.336	0.364	0.300	1.000
18	Sequential Ranking-16	Equal	Equal	0.281	0.413	0.306	1.000
19	Sequential Ranking-17	Equal	Equal	0.286	0.388	0.326	1.000
20	Sequential Ranking-18	Equal	Equal	0.271	0.411	0.318	1.000
21	Sequential Ranking-19	Equal	Equal	0.291	0.404	0.304	1.000
22	Sequential Ranking-20	Equal	Equal	0.311	0.401	0.289	1.000
23	Sequential Ranking-21	Equal	Equal	0.340	0.360	0.300	1.000
24	Sequential Ranking-22	Equal	Equal	0.285	0.409	0.306	1.000
25	Sequential Ranking-23	Equal	Equal	0.291	0.380	0.329	1.000
26	Sequential Ranking-24	Equal	Equal	0.265	0.415	0.320	1.000
27	Sequential Ranking-25	Equal	Equal	0.285	0.408	0.307	1.000
28	Sequential Ranking-26	Equal	Equal	0.313	0.393	0.294	1.000
29	Sequential Ranking-27	Equal	Equal	0.338	0.361	0.301	1.000
30	Sequential Ranking-28	Equal	Equal	0.289	0.405	0.306	1.000
31	Sequential Ranking-29	Equal	Equal	0.295	0.375	0.330	1.000
32	Sequential Ranking-30	Equal	Equal	0.270	0.406	0.324	1.000
33	Sequential Ranking-31	Equal	Equal	0.290	0.399	0.310	1.000
34	Sequential Ranking-32	Equal	Equal	0.307	0.397	0.296	1.000
35	Sequential Ranking-33	Equal	Equal	0.340	0.353	0.307	1.000
36	Sequential Ranking-34	Equal	Equal	0.287	0.406	0.307	1.000
37	Sequential Ranking-35	Equal	Equal	0.299	0.372	0.330	1.000
38	Sequential Ranking-36	Equal	Equal	0.274	0.402	0.324	1.000
39	Sequential Ranking-37	Equal	Equal	0.294	0.395	0.311	1.000
40	Sequential Ranking-38	Equal	Equal	0.312	0.388	0.300	1.000
41	Sequential Ranking-39	Equal	Equal	0.334	0.357	0.309	1.000
42	Sequential Ranking-40	Equal	Equal	0.289	0.398	0.312	1.000
43	Sequential Ranking-41	Equal	Equal	0.297	0.373	0.331	1.000
44	Sequential Ranking-42	Equal	Equal	0.278	0.398	0.324	1.000
45	FAHP	FAHP	Equal	0.307	0.418	0.275	1.000
46	Equal	FAHP	Equal	0.305	0.411	0.284	1.000
47	Sequential Ranking-1	FAHP	Equal	0.293	0.428	0.279	1.000
48	Sequential Ranking-2	FAHP	Equal	0.312	0.424	0.264	1.000
49	Sequential Ranking-3	FAHP	Equal	0.336	0.385	0.279	1.000
50	Sequential Ranking-4	FAHP	Equal	0.287	0.431	0.282	1.000
51	Sequential Ranking-5	FAHP	Equal	0.297	0.404	0.298	1.000
52	Sequential Ranking-6	FAHP	Equal	0.270	0.435	0.294	1.000
53	Sequential Ranking-7	FAHP	Equal	0.298	0.425	0.277	1.000
54	Sequential Ranking-8	FAHP	Equal	0.316	0.421	0.263	1.000
55	Sequential Ranking-9	FAHP	Equal	0.342	0.376	0.282	1.000
56	Sequential Ranking-10	FAHP	Equal	0.281	0.437	0.283	1.000
57	Sequential Ranking-11	FAHP	Equal	0.301	0.398	0.302	1.000
58	Sequential Ranking-12	FAHP	Equal	0.268	0.438	0.294	1.000
59	Sequential Ranking-13	FAHP	Equal	0.296	0.428	0.277	1.000
60	Sequential Ranking-14	FAHP	Equal	0.322	0.418	0.260	1.000
61	Sequential Ranking-15	FAHP	Equal	0.347	0.373	0.280	1.000
62	Sequential Ranking-16	FAHP	Equal	0.287	0.428	0.286	1.000
63	Sequential Ranking-17	FAHP	Equal	0.294	0.403	0.303	1.000
64	Sequential Ranking-18	FAHP	Equal	0.271	0.431	0.298	1.000
65	Sequential Ranking-19	FAHP	Equal	0.299	0.421	0.280	1.000
66	Sequential Ranking-20	FAHP	Equal	0.319	0.421	0.260	1.000
67	Sequential Ranking-21	FAHP	Equal	0.353	0.370	0.278	1.000
68	Sequential Ranking-22	FAHP	Equal	0.292	0.425	0.284	1.000
69	Sequential Ranking-23	FAHP	Equal	0.300	0.394	0.305	1.000
70	Sequential Ranking-24	FAHP	Equal	0.265	0.437	0.299	1.000
71	Sequential Ranking-25	FAHP	Equal	0.293	0.426	0.281	1.000
72	Sequential Ranking-26	FAHP	Equal	0.323	0.414	0.264	1.000
73	Sequential Ranking-27	FAHP	Equal	0.350	0.373	0.278	1.000
74	Sequential Ranking-28	FAHP	Equal	0.297	0.421	0.282	1.000
75	Sequential Ranking-29	FAHP	Equal	0.305	0.391	0.304	1.000
76	Sequential Ranking-30	FAHP	Equal	0.271	0.428	0.302	1.000
77	Sequential Ranking-31	FAHP	Equal	0.299	0.418	0.284	1.000
78	Sequential Ranking-32	FAHP	Equal	0.316	0.419	0.265	1.000
79	Sequential Ranking-33	FAHP	Equal	0.353	0.366	0.281	1.000
80	Sequential Ranking-34	FAHP	Equal	0.294	0.424	0.281	1.000
81	Sequential Ranking-35	FAHP	Equal	0.310	0.388	0.302	1.000
82	Sequential Ranking-36	FAHP	Equal	0.275	0.425	0.300	1.000
83	Sequential Ranking-37	FAHP	Equal	0.303	0.415	0.282	1.000
84	Sequential Ranking-38	FAHP	Equal	0.322	0.410	0.268	1.000
85	Sequential Ranking-39	FAHP	Equal	0.347	0.371	0.282	1.000
86	Sequential Ranking-40	FAHP	Equal	0.298	0.417	0.285	1.000
87	Sequential Ranking-41	FAHP	Equal	0.308	0.391	0.301	1.000
88	Sequential Ranking-42	FAHP	Equal	0.281	0.421	0.298	1.000
Minimum Share				0.2647	0.3534	0.2603	
Maximum Share				0.3534	0.4379	0.3306	

Table S12: A Summary of White Nile Sub- basin Water Entitlement Weight Scenarios and Outputs

Scenario #	Relevant Factors Weight	Sub-factors weighting method	Indicators weighting method	Fraction of Share			Total
				Egypt	Sudan & S.Sudan	Equatorial States	
1	FAHP	Equal	Equal	0.2904	0.3472	0.3621	1.000
2	Equal	Equal	Equal	0.2843	0.3229	0.3915	0.999
3	Sequential Ranking-1	Equal	Equal	0.2689	0.3133	0.4156	0.998
4	Sequential Ranking-2	Equal	Equal	0.2849	0.3061	0.4083	0.999
5	Sequential Ranking-3	Equal	Equal	0.3088	0.3180	0.3722	0.999
6	Sequential Ranking-4	Equal	Equal	0.2777	0.3311	0.3900	0.999
7	Sequential Ranking-5	Equal	Equal	0.2831	0.3074	0.4079	0.998
8	Sequential Ranking-6	Equal	Equal	0.2572	0.3323	0.4085	0.998
9	Sequential Ranking-7	Equal	Equal	0.2722	0.3117	0.4138	0.998
10	Sequential Ranking-8	Equal	Equal	0.2890	0.3065	0.4042	1.000
11	Sequential Ranking-9	Equal	Equal	0.3142	0.3216	0.3632	0.999
12	Sequential Ranking-10	Equal	Equal	0.2739	0.3348	0.3900	0.999
13	Sequential Ranking-11	Equal	Equal	0.2854	0.3050	0.4079	0.998
14	Sequential Ranking-12	Equal	Equal	0.2543	0.3381	0.4056	0.998
15	Sequential Ranking-13	Equal	Equal	0.2693	0.3175	0.4109	0.998
16	Sequential Ranking-14	Equal	Equal	0.2924	0.3049	0.4024	1.000
17	Sequential Ranking-15	Equal	Equal	0.3183	0.3221	0.3590	0.999
18	Sequential Ranking-16	Equal	Equal	0.2793	0.3385	0.3810	0.999
19	Sequential Ranking-17	Equal	Equal	0.2817	0.3088	0.4079	0.998
20	Sequential Ranking-18	Equal	Equal	0.2566	0.3358	0.4056	0.998
21	Sequential Ranking-19	Equal	Equal	0.2717	0.3151	0.4109	0.998
22	Sequential Ranking-20	Equal	Equal	0.2895	0.3107	0.3995	1.000
23	Sequential Ranking-21	Equal	Equal	0.3217	0.3205	0.3572	0.999
24	Sequential Ranking-22	Equal	Equal	0.2834	0.3389	0.3768	0.999
25	Sequential Ranking-23	Equal	Equal	0.2871	0.3124	0.3989	0.998
26	Sequential Ranking-24	Equal	Equal	0.2528	0.3396	0.4056	0.998
27	Sequential Ranking-25	Equal	Equal	0.2679	0.3189	0.4109	0.998
28	Sequential Ranking-26	Equal	Equal	0.2918	0.3084	0.3995	1.000
29	Sequential Ranking-27	Equal	Equal	0.3188	0.3263	0.3543	0.999
30	Sequential Ranking-28	Equal	Equal	0.2867	0.3373	0.3750	0.999
31	Sequential Ranking-29	Equal	Equal	0.2911	0.3129	0.3947	0.999
32	Sequential Ranking-30	Equal	Equal	0.2582	0.3432	0.3966	0.998
33	Sequential Ranking-31	Equal	Equal	0.2733	0.3226	0.4019	0.998
34	Sequential Ranking-32	Equal	Equal	0.2880	0.3122	0.3995	1.000
35	Sequential Ranking-33	Equal	Equal	0.3211	0.3240	0.3543	0.999
36	Sequential Ranking-34	Equal	Equal	0.2838	0.3431	0.3721	0.999
37	Sequential Ranking-35	Equal	Equal	0.2945	0.3113	0.3929	0.999
38	Sequential Ranking-36	Equal	Equal	0.2623	0.3436	0.3924	0.998
39	Sequential Ranking-37	Equal	Equal	0.2773	0.3230	0.3977	0.998
40	Sequential Ranking-38	Equal	Equal	0.2934	0.3158	0.3905	1.000
41	Sequential Ranking-39	Equal	Equal	0.3173	0.3278	0.3543	0.999
42	Sequential Ranking-40	Equal	Equal	0.2861	0.3408	0.3721	0.999
43	Sequential Ranking-41	Equal	Equal	0.2916	0.3171	0.3900	0.999
44	Sequential Ranking-42	Equal	Equal	0.2657	0.3421	0.3906	0.998
45	FAHP	FAHP	Equal	0.3065	0.3218	0.3718	1.000
46	Equal	FAHP	Equal	0.2985	0.3038	0.3977	1.000
47	Sequential Ranking-1	FAHP	Equal	0.2781	0.3021	0.4198	1.000
48	Sequential Ranking-2	FAHP	Equal	0.2952	0.2925	0.4123	1.000
49	Sequential Ranking-3	FAHP	Equal	0.3240	0.3092	0.3668	1.000
50	Sequential Ranking-4	FAHP	Equal	0.2871	0.3212	0.3917	1.000
51	Sequential Ranking-5	FAHP	Equal	0.2954	0.2951	0.4096	1.000
52	Sequential Ranking-6	FAHP	Equal	0.2585	0.3224	0.4191	1.000
53	Sequential Ranking-7	FAHP	Equal	0.2843	0.2976	0.4181	1.000
54	Sequential Ranking-8	FAHP	Equal	0.3010	0.2898	0.4092	1.000
55	Sequential Ranking-9	FAHP	Equal	0.3317	0.3109	0.3574	1.000
56	Sequential Ranking-10	FAHP	Equal	0.2839	0.3221	0.3940	1.000
57	Sequential Ranking-11	FAHP	Equal	0.2996	0.2896	0.4107	1.000
58	Sequential Ranking-12	FAHP	Equal	0.2553	0.3259	0.4188	1.000
59	Sequential Ranking-13	FAHP	Equal	0.2811	0.3010	0.4179	1.000
60	Sequential Ranking-14	FAHP	Equal	0.3071	0.2853	0.4075	1.000
61	Sequential Ranking-15	FAHP	Equal	0.3375	0.3082	0.3543	1.000
62	Sequential Ranking-16	FAHP	Equal	0.2916	0.3238	0.3846	1.000
63	Sequential Ranking-17	FAHP	Equal	0.2964	0.2905	0.4131	1.000
64	Sequential Ranking-18	FAHP	Equal	0.2596	0.3204	0.4200	1.000
65	Sequential Ranking-19	FAHP	Equal	0.2854	0.2956	0.4190	1.000
66	Sequential Ranking-20	FAHP	Equal	0.3039	0.2888	0.4073	1.000
67	Sequential Ranking-21	FAHP	Equal	0.3437	0.3037	0.3526	1.000
68	Sequential Ranking-22	FAHP	Equal	0.2974	0.3211	0.3815	1.000
69	Sequential Ranking-23	FAHP	Equal	0.3041	0.2922	0.4036	1.000
70	Sequential Ranking-24	FAHP	Equal	0.2564	0.3213	0.4223	1.000
71	Sequential Ranking-25	FAHP	Equal	0.2822	0.2965	0.4213	1.000
72	Sequential Ranking-26	FAHP	Equal	0.3082	0.2833	0.4084	1.000
73	Sequential Ranking-27	FAHP	Equal	0.3405	0.3072	0.3523	1.000
74	Sequential Ranking-28	FAHP	Equal	0.3036	0.3167	0.3798	1.000
75	Sequential Ranking-29	FAHP	Equal	0.3099	0.2895	0.4006	1.000
76	Sequential Ranking-30	FAHP	Equal	0.2641	0.3230	0.4129	1.000
77	Sequential Ranking-31	FAHP	Equal	0.2899	0.2982	0.4119	1.000
78	Sequential Ranking-32	FAHP	Equal	0.3050	0.2842	0.4108	1.000
79	Sequential Ranking-33	FAHP	Equal	0.3448	0.3017	0.3535	1.000
80	Sequential Ranking-34	FAHP	Equal	0.3004	0.3201	0.3795	1.000
81	Sequential Ranking-35	FAHP	Equal	0.3161	0.2850	0.3989	1.000
82	Sequential Ranking-36	FAHP	Equal	0.2699	0.3203	0.4098	1.000
83	Sequential Ranking-37	FAHP	Equal	0.2957	0.2955	0.4089	1.000
84	Sequential Ranking-38	FAHP	Equal	0.3127	0.2859	0.4013	1.000
85	Sequential Ranking-39	FAHP	Equal	0.3415	0.3026	0.3558	1.000
86	Sequential Ranking-40	FAHP	Equal	0.3047	0.3147	0.3807	1.000
87	Sequential Ranking-41	FAHP	Equal	0.3129	0.2885	0.3986	1.000
88	Sequential Ranking-42	FAHP	Equal	0.2761	0.3158	0.4081	1.000
Minimum Share				0.2528	0.2833	0.3523	
Maximum Share				0.3448	0.3472	0.4223	