

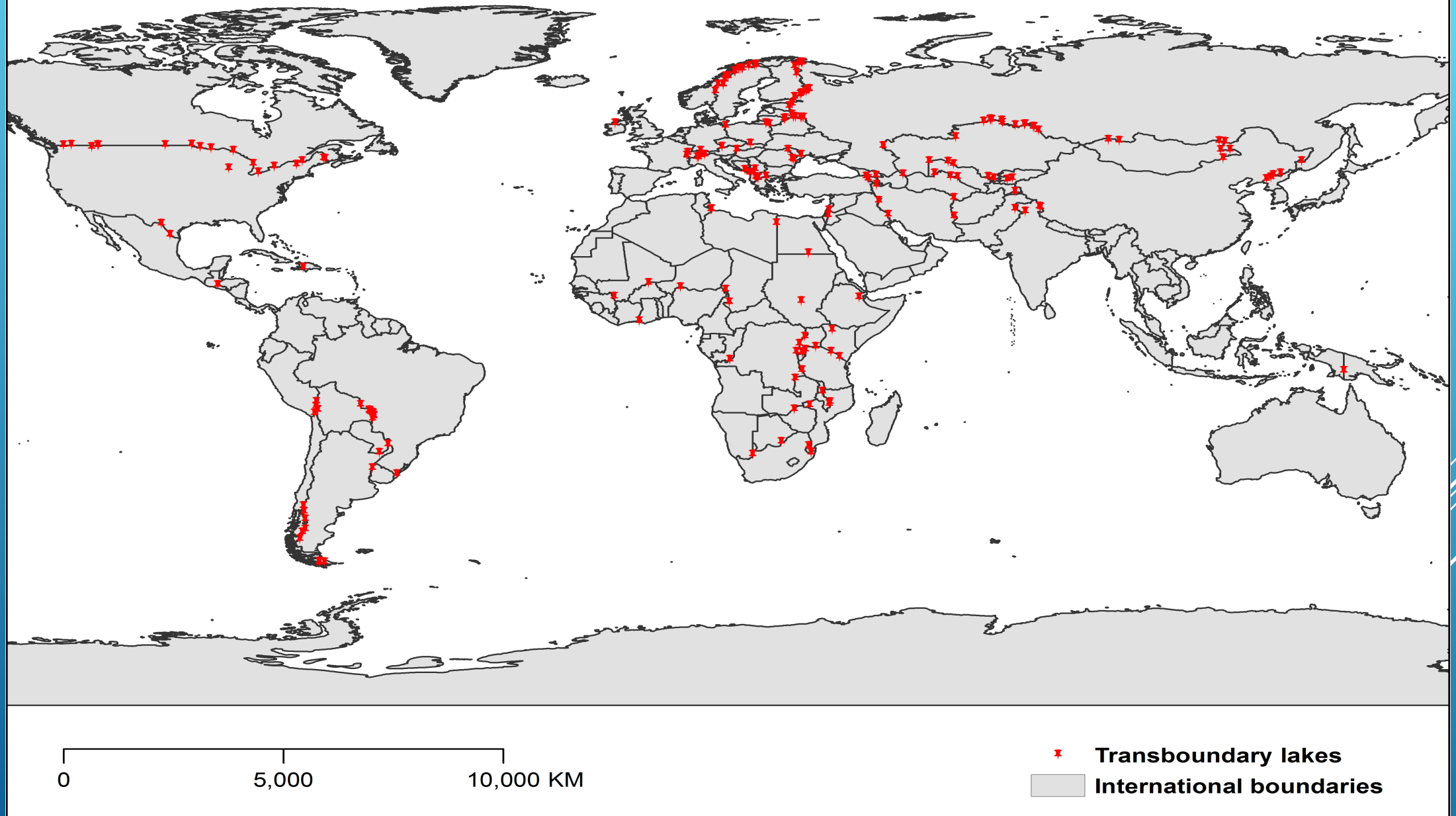
Transboundary Lakes and Reservoirs



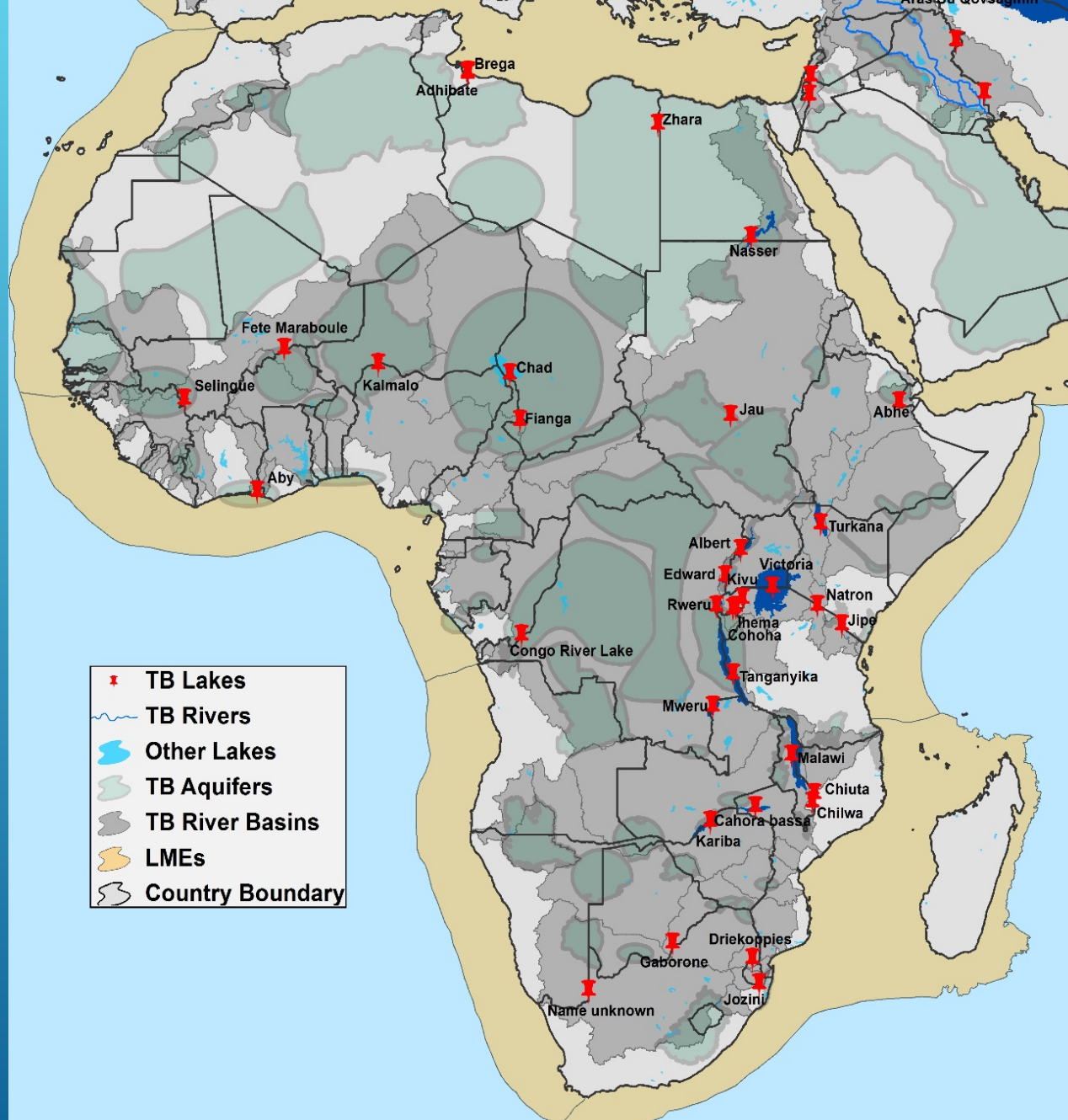
International Lake Environment Committee
Kusatsu, Japan



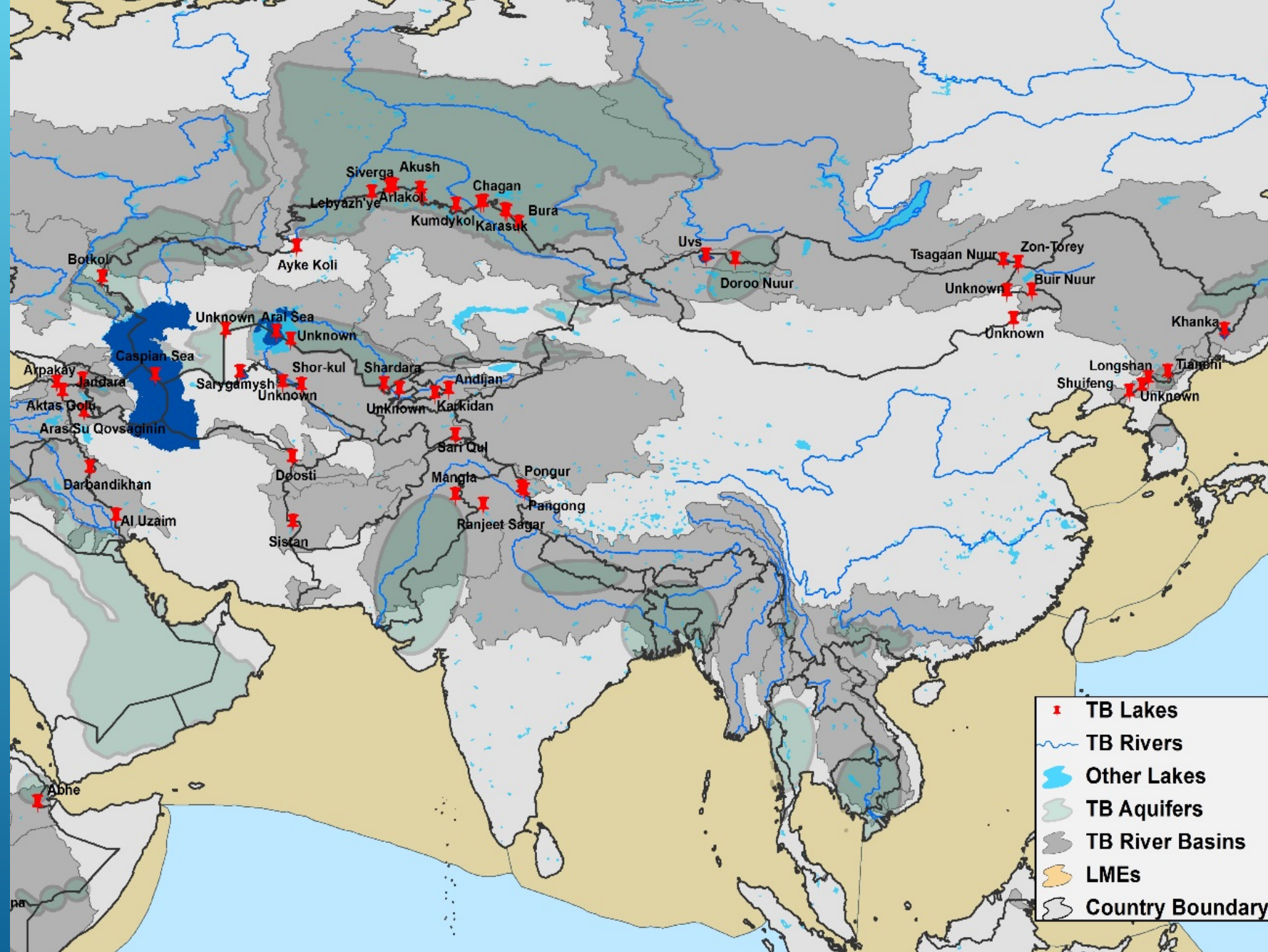
Location of global transboundary lakes and reservoirs



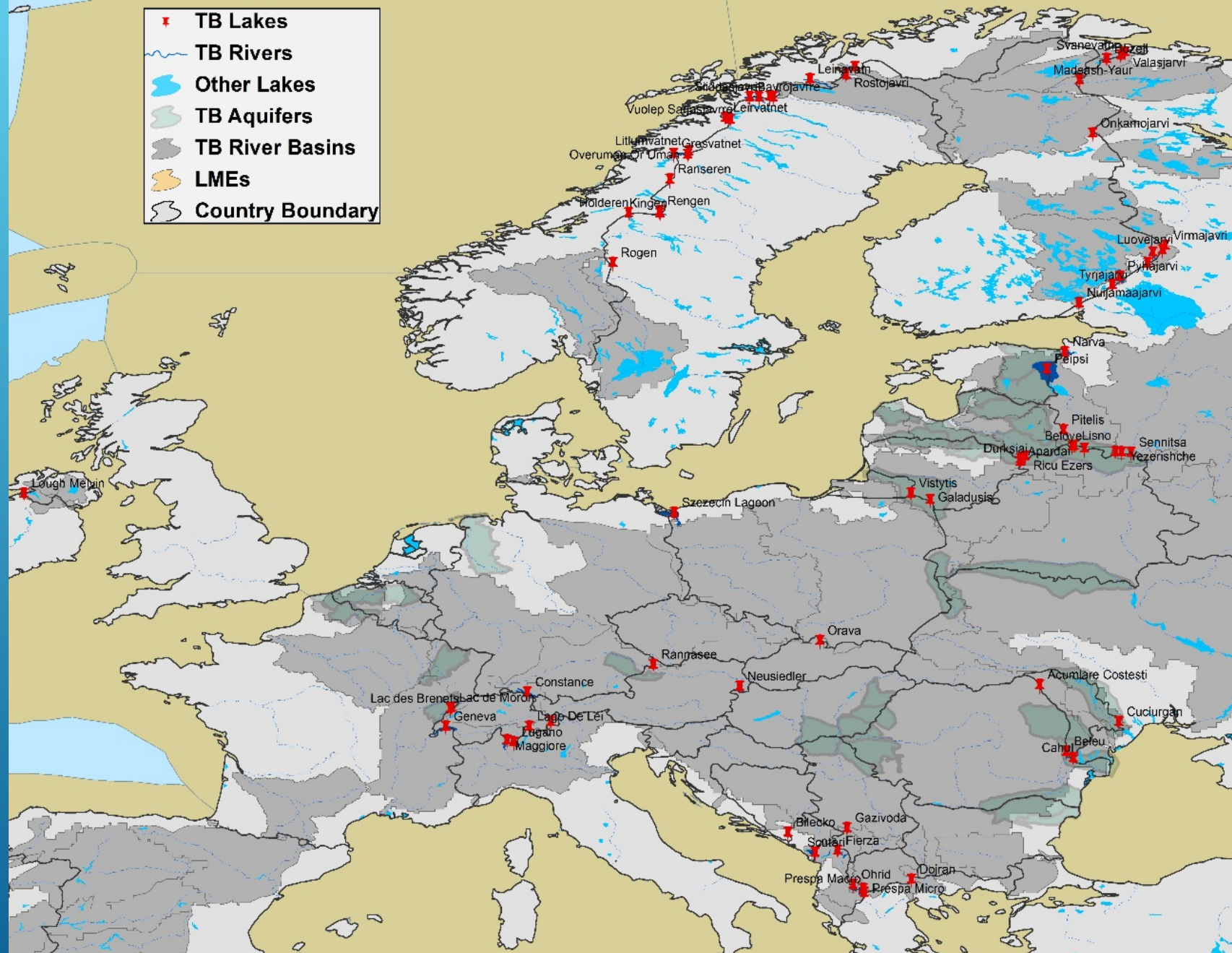
GLOBAL DISTRIBUTION OF TRANSBOUNDARY LAKES/RESERVOIRS



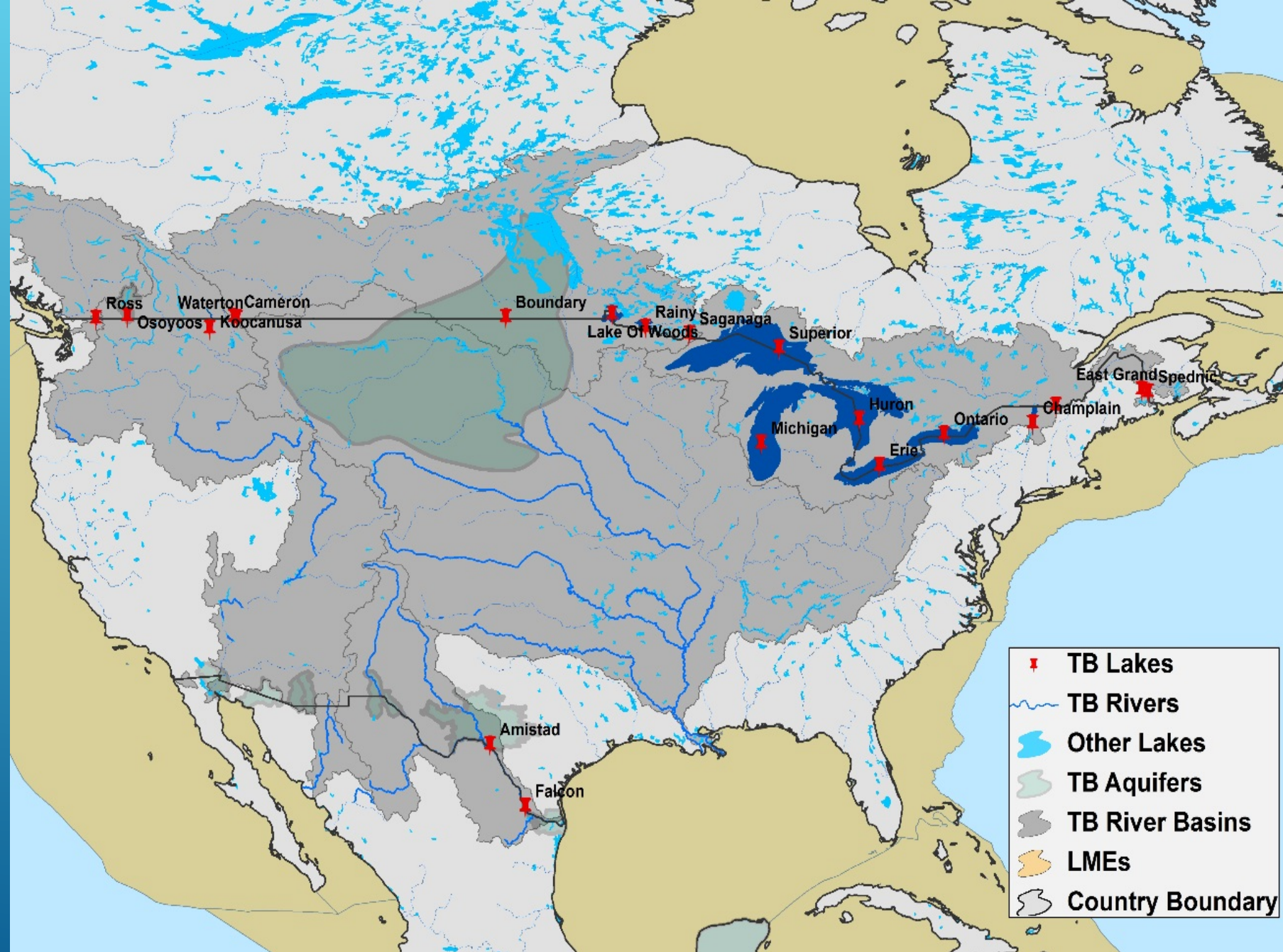
AFRICAN LAKES (23)



ASIAN LAKES (8)



EUROPEAN LAKES (9)

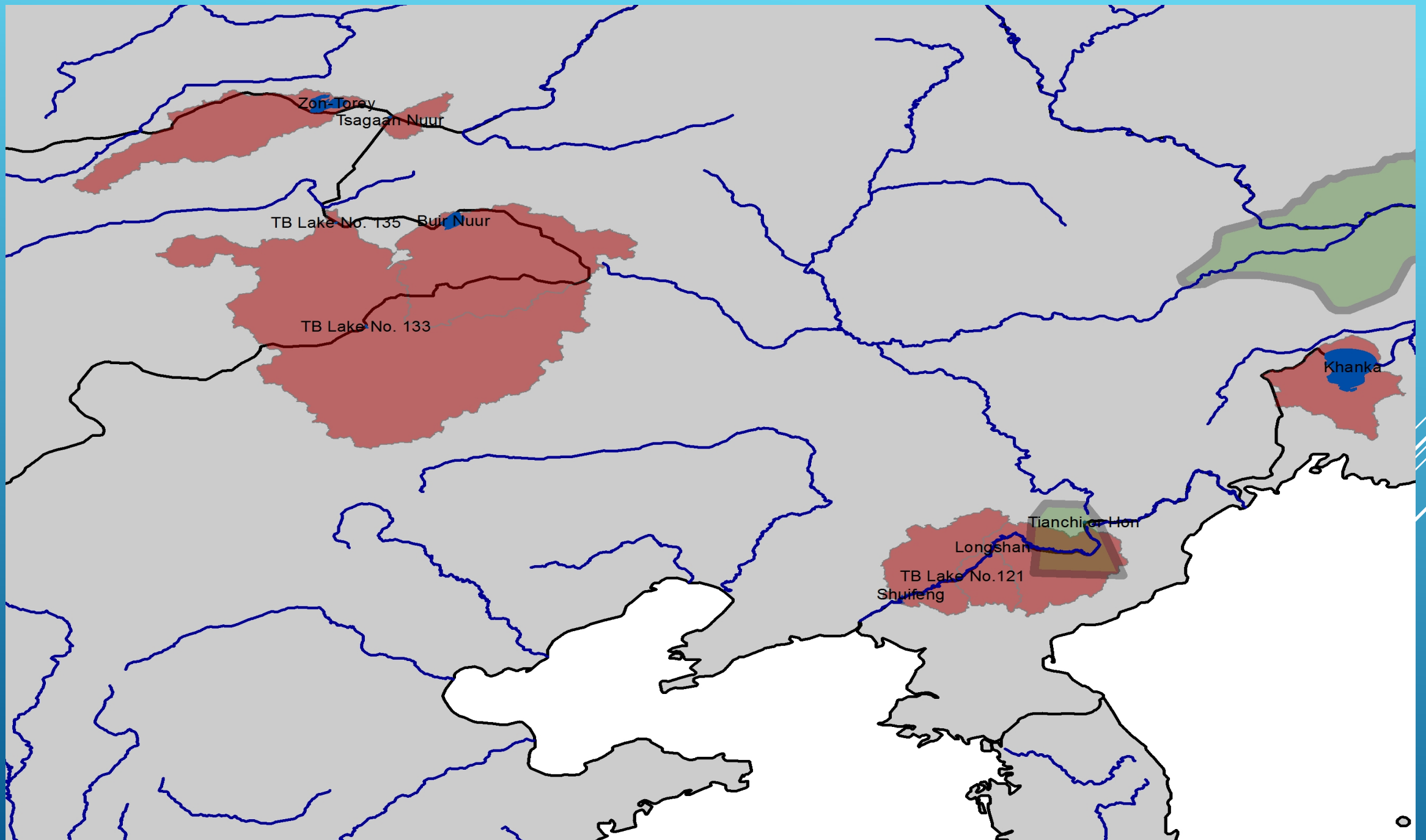


NORTH AMERICA (7)

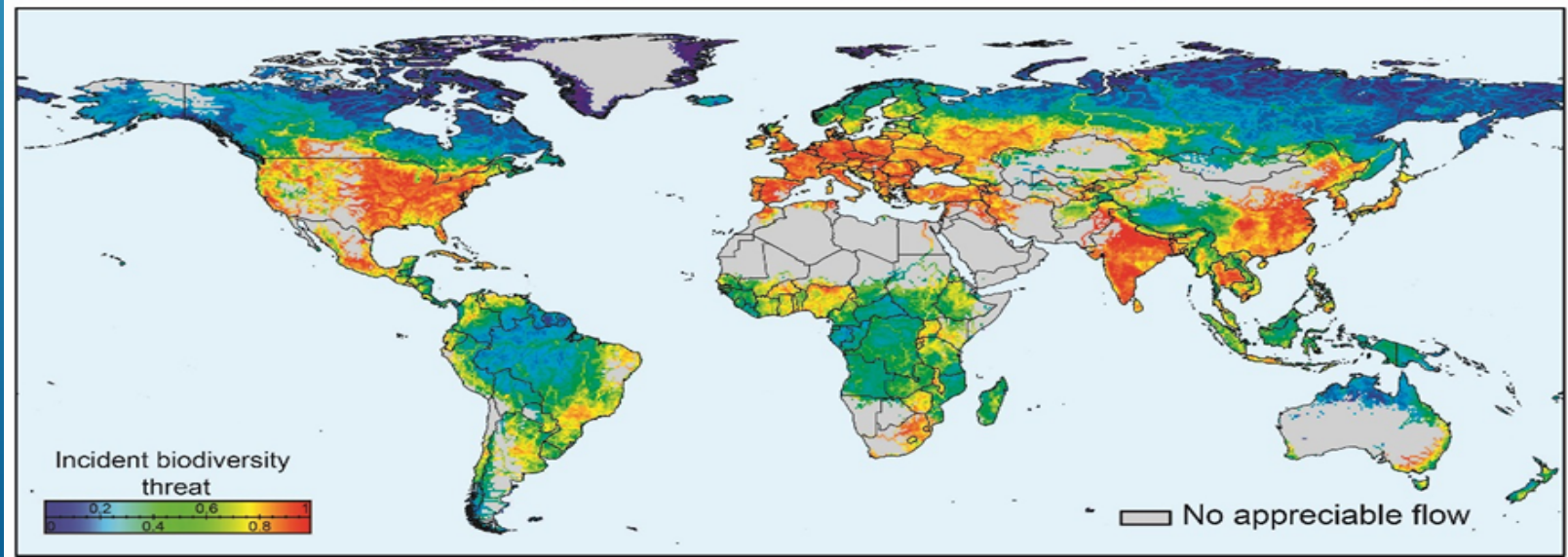
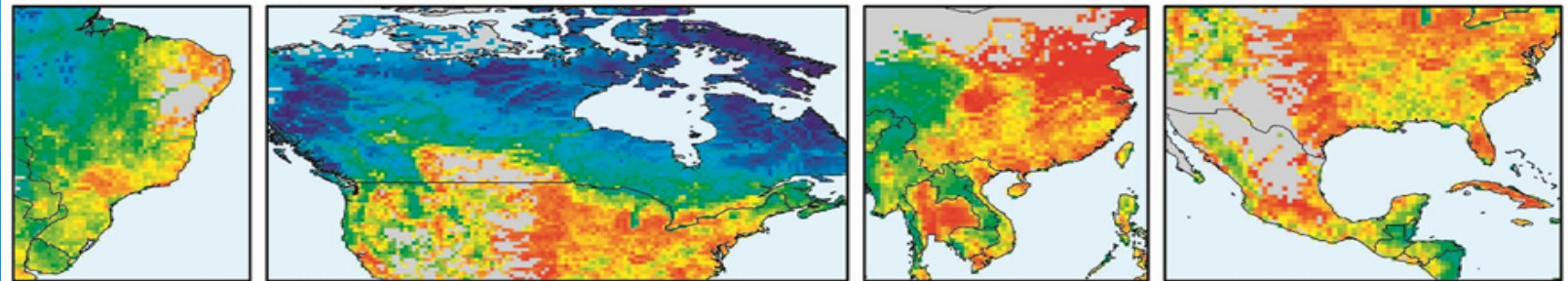
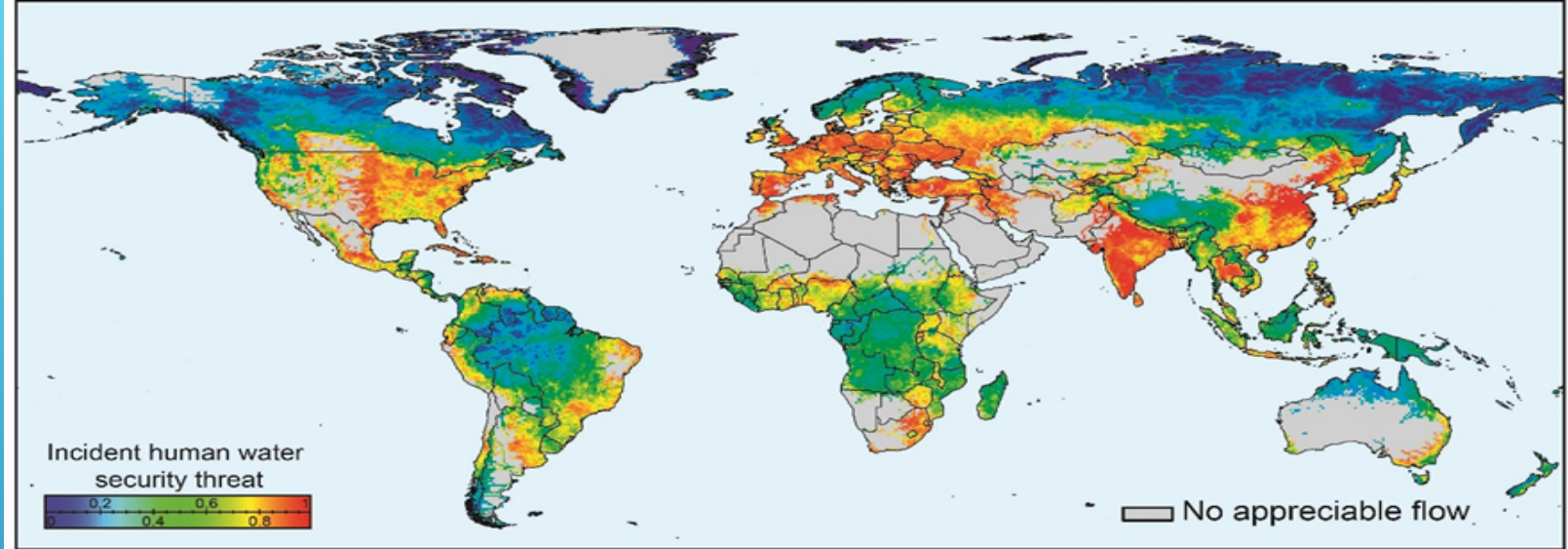
6)



SOUTH AMERICA (6)



GLOBAL OVERVIEW OF INCIDENT HUMAN WATER SECURITY (HWS) AND BIODIVERSITY (BD) THREATS



AE3									
TWAP-LG, 206 Case, River-Threat Indicator V									
206ID, 50km Band vs. V									
Identifiers									
ID	206 ID	Lake Name	Reg	Reg ID	River Basin	TB River Basin	Lake Type	HWS	Inland HW
62	206 ID								
33	63	Victoria	Afr	33	Kenya; Tanzania; Uganda; DR Congo; Tanzania; Malawi; Mozambique	Nile	L	0.45	0.7
31	61	Malawi	Afr	31	Kenya; Tanzania; Uganda; DR Congo; Tanzania; Malawi; Mozambique	Nile	L	0.40	0.8
25	54	Nya	Afr	24	Ethiopia; Kenya; DR Congo; Uganda	Nile	L	0.46	0.6
32	62	Turkana	Afr	32	Ethiopia; Kenya; DR Congo; Uganda	Nile	L	0.33	0.6
11	34	Albert Nasser/Aswan	Afr	4	Egypt; Sudan	Nile	R	0.44	0.7
27	57	Kariba	Afr	27	Zambia; Zimbabwe	Zambezi	R	0.37	0.6
22	51	Mweru	Afr	21	DR Congo; Zambia; Mozambique; Zambia	Zambezi	R	0.34	0.6
25	55	ora	Afr	25	DR Congo; Zambia; Mozambique; Zambia	Zambezi	L	0.32	0.6

ストレス検知

Select Lakes number and Grid size

Lakes number: 206

Grid Type: 100km Band_Clippped by Basins

OK

Determine the Relative Weights

Weight Set A Weight Set B

	Catchment Disturbances	Pollution	Water Resources Development	Biotic Factors	Total
HWS	0.18	0.35	0.41	0.06	1
BD	0.22	0.28	0.3	0.2	1

Criteria Reduction Weight Modification OK

Region and Criteria

Region: Africa

HWS: ☐ Top ☒ All

Criteria: GNI Per Capita

☐ More than 5000 ☒ Less than

Sort by: Areas and Lengths

Lake Area (km2)

OK

Area (km2)									
Ascending									
population		Water Stress	Water Uses		Socioeconomy		Additional		
Number	Density		Agricultural Water Use	Industrial Water Use	Domestic Water Use	GNI Per Capita	HDI	Riparian Countries	Transboundary River Basins
7,436,052	102.22	0.00	12.68	0.8	2.209	595.3	0.486	Kenya; Tanzania; Uganda; DR Congo; Tanzania; Malawi; Mozambique	Nile
3,754,496	27.44	15.42	4.817	0.109	0.534	422.9	0.403	Ethiopia; Kenya; DR Congo; Uganda	Congo Zaire
2,297,926	44.04	44.42	9.74	0.316	1.097	362.4	0.425	Ethiopia; Kenya; DR Congo; Uganda	Zambezi
9,922,974	47.19	144.54	5.92	0.04	0.774	458.9	0.41	Ethiopia; Kenya; DR Congo; Uganda	Nile
9,651,488	144.54	0.00	9.427	0.691	1.813	543.7	0.458	Egypt; Sudan	Nile
9,000,000	41.44	774.70	18.81	0.302	0.93	698.6	0.433	Zambia; Zimbabwe	Zambezi
5,240,000	7.44	711.44	1.638	0.102	0.282	1419	0.431	DR Congo; Zambia; Mozambique; Zambia	Congo Zaire
4,269,364	17.20	0.00	1.013	0.296	0.806	841.5	0.383		

Rank	Lake	Cont.	Surface Area (km²)	HWS Threat
1	Cahul	Eur	89.0	0.61
2	Falcon	N.Am	120.6	0.61
3	Mangla	Asia	85.4	0.59
4	Galilee	Eur	162.0	0.59
5	Aras Su Qovsaginin Su Anbari	Asia	52.1	0.57
6	Dead Sea	Eur	642.7	0.57
7	Darbandikhan	Asia	114.3	0.56
8	Neusiedler/Ferto	Eur	141.9	0.54
9	Szczecin Lagoon	Eur	822.4	0.54
10	Josini/Pongola-poort Dam	Afr.	128.6	0.52
11	Shardara/Kara-Kul	Asia	746.1	0.52
12	Erie	N.Am	26560.8	0.51
13	Macro Prespa (Large Prespa)	Eur	263.0	0.50
14	Azuei	S.Am	117.3	0.50
15	Ohrid	Eur	354.3	0.49
16	Michigan	N.Am	58535.5	0.48
17	Ontario	N.Am	19062.2	0.46
18	Caspian Sea	Asia	377543.2	0.45
19	Amistad	N.Am	131.3	0.42
20	Victoria	Afr.	66841.5	0.42
21	Ihema	Afr.	93.2	0.41
22	Sistan	Asia	488.2	0.41
23	Scutari/Skadar	Eur	381.5	0.40
24	Maggiore	Eur	211.4	0.40

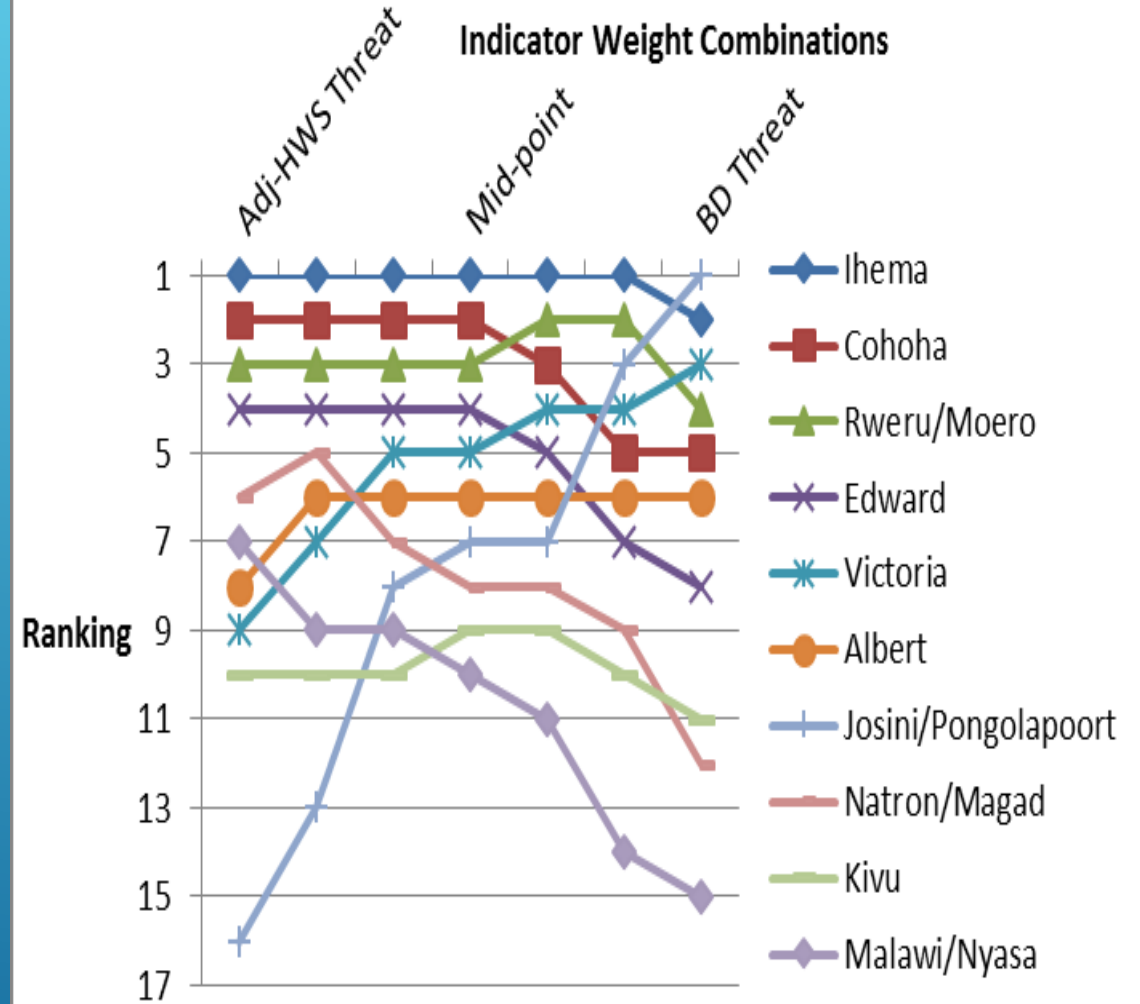
Rank	Lake	Cont.	Surface Area (km²)	Adj-HWS Threat
1	Sistan	Asia	488.2	0.98
2	Ihema	Afr.	93.2	0.97
3	Azuei	S.Am	117.3	0.96
4	Rweru/Moero	Afr.	125.6	0.96
5	Cohoha	Afr.	64.8	0.96
6	Edward	Afr.	2232.0	0.94
7	Natron/Magadi	Afr.	560.4	0.93
8	Abbe/Abhe	Afr.	310.6	0.93
9	Victoria	Afr.	66841.5	0.91
10	Albert	Afr.	5502.3	0.91
11	Kivu	Afr.	2371.1	0.91
12	Malawi/Nyasa	Afr.	29429.2	0.91
13	Dead Sea	Eur	642.7	0.90
14	Turkana	Afr.	7439.2	0.90
15	Aras Su Qovsaginin Su Anbari	Asia	52.1	0.89
16	Mangla	Asia	85.4	0.87
17	Galilee	Eur	162.0	0.87
18	Darbandikhan	Asia	114.3	0.87
19	Selingue	Afr.	334.4	0.87
20	Shardara/Kara-Kul	Asia	746.1	0.86
21	Nasser/Aswan	Afr.	5362.7	0.86
22	Chilwa	Afr.	1084.2	0.86
23	Josini/Pongola-poort Dam	Afr.	128.6	0.85
24	Chiuta	Afr.	143.3	0.85

Case A:

Adj-HWS Threat (H-L) Rank vs. BD Threat (H-L) Rank

Threat Rank Weight									
Adj-HWS Threat	1.0	0.8	0.6	0.5	0.4	0.2	0.0		
BD Threat	0.0	0.2	0.4	0.5	0.6	0.8	1.0		
Threat Ranks									
Lake Name	Adj-HWS Threat			Mid-point			BD Threat	Sum of Ranks	Overall Rank
Ihema	1	1	1	1	1	1	2	8	1
Cohoha	2	2	2	2	3	5	5	21	3
Rweru/Moero	3	3	3	3	2	2	4	20	2
Edward	4	4	4	4	5	7	8	36	4
Victoria	9	7	5	5	4	4	3	37	5
Albert	8	6	6	6	6	6	6	44	6
Josini/Pongolapoort	16	13	8	7	7	3	1	55	8
Natron/Magad	6	5	7	8	8	9	12	55	7
Kivu	10	10	10	9	9	10	11	69	9
Malawi/Nyasa	7	9	9	10	11	14	15	75	10
Abbe/Abhe	5	8	11	11	15	16	19	85	12
Chad	17	16	14	12	10	8	7	84	11
Selingue	12	12	12	13	14	15	14	92	13
Nasser/Aswan	13	14	13	14	12	13	13	92	14
Aby	19	18	16	15	13	11	9	101	15
Turkana	11	11	15	16	16	18	18	105	16
Chilwa	14	15	17	17	18	17	17	115	17
Kariba	23	22	18	18	17	12	10	120	18
Chiuta	15	17	19	19	20	21	22	133	19
Cahora Bassa	21	20	21	20	19	19	16	136	20
Tanganyika	18	19	20	21	21	20	20	139	21
Mweru	20	21	22	22	22	22	21	150	22
Lake Congo River	22	23	23	23	23	23	23	160	23

Case A



African TB Lake Threats Based on Altered Adj-HWS and BD Rank Weights

Continent	Lake Name		Adj-HWS	HWS	BD	HDI	Adj-HWS Rank	HDI Rank	RvBD Rank	Sum Adj-HWS + RvBD	Overall Rank	Sum Adj-HWS + HDI	Overall Rank	Sum Adj-HWS + RvBD + HDI	Overall Rank
Africa	Abbe/Abhe		0.93	0.31	0.29	0.40	7	7	7	14	1	14	3	21	1
Africa	Turkana		0.9	0.33	0.30	0.41	13	10	9	22	2	23	10	32	2
Africa	Selingue		0.87	0.30	0.32	0.36	16	2	15	31	11	18	5	33	3
Africa	Malawi/Nyasa		0.91	0.29	0.32	0.42	9	12	14	23	3	21	9	35	4
Africa	Chiuta		0.85	0.25	0.26	0.41	23	9	3	26	5	32	15	35	5
Africa	Cohoha		0.96	0.39	0.41	0.38	3	4	28	31	12	7	1	35	6
Africa	Kivu		0.91	0.31	0.33	0.38	12	6	18	30	8	18	4	36	7
Africa	Rweru/Moero		0.96	0.40	0.42	0.36	4	3	30	34	16	7	2	37	8
Africa	Lake Congo River		0.75	0.20	0.22	0.34	35	1	1	36	18	36	19	37	9
Africa	Tanganyika		0.84	0.25	0.29	0.40	26	8	6	32	14	34	17	40	10
Africa	Edward		0.94	0.34	0.35	0.43	6	13	22	28	7	19	6	41	11
Africa	Chilwa		0.86	0.28	0.30	0.41	21	11	10	31	10	32	14	42	12
Africa	Mweru		0.81	0.24	0.28	0.38	33	5	4	37	21	38	20	42	13
Asia	Sistan		0.98	0.41	0.38	0.46	1	20	25	26	6	21	8	46	14
Africa	Natron/Magad		0.93	0.36	0.33	0.51	8	23	17	25	4	31	13	48	15
Africa	Nasser/Aswan		0.86	0.29	0.32	0.43	20	16	16	36	19	36	18	52	16
Africa	Albert		0.91	0.35	0.37	0.46	10	19	24	34	15	29	12	53	17
Africa	Ihema		0.97	0.41	0.44	0.44	2	18	33	35	17	20	7	53	18
S.Amer	Azuei		0.96	0.50	0.43	0.46	5	21	31	36	20	26	11	57	19
Asia	Aral		0.84	0.29	0.28	0.60	27	26	5	32	13	53	31	58	20
Asia	Sarygamysh		0.82	0.26	0.25	0.67	29	29	2	31	9	58	32	60	21
Africa	Cahora Bassa		0.78	0.29	0.31	0.43	34	15	13	47	25	49	25	62	22
Africa	Victoria		0.91	0.42	0.44	0.47	11	22	32	43	24	33	16	65	23
Africa	Chad		0.84	0.38	0.36	0.43	25	17	23	48	26	42	21	65	24
Africa	Kariba		0.75	0.33	0.34	0.43	36	14	19	55	30	50	28	69	25
S.Amer	Titicaca		0.82	0.33	0.29	0.71	32	32	8	40	22	64	35	72	26
Africa	Aby		0.83	0.35	0.35	0.52	28	24	21	49	27	52	30	73	27
S.Amer	Chungarkkota		0.82	0.36	0.31	0.71	31	33	12	43	23	64	34	76	28
Asia	Shardara/Kara-Kul		0.86	0.52	0.46	0.65	22	28	35	57	31	50	27	85	29
Europe	Dead Sea		0.9	0.57	0.49	0.72	14	34	38	52	29	48	24	86	30
Africa	Josini/Pongolapoort Dam		0.85	0.52	0.48	0.61	24	27	37	61	34	51	29	88	31
S.Amer	Salto Grande		0.67	0.29	0.30	0.74	40	38	11	51	28	78	39	89	32
Asia	Darbandikhan		0.87	0.56	0.54	0.68	17	30	46	63	35	47	23	93	33
S.Amer	Lago de Yacyreta		0.75	0.31	0.34	0.73	38	36	20	58	32	74	38	94	34
Asia	Aras Su Qovsaginin Su Anbari		0.89	0.57	0.53	0.73	15	35	44	59	33	50	26	94	35
Asia	Mangla		0.87	0.59	0.62	0.54	18	25	53	71	39	43	22	96	36
S.Amer	Itaipu		0.75	0.36	0.42	0.73	37	37	29	66	37	74	37	103	37
Asia	Caspian Sea		0.73	0.45	0.40	0.77	39	41	27	66	36	80	40	107	38
Europe	Galilee		0.87	0.59	0.55	0.88	19	46	47	66	38	65	36	112	39
Europe	Cahul		0.82	0.61	0.61	0.69	30	31	51	81	42	61	33	112	40
Europe	Scutari/Skadar		0.62	0.40	0.45	0.78	41	42	34	75	41	83	41	117	41
N.Amer	Amistad		0.49	0.42	0.39	0.86	47	45	26	73	40	92	47	118	42
Europe	Macro Prespa (Large Prespa)		0.51	0.50	0.49	0.75	44	40	40	84	43	84	42	124	43
Europe	Ohrid		0.47	0.49	0.49	0.74	49	39	39	88	46	88	44	127	44
Europe	Szczecin Lagoon		0.53	0.54	0.51	0.83	43	43	43	86	44	86	43	129	45
N.Amer	Huron		0.42	0.40	0.47	0.93	51	50	36	87	45	101	51	137	46
Europe	Neusiedler/Ferto		0.58	0.54	0.61	0.88	42	47	50	92	47	89	45	139	47
N.Amer	Ontario		0.48	0.46	0.53	0.92	48	49	45	93	48	97	49	142	48
Europe	Lake Maggiore		0.33	0.40	0.50	0.89	52	48	42	94	50	100	50	142	49
N.Amer	Falcon		0.5	0.61	0.62	0.85	46	44	52	98	53	90	46	142	50
N.Amer	Erie		0.51	0.51	0.57	0.93	45	51	49	94	51	96	48	145	51
N.Amer	Champlain		0.29	0.39	0.49	0.94	53	52	41	94	49	105	53	146	52
N.Amer	Michigan		0.44	0.48	0.56	0.94	50	53	48	98	52	103	52	151	53

Cont.	Lake Name	Adj-HWS	HWS	BD	HDI	Adj-HWS Rank	HDI Rank	RvBD Rank	Sum Adj HWS + RvBD	Overall Rank	Sum Adj HWS + HDI	Overall Rank	Sum Adj-HWS + RvBD + HDI	Overall Rank
Afr	Abbe/Abhe	0.93	0.31	0.29	0.40	7	7	7	14	1	14	3	21	1
Afr	Turkana	0.90	0.33	0.30	0.41	13	10	9	22	2	23	10	32	2
Afr	Selingue	0.87	0.30	0.32	0.36	16	2	15	31	11	18	5	33	3
Afr	Malawi/Nyasa	0.91	0.29	0.32	0.42	9	12	14	23	3	21	9	35	4
Afr	Chiuta	0.85	0.25	0.26	0.41	23	9	3	26	5	32	15	35	5
Afr	Cohoha	0.96	0.39	0.41	0.38	3	4	28	31	2	7	1	35	6
Afr	Kivu	0.91	0.31	0.33	0.38	12	6	18	30	8	18	4	36	7
Afr	Rweru/Moero	0.96	0.40	0.42	0.36	4	3	30	34	16	7	2	37	8
Afr	Lake Congo River	0.75	0.20	0.22	0.34	35	1	1	36	18	36	19	37	9
Afr	Tanganyika	0.84	0.25	0.29	0.40	26	8	6	32	14	34	17	40	10
Afr	Edward	0.94	0.34	0.35	0.43	6	13	22	28	7	19	6	41	11
Afr	Chilwa	0.86	0.28	0.30	0.41	21	11	10	31	10	32	14	42	12
Afr	Mweru	0.81	0.24	0.28	0.38	33	5	4	37	21	38	20	42	13
Asia	Sistan	0.98	0.41	0.38	0.46	1	20	25	26	6	21	8	46	14
Afr	Natron/Magad	0.93	0.36	0.33	0.51	8	23	17	25	4	31	13	48	15
Afr	Nasser/Aswan	0.86	0.29	0.32	0.43	20	16	16	36	19	36	18	52	16
Afr	Albert	0.91	0.35	0.37	0.46	10	19	24	34	15	29	12	53	17
Afr	Ihema	0.97	0.41	0.44	0.44	2	18	33	35	17	20	7	53	18
S.Am,	Azuei	0.96	0.50	0.43	0.46	5	21	31	36	20	26	11	57	19
	Aral Sea	0.84	0.29	0.38	0.60	27	26	5	32	13	31	31	58	20
Asia	Sarygamysh	0.82	0.26	0.25	0.67	29	29	2	31	9	32	32	60	21
Afr	Cahora Bassa	0.78	0.29	0.31	0.43	34	15	13	47	25	25	25	62	22

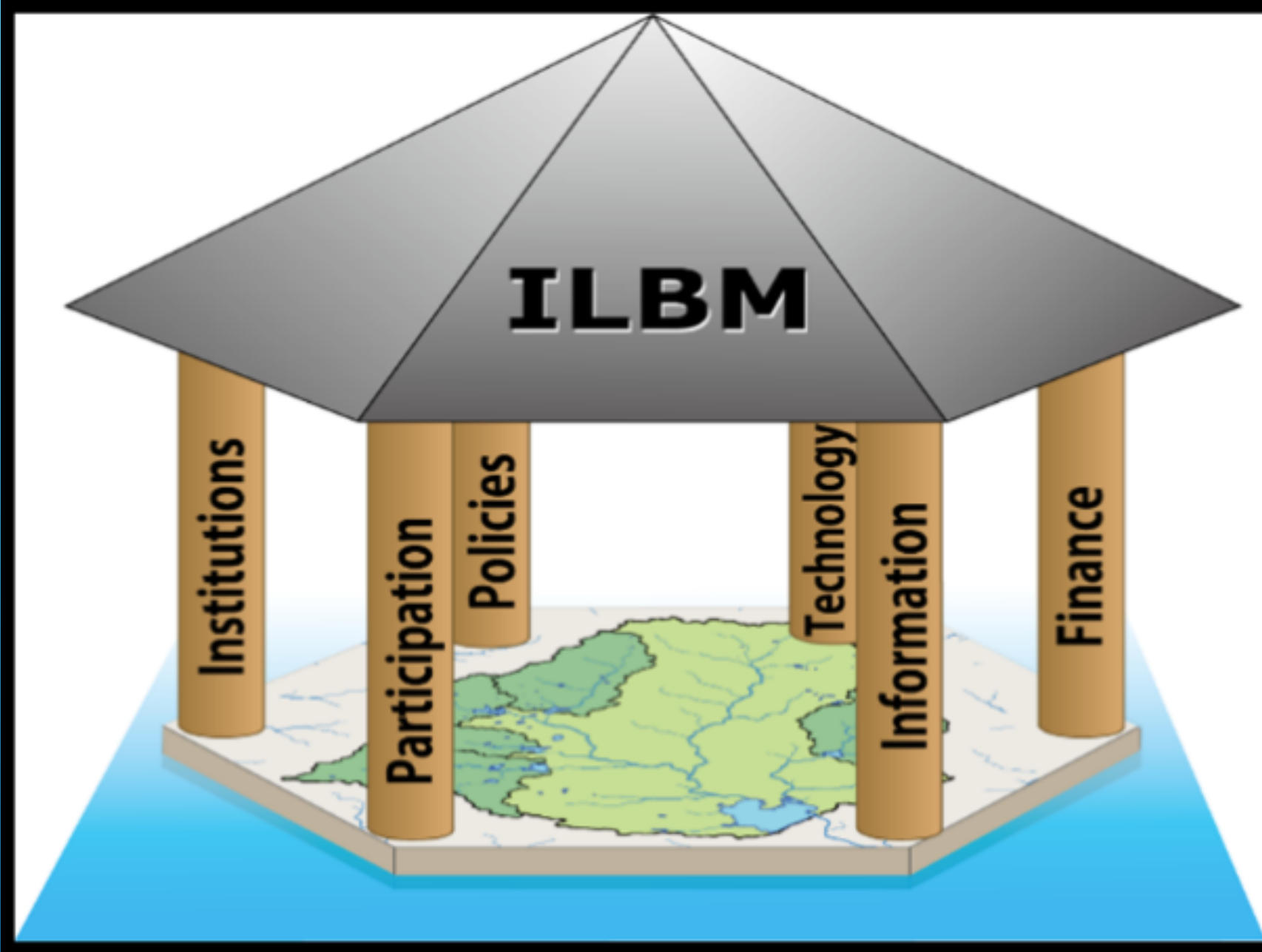
Integrated Water Resources Management (IWRM):

“A process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems”.

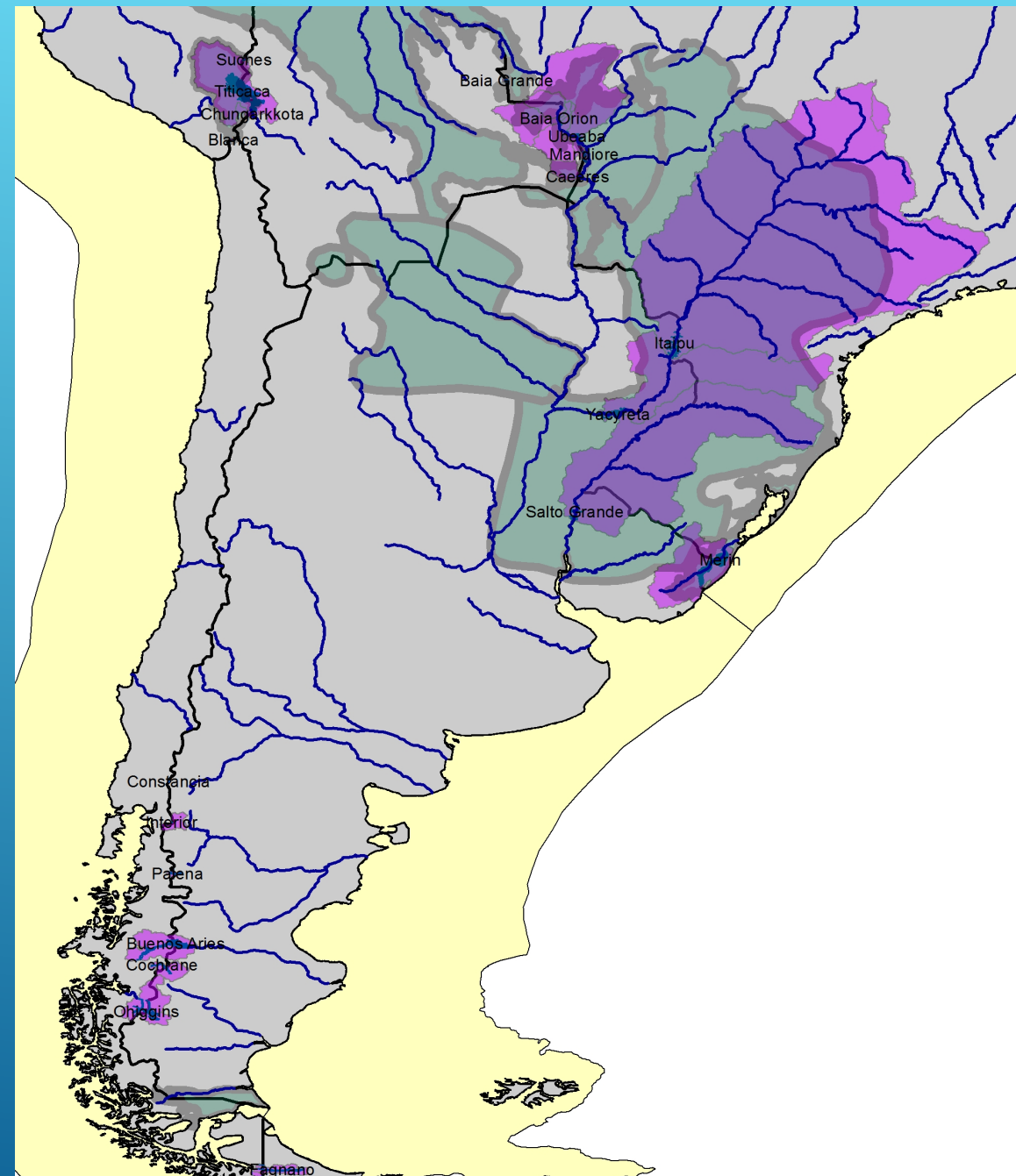
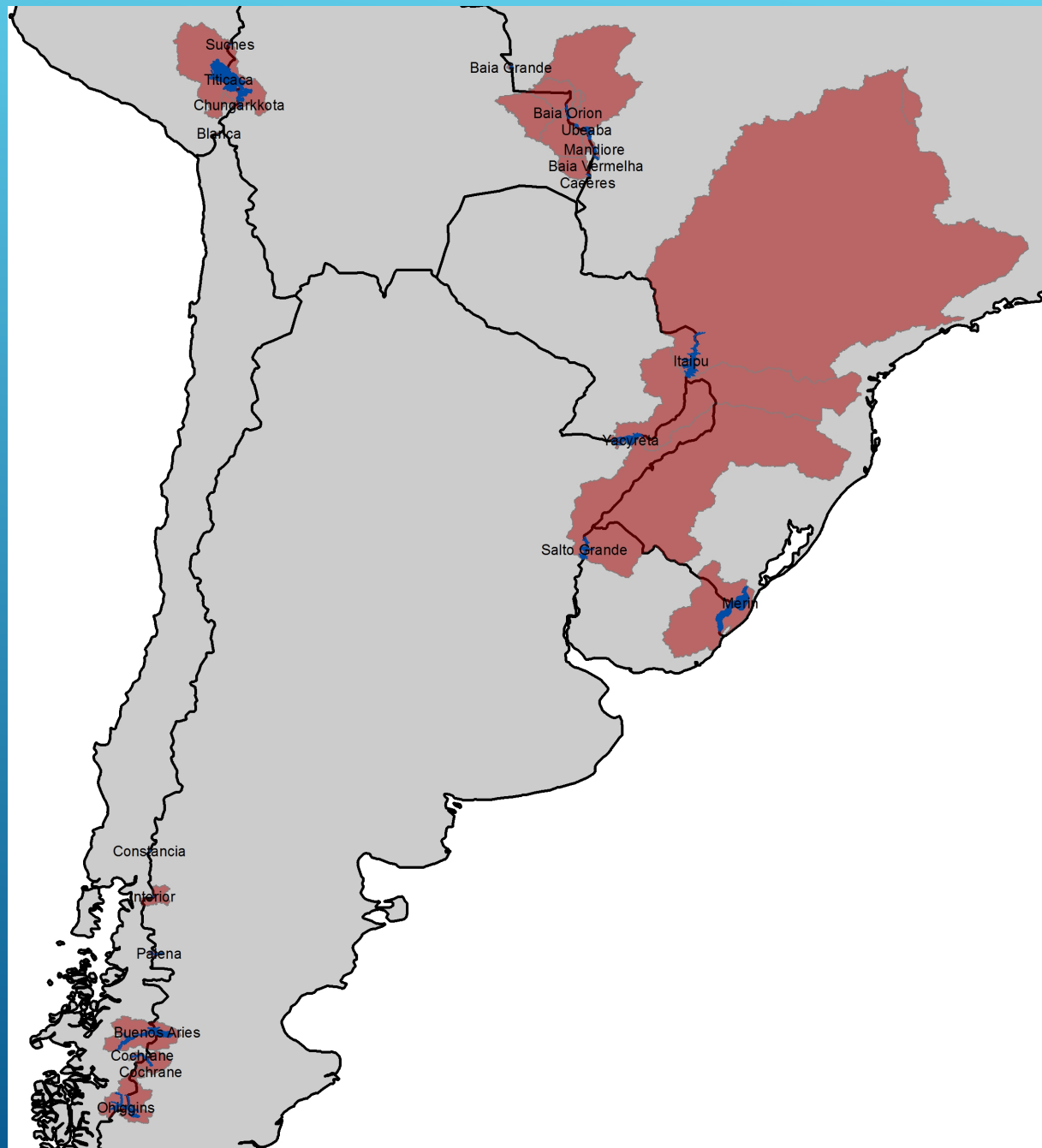


Integrated Lentic-Lotic Basin Management (ILLBM/ILBM):

“A focus on the holistic management of lakes and other lentic water systems through gradual, continuous and holistic improvement of basin governance, including ecosystem services shared value assessment (ESSVA) to facilitate sustainable ecosystem services.”



Overview of ILBM Governance Framework



Three Main Messages from TB Lakes Assessment

- *Lack of uniform lake data makes it difficult to accurately assess the status and trends of transboundary lakes on a global scale.*

Lakes and other lentic (pooled) water systems contain more than 90 per cent of the liquid freshwater on the surface of our planet, and provide the widest range of life-supporting ecosystem goods and services. However, there is a serious lack of lake basin data on a global scale, seriously hindering our ability to make accurate assessments or realistic comparisons of the status and trends of transboundary lakes. The international water community must undertake significant development of knowledge bases focusing on lakes, their basins and other lentic water systems in order to address this serious deficiency.

- ***Based on basin characteristics, African transboundary lakes as a group exhibited the greatest (Adjusted) Human Water Security threats, following by lakes in Asia and South America. Transboundary lakes in developed countries exhibited the greatest Incident Biodiversity threats, with those in developing countries exhibiting comparatively better conditions.***

Accurate assessment of transboundary lake threats is not simply a number-crunching exercise; it requires agreed set of indicators that can be translated into contextually-determined weighted scores, based on factors/ preconditions most important to the user of the results. The TWAP transboundary lakes threats were based on basin characteristics expressed as 24 basin indicators (drivers) categorized in four thematic subject areas, complimented by expert opinion and scenario analyses. Subsequent TWAP-scale assessments, including in-lake information and data will provide more definitive conclusions regarding the lake threats. Nevertheless, as for any prioritization decision-making process, it is very difficult to identify a unilaterally-agreed list of transboundary lake basins requiring priority management interventions within the TWAP framework.

- ***Integrated Water Resource Management (IWRM) can best assess and manage lakes and other lentic water systems for sustainable ecosystem services within the context of an Integrated Lentic-Lotic Basin Management (ILLBM) framework for lake basins, their inflowing and outflowing rivers and other lotic waters.***

IWRM has facilitated water resources policy reforms in many countries, but does not adequately consider defining characteristics of lentic water systems or their ecosystem services, which requires longer-term, incremental lake basin governance improvements directed to their sustainable use and conservation. Infusing ILLBM with IWRM offers an effective means of sustainably managing lakes/reservoirs and interlinked water systems, through gradual, continuous improvement of basin governance (i.e., institutions, policies, stakeholder participation, scientific and traditional knowledge, technical possibilities, funding constraints). It also provides standardized analysis process for enhancing GEF TDA/SAP process for catalysing transboundary water management interventions. As an extension of the ILBM framework, ILLBM also provides a virtual framework for strengthening river-lake-coastal basin governance.

**So, go jump in the lake.....
...but be sure it's not degraded
before you do!**

