



NILE BASIN INITIATIVE
INITIATIVE DU BASSIN DU NIL

COARSE EFLOW ASSESSMENT 8 RIVER SITES NILE BASIN

BY G O'BRIEN



Coarse e-flow assessment Nile Basin



COARSE ENVIRONMENTAL FLOW ASSESSMENT FOR SELECTED SITES IN THE NILE BASIN

**Project title: Biodiversity Conservation and Sustainable Utilisation of
Ecosystem Services of Wetlands of Transboundary Relevance in the Nile
Basin**

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

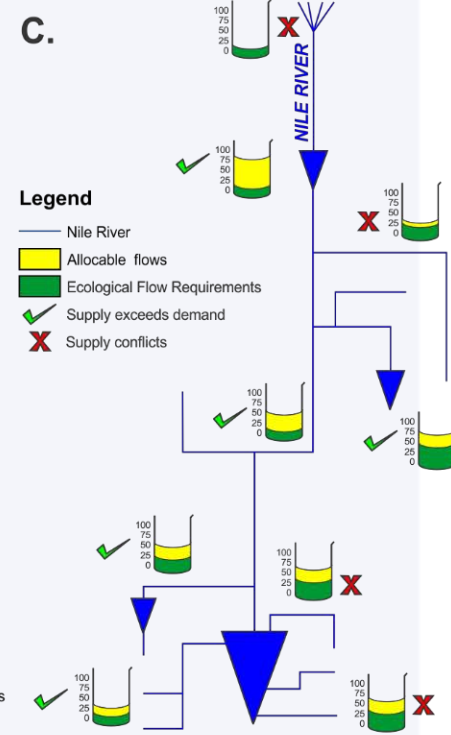
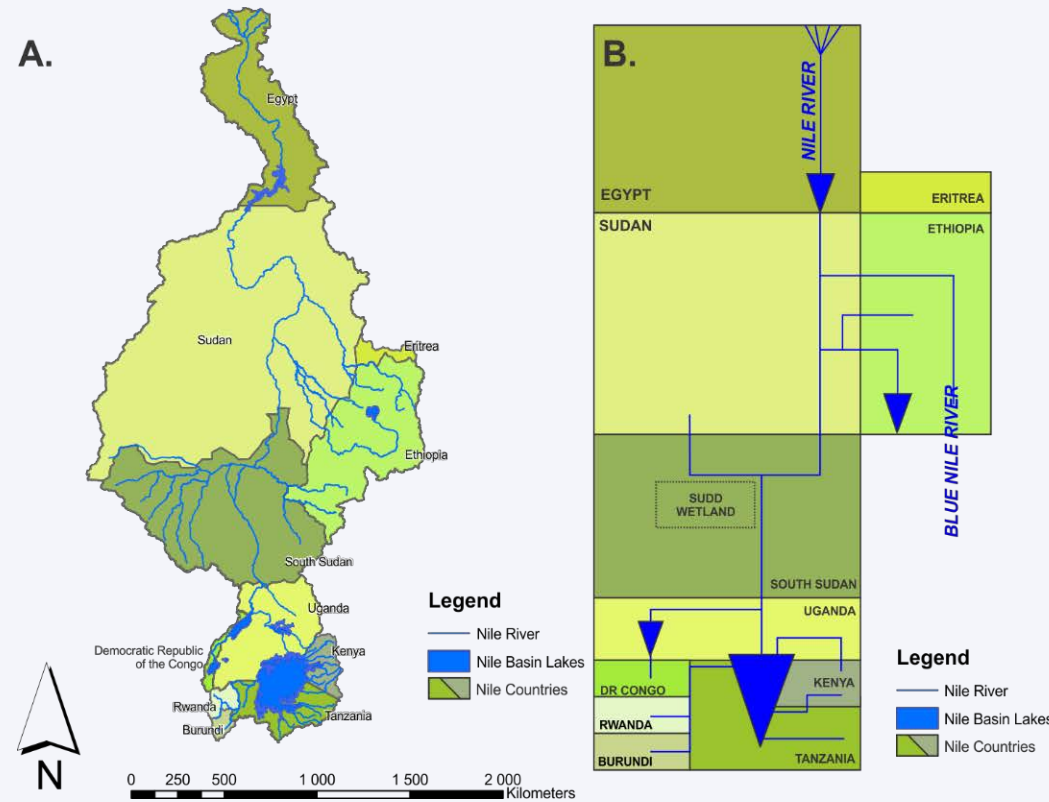


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Environmental flows describe the quantity, timing, and quality of freshwater flows and levels necessary to sustain aquatic ecosystems which, in turn, support human cultures, economies, livelihoods, and well-being.

Brisbane declaration of environmental flows (2018)

Aquatic ecosystems include rivers, streams, springs, floodplain and other wetlands, lakes, coastal waterbodies, including lagoons and estuaries, and groundwater-dependent ecosystems.

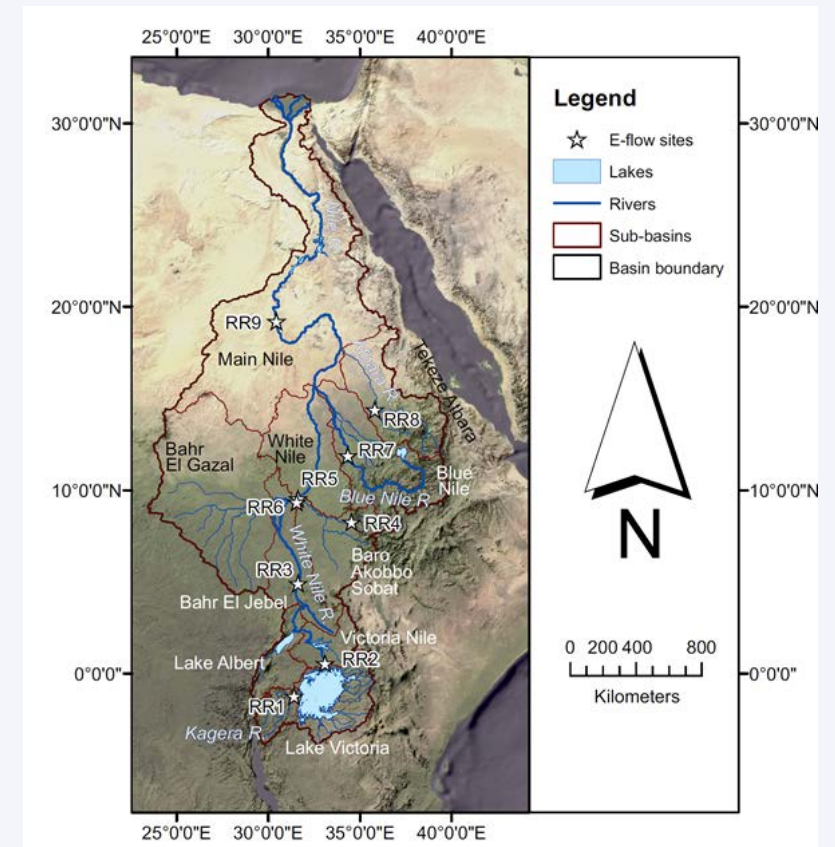


Coarse e-flow assessment Nile Basin

THE AIM OF THE STUDY IS TO DETERMINE COARSE EFLOWS FOR NINE REACHES OF RIVERS IN THE NILE BASIN.

To achieve the aim the following objectives were established:

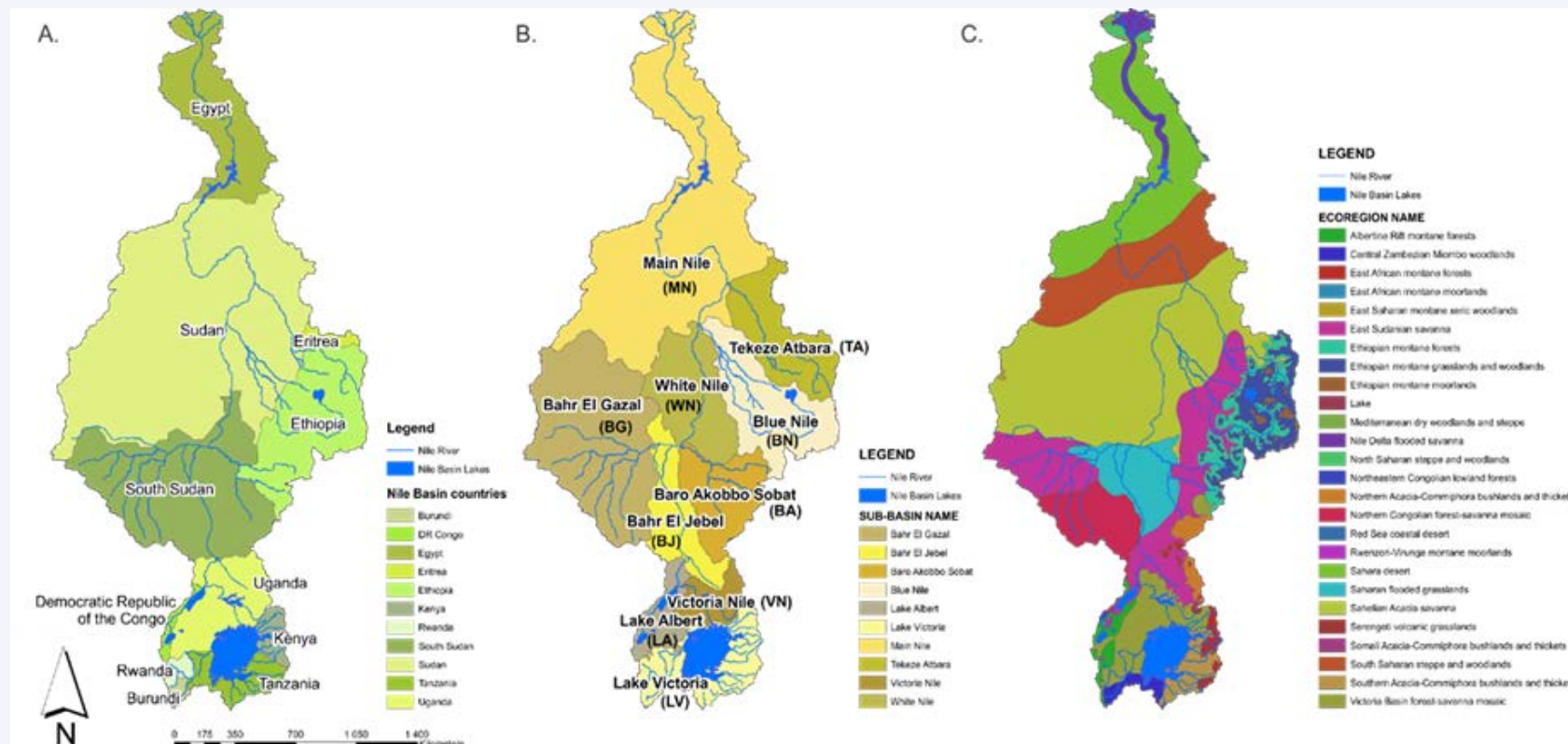
1. Review available hydrology, hydraulics and ecosystem information for each reach to establish coarse flow-ecosystem relationships for each reach considered.
2. Determine eflows to maintain the ecosystem integrity of each reach in a Class B (largely natural), C (moderately modified) and D (largely modified by sustainable).
3. Apply the PROBFLO holistic eflow determination method to propose low confident eflows for the eight river reaches.
4. Establish a Microsoft Excel[®] *HYDROLOGY – EFLOW QUERY TOOL* to evaluate the probable ecological effects of altered flows in the study.



PROBFLO

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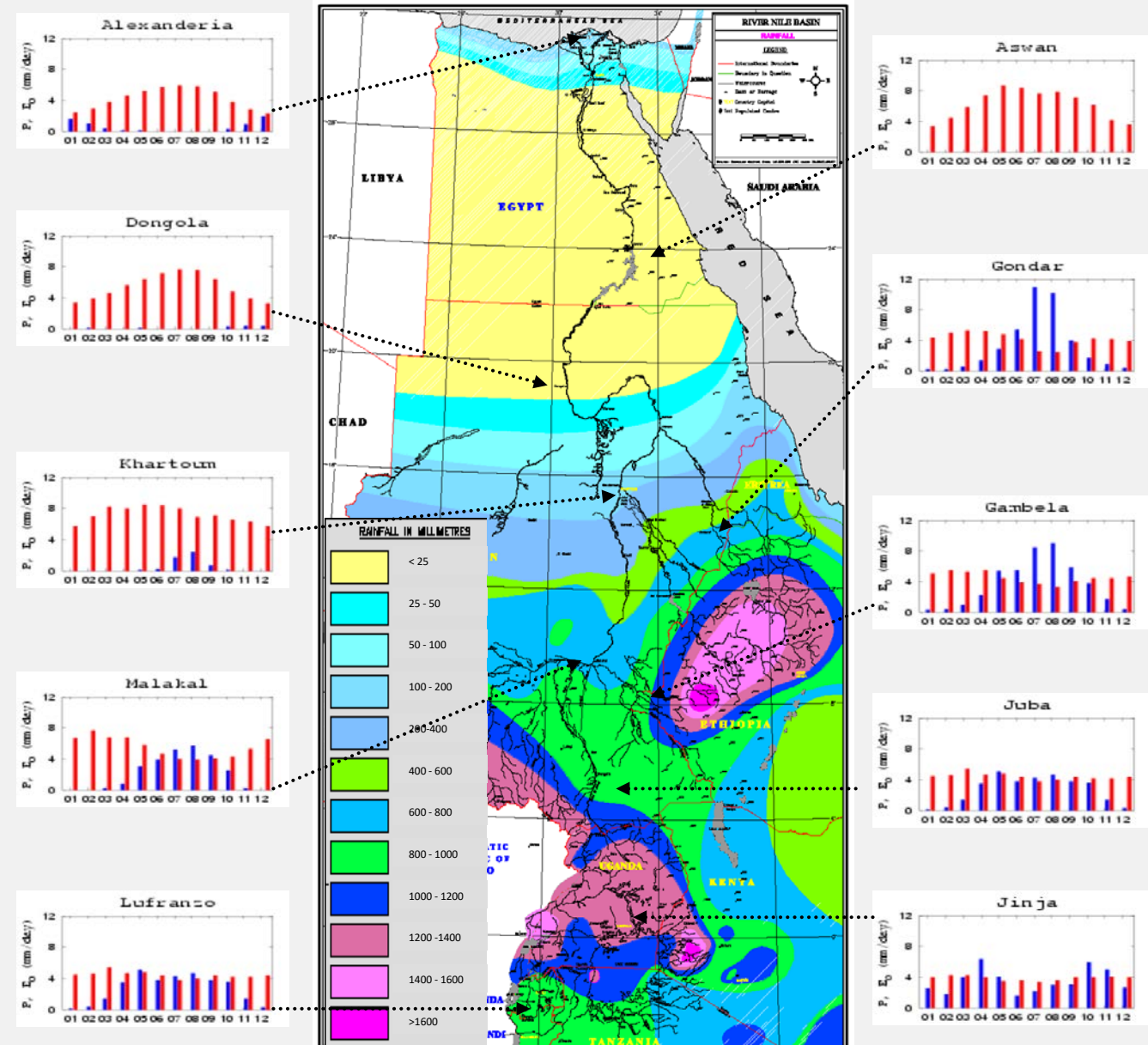
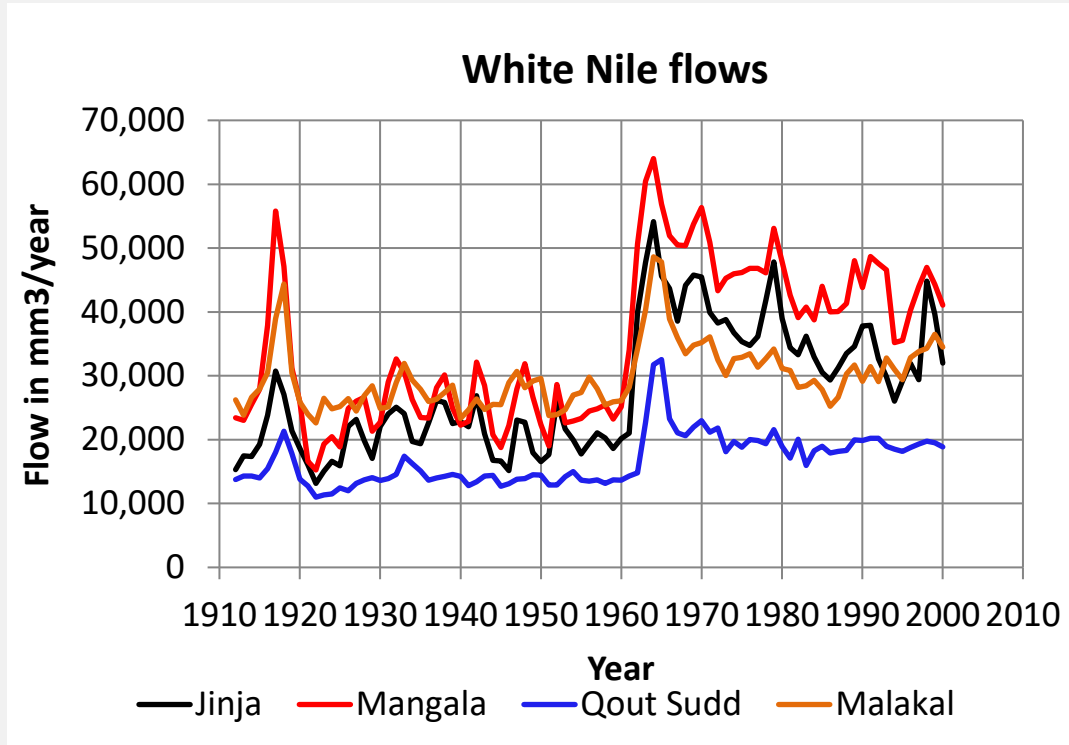
Available information → Study area, catchment, ecoregions and general biodiversity and ecosystem process information.



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RR	River	Reach Name	Site/ Weir	Period	Reference MAR (MCM)
RR1	Kagera	Kagera River	Kyaka Ferry	1952-1989	6 979
RR2	Victoria Nile	Victoria Nile downstream of Lake Victoria	Jinja	1963-2013	34 024
RR3	Bahr el Jebel	Bahr el Jebel upstream of Sudd inflow	Mangala	1963-1981	50 479
RR4	Baro River	Baro River upstream of Machar Marshes	Gambela	1977-2004	12 176
RR5	Sobat	Sobat River upstream of mouth (confluence with White Nile)	Hillet Dolieb	1906-1982	13 651
RR6	White Nile	White Nile upstream of Jebel Aulia	Malakal	1963-2006	32 043
RR7	Blue Nile	Blue Nile downstream of GERD	Eldiem/Roseires	1921-2013	49 712
RR8	Atbara	Atbara River	Kubor and Wad Elhiliew	1921-2001	12 616
RR9	Nile	Main Nile upstream of Lake Nasser	Dongola	1944-2008	77 513

Available information → Natural and present hydrology with dry (<1962) vs. wet (>1962) phase variability.



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Available information → Evaluation of habitat variability using google earth.



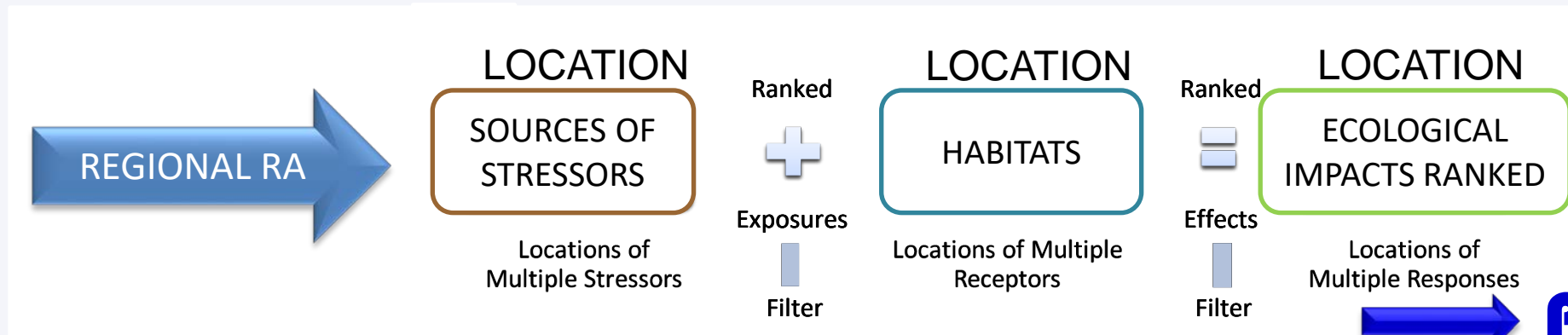
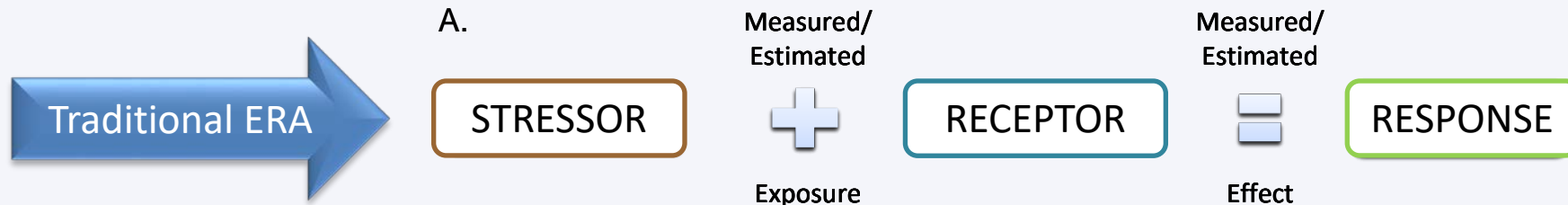
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Available information → Vision for eflows based on ecological classification system A → F.

Ecological Categories	Name	Description
A	Natural	Unmodified natural
B	Good	Largely natural with few modifications
C	Fair	Moderately modified
D	Poor	Largely modified
E	Seriously modified	Seriously modified
F	Critically modified	Critically or extremely modified

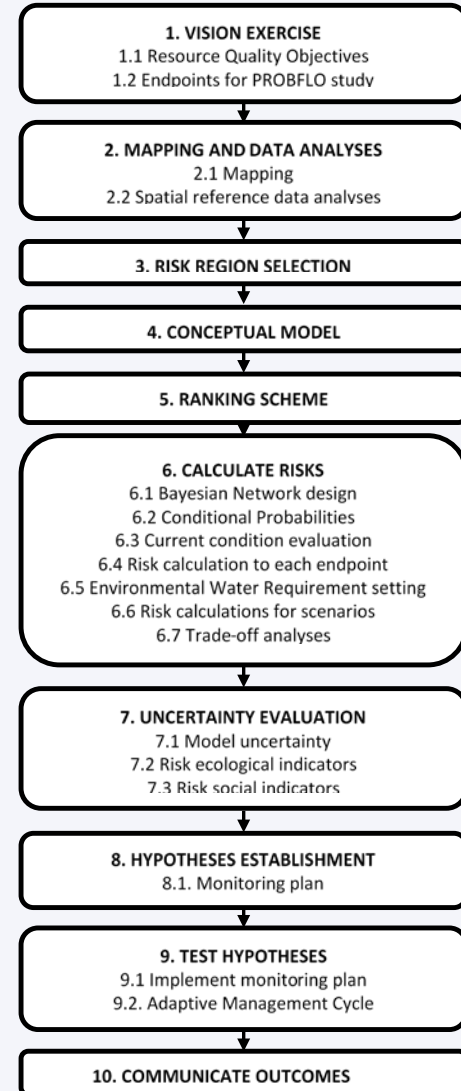
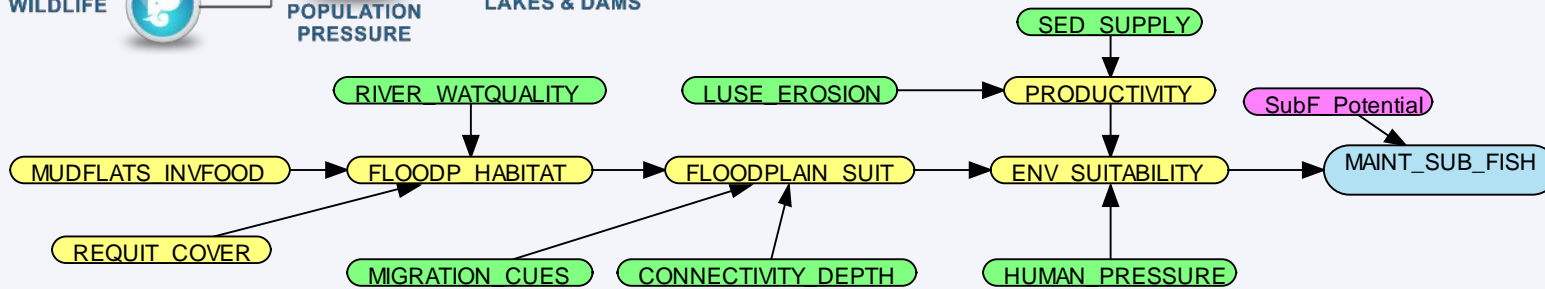
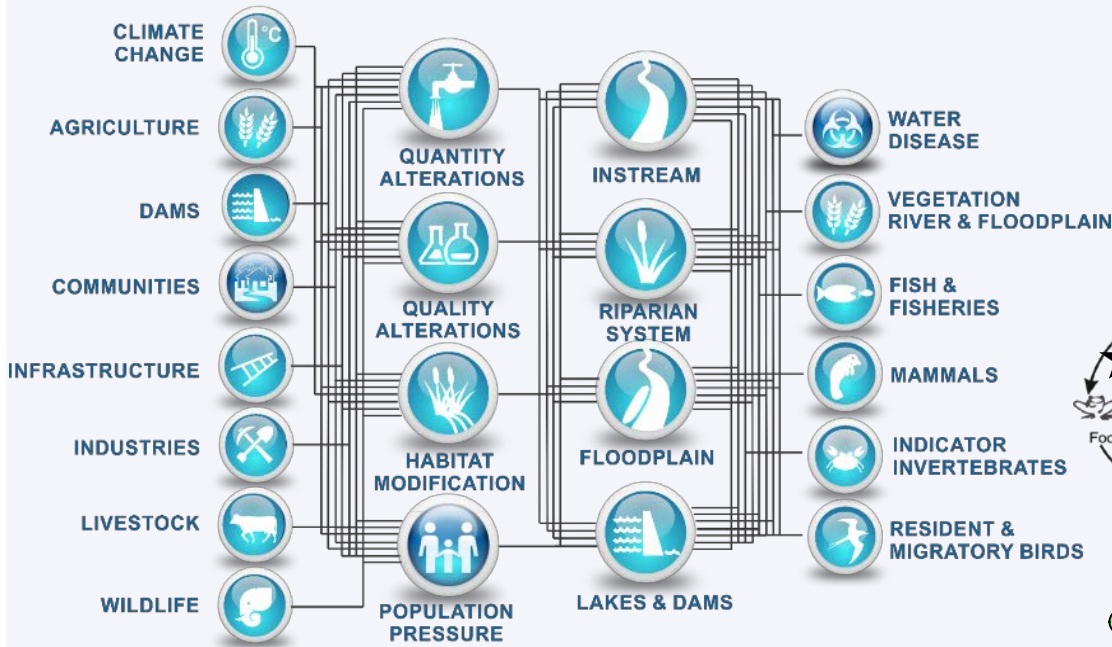
Threshold of sustainability

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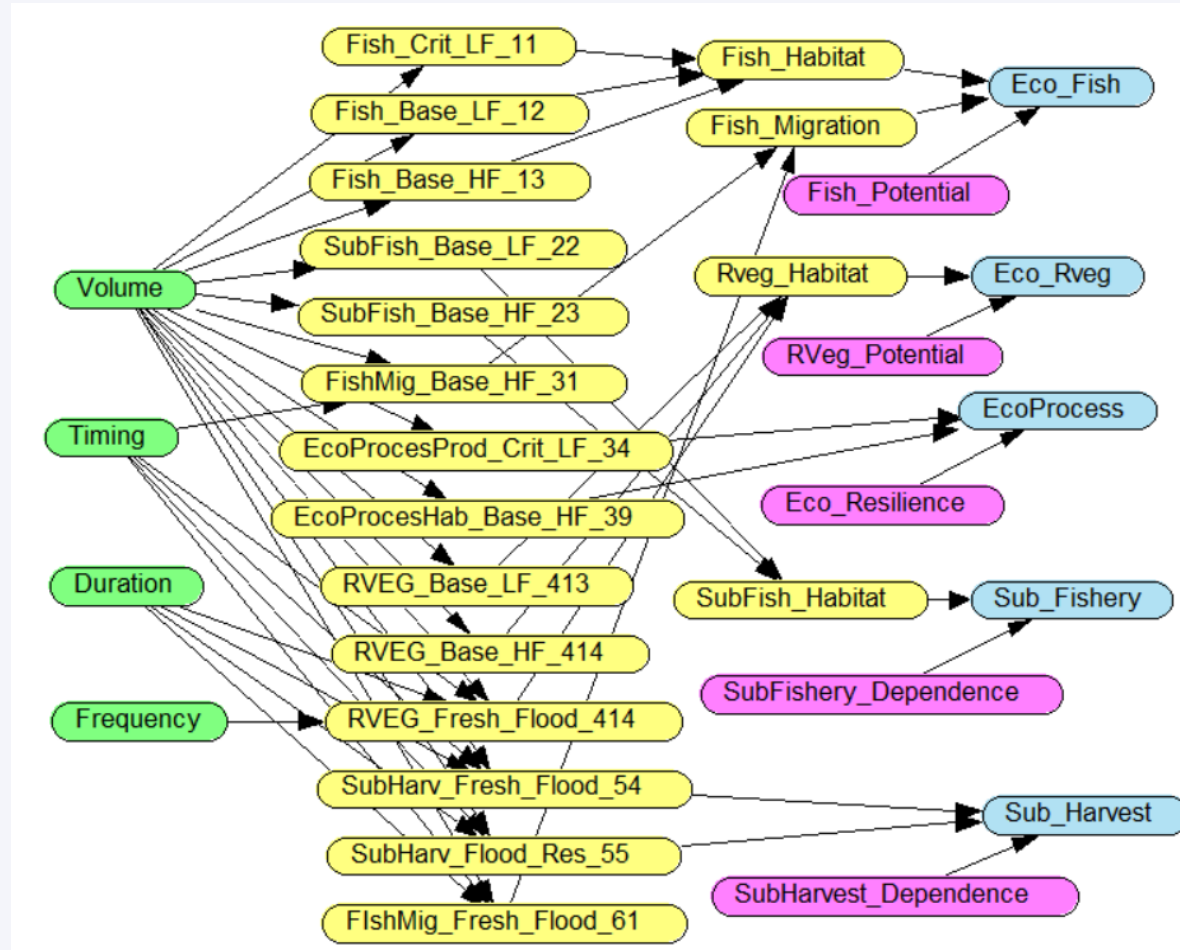


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USE ACTIVITIES STRESSORS HABITATS ENDPOINTS



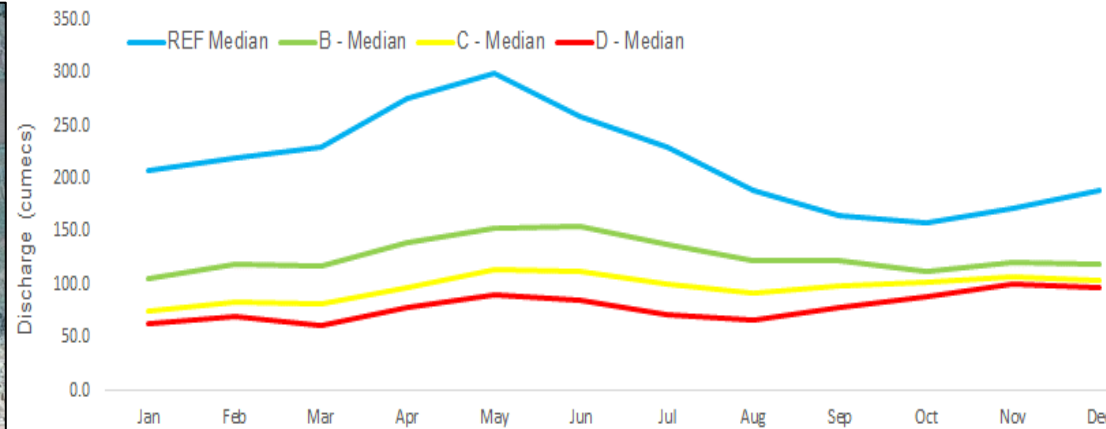
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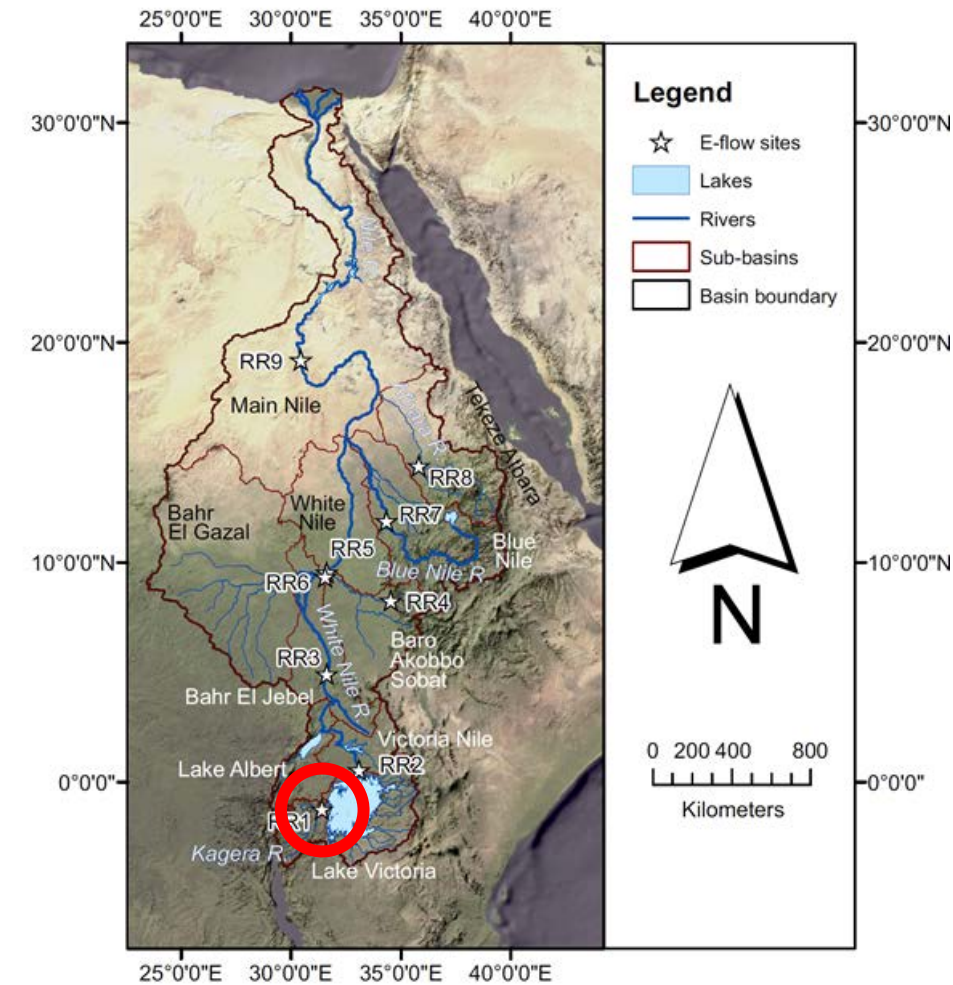
COARSE EFLOW ASSESSMENT FOR SELECTED SITES IN THE NILE BASIN

Kagera River outcomes:

RR	River	Reference (MCM)	% Requirement				Volume Requirement (MCM)			
			Low flows	Drought flows	Floods	Total	Low flows	Drought flows	Floods	Total
RR1	Kagera	6 979	47.7	Not specified	10.0	57.7	3 349	Not specified	705	4 054



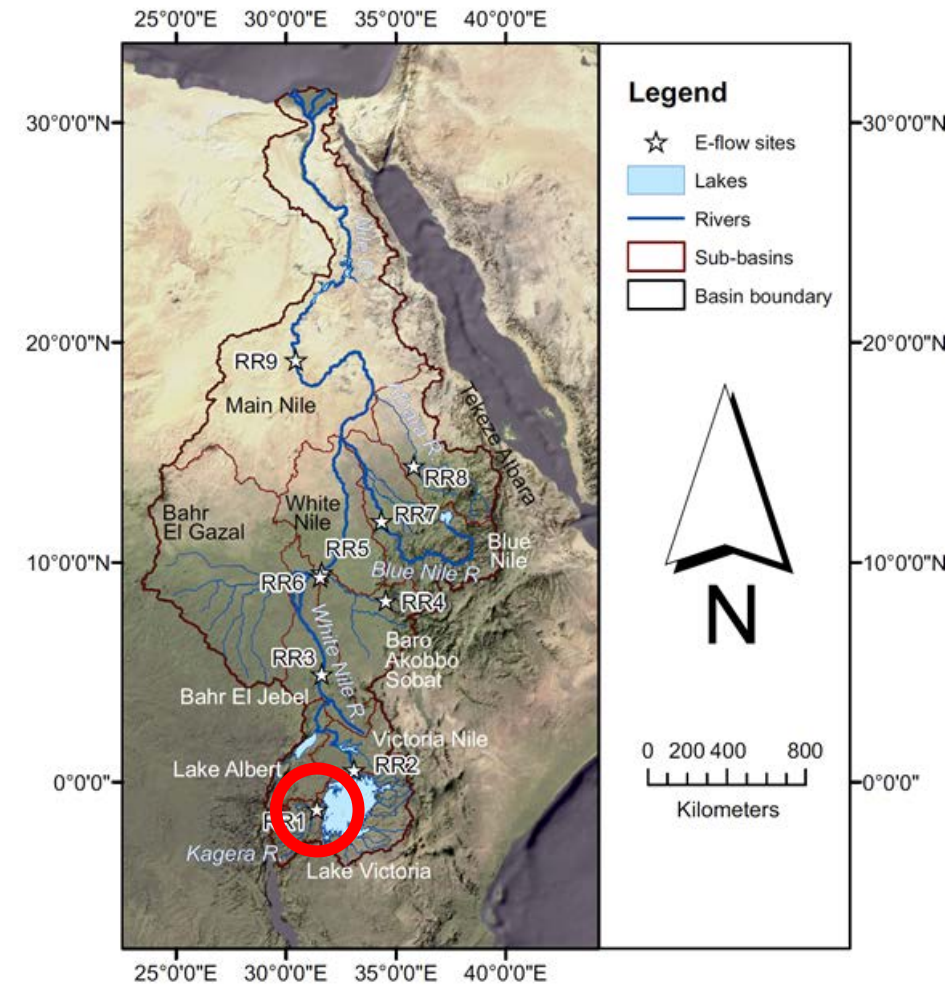
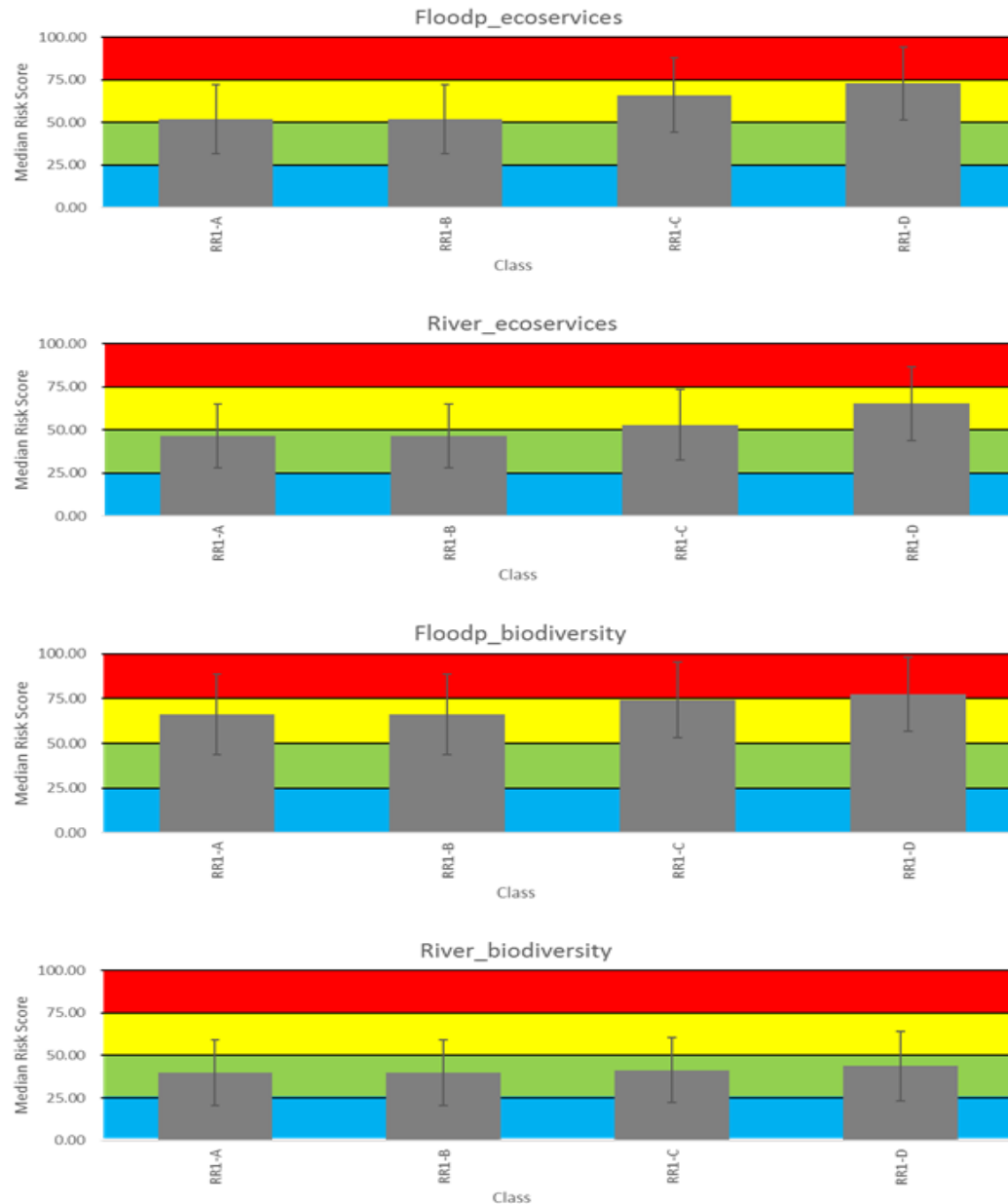
RR	River	Flow Component	Percentage EFR per Ecological Class		
			B	C	D
1	Kagera River	Drought flows	Included in Maintenance Low flows		
		Maintenance (or base) flows Low (or dry) period	48%	29%	17%
		Maintenance (or base) flows high (or wet) period	10%	9%	4%
		Total	58%	38%	21%



← Low confidence eflow

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Kagera River outcomes:

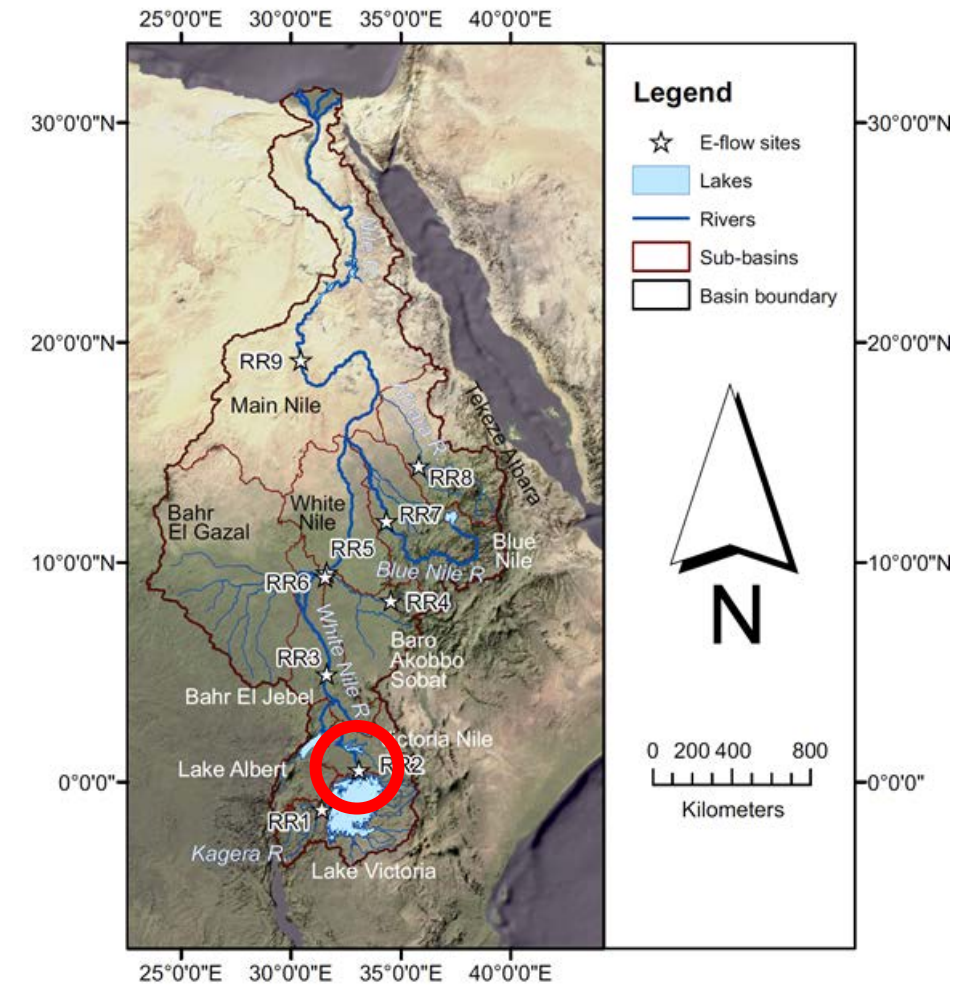
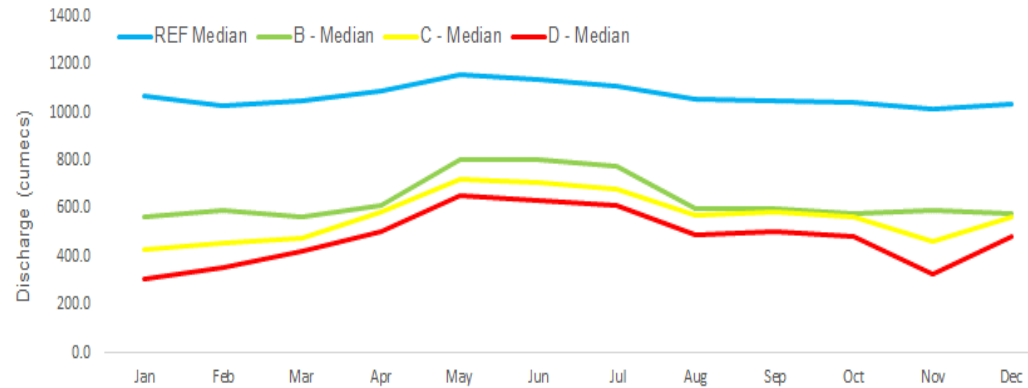


← Socio-ecological consequences (risk) of altered flows.

COARSE EFLOW ASSESSMENT FOR SELECTED SITES IN THE NILE BASIN

Nile River (Vitoria Nile) outcomes:

RR	River	Reference (MCM)	% Requirement				Volume Requirement (MCM)			
			Low flows	Drought flows	Floods	Total	Low flows	Drought flows	Floods	Total
RR2	Victoria Nile	34 024	45.7	Not specified	7.60	53.5	15 614	Not specified	2 592	18 206



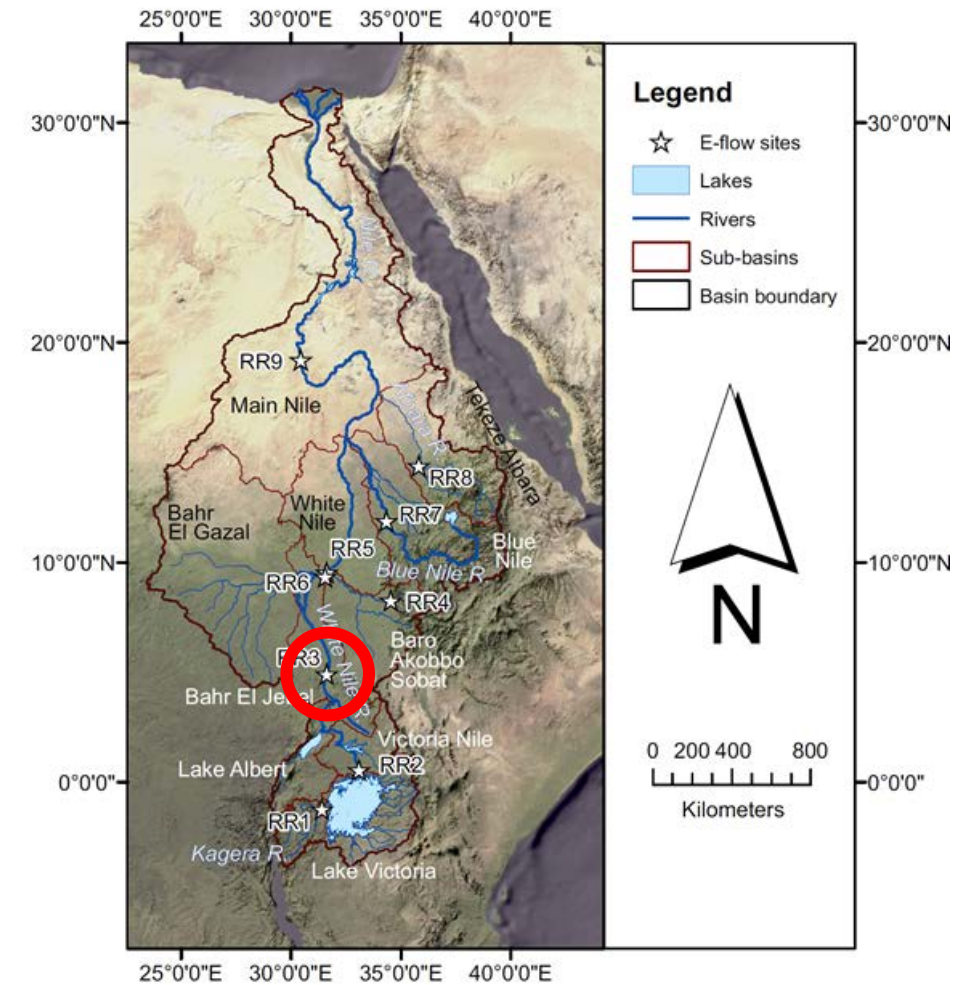
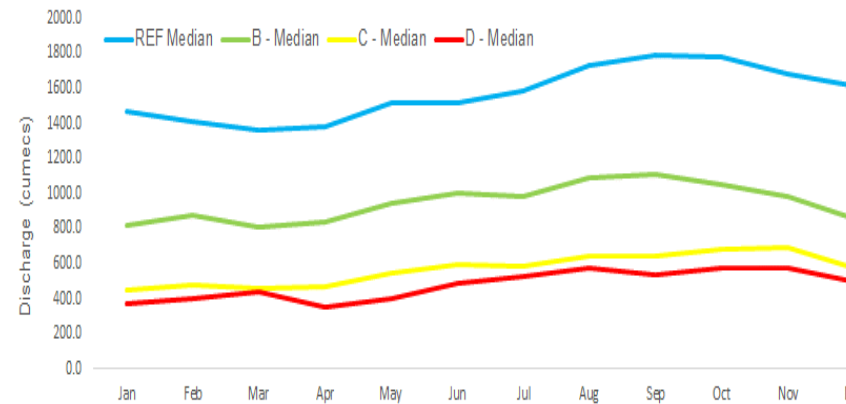
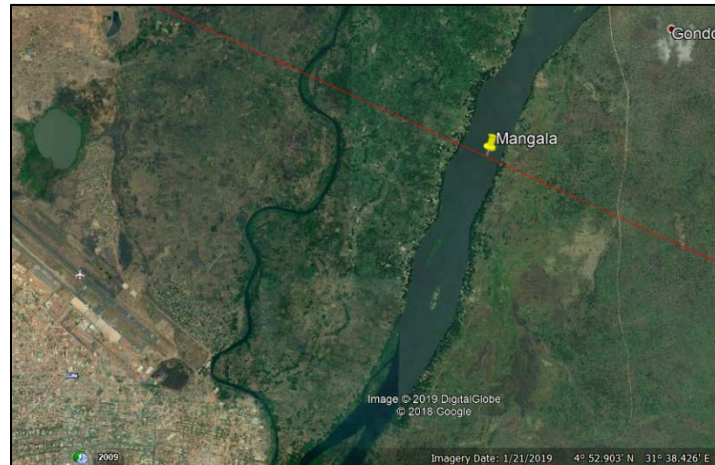
← Low confidence eflow

RR	River	Flow Component	Percentage EFR per Ecological Class		
			B	C	D
2	White Nile (Victoria Nile)	Drought flows	Included in Maintenance Low flows		
		Maintenance (or base) flows Low (or dry) period	46%	32%	23%
		Maintenance (or base) flows high (or wet) period	8%	5%	5%
		Total	54%	37%	29%

COARSE EFLOW ASSESSMENT FOR SELECTED SITES IN THE NILE BASIN

Nile River (BAHR EL JEBEL) outcomes:

RR	River	Reference (MCM)	% Requirement				Volume Requirement (MCM)			
			Low flows	Drought flows	Floods	Total	Low flows	Drought flows	Floods	Total
RR3	Bahr el Jebel	50 479	45.8	Not specified	6.2	52.0	22 932	Not specified	3 091	26 024



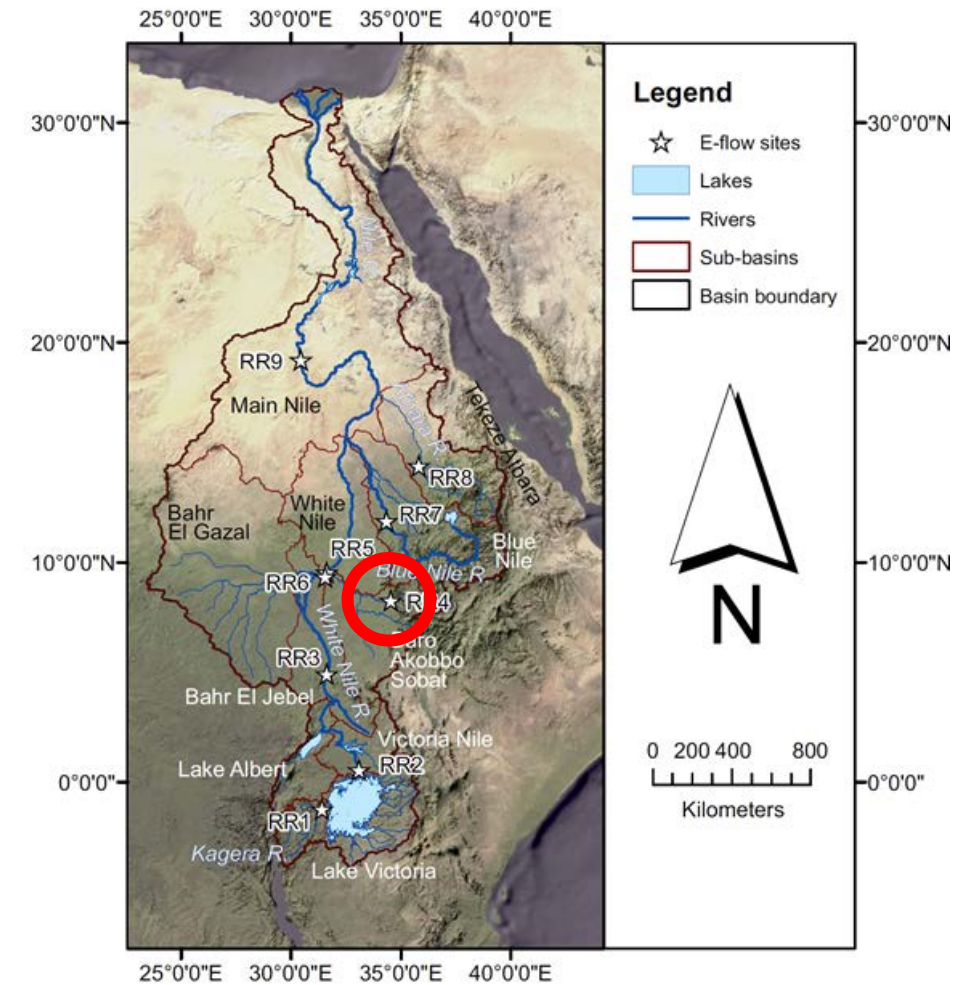
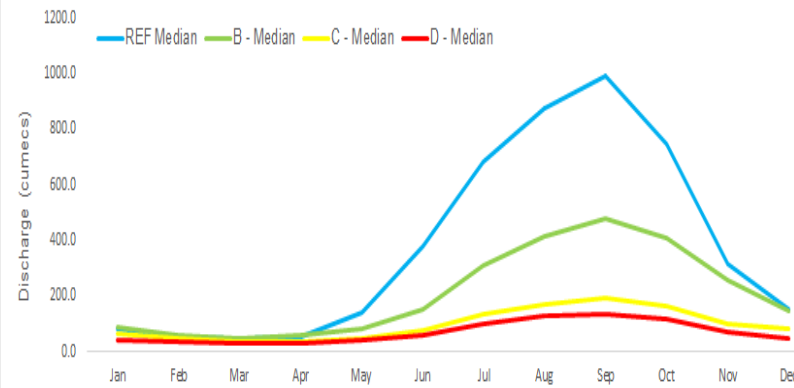
← Low confidence eflow

RR	River	Flow Component	Percentage EFR per Ecological Class		
			B	C	D
3	White Nile (Bahr el Jebel)	Drought flows	Included in Maintenance Low flows		
		Maintenance (or base) flows Low (or dry) period	46%	22%	19%
		Maintenance (or base) flows high (or wet) period	6%	4%	3%
		Total	52%	26%	21%

COARSE EFLOW ASSESSMENT FOR SELECTED SITES IN THE NILE BASIN

Baro River outcomes:

RR	River	Reference (MCM)	% Requirement				Volume Requirement (MCM)			
			Low flows	Drought flows	Floods	Total	Low flows	Drought flows	Floods	Total
RR4	Baro	12 176	47.7	15.0	10.4	49.6	4 709	1 803	1 246	5 954



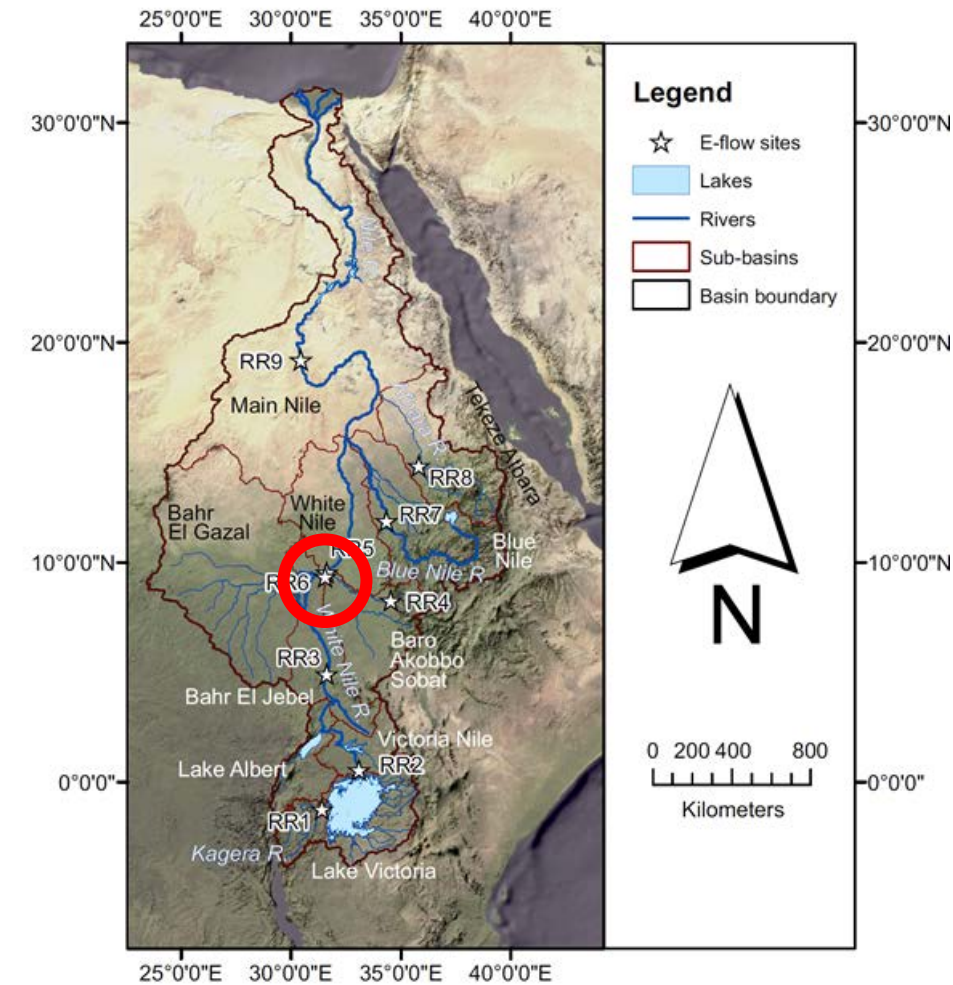
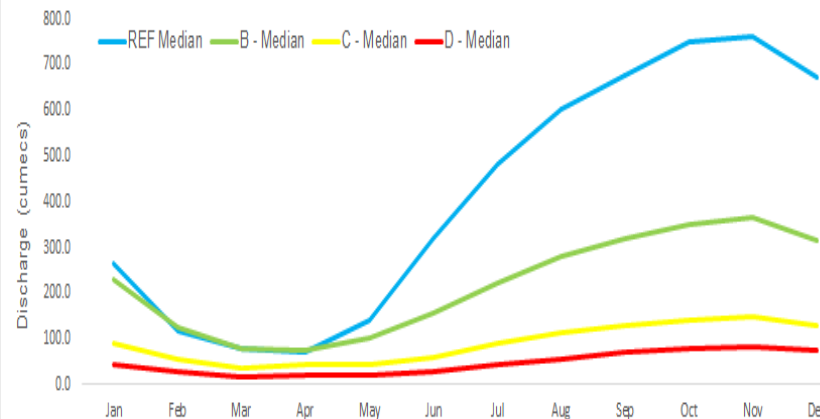
← Low confidence eflow

RR	River	Flow Component	Percentage EFR per Ecological Class		
			B	C	D
4	Baro River	Drought flows	15%	12%	11%
		Maintenance (or base) flows Low (or dry) period	39%	23%	11%
		Maintenance (or base) flows high (or wet) period	10%	3%	1%
		Total	50%	26%	13%

COARSE EFLOW ASSESSMENT FOR SELECTED SITES IN THE NILE BASIN

Sobat River outcomes:

RR	River	Reference (MCM)	% Requirement				Volume Requirement (MCM)			
			Low flows	Drought flows	Floods	Total	Low flows	Drought flows	Floods	Total
RR5	Sobat	13 651	33.2	18.1	13.0	46.2	4 524	2 462	1 769	6 294



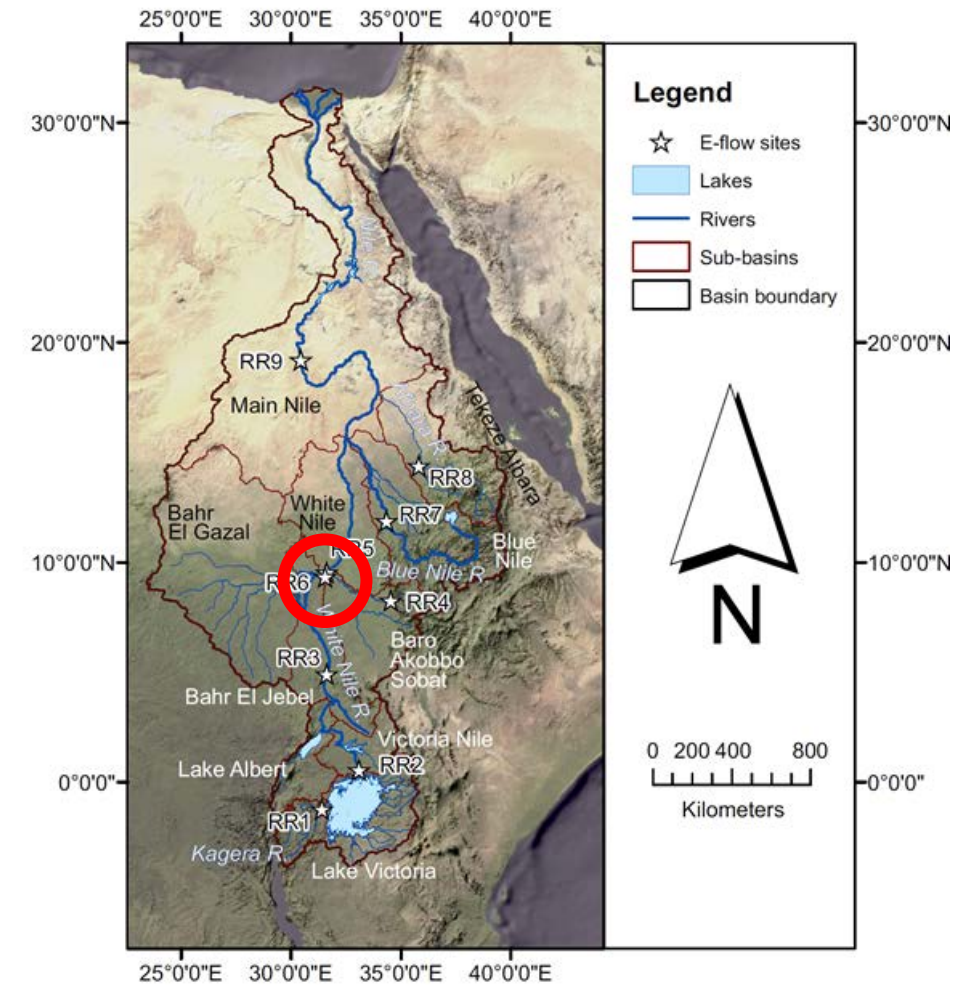
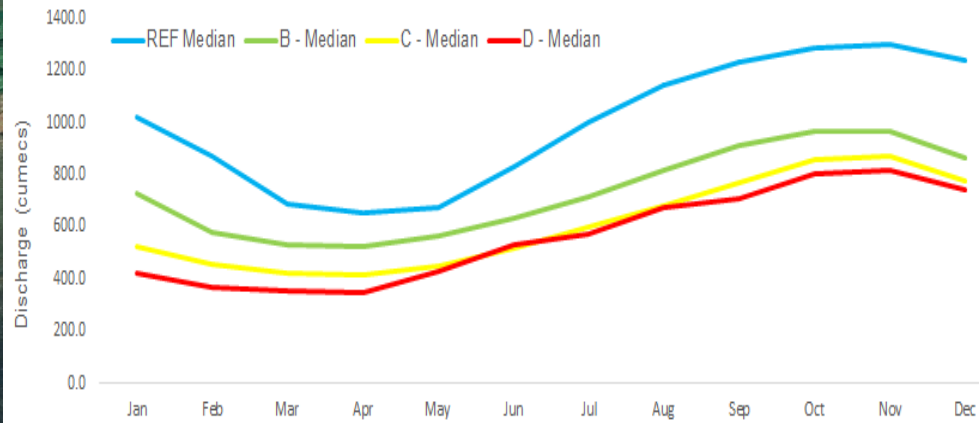
← Low confidence eflow

RR	River	Flow Component	Percentage EFR per Ecological Class		
			B	C	D
5	Sobat River	Drought flows	18%	9%	7%
		Maintenance (or base) flows Low (or dry) period	33%	15%	7%
		Maintenance (or base) flows high (or wet) period	13%	4%	2%
		Total	46%	19%	9%

COARSE EFLOW ASSESSMENT FOR SELECTED SITES IN THE NILE BASIN

White Nile River outcomes:

RR	River	Reference (MCM)	% Requirement				Volume Requirement (MCM)			
			Low flows	Drought flows	Floods	Total	Low flows	Drought flows	Floods	Total
RR6	White Nile	32 043	47.5	Not specified	16.8	64.3	15 209	Not specified	5 382	20 592



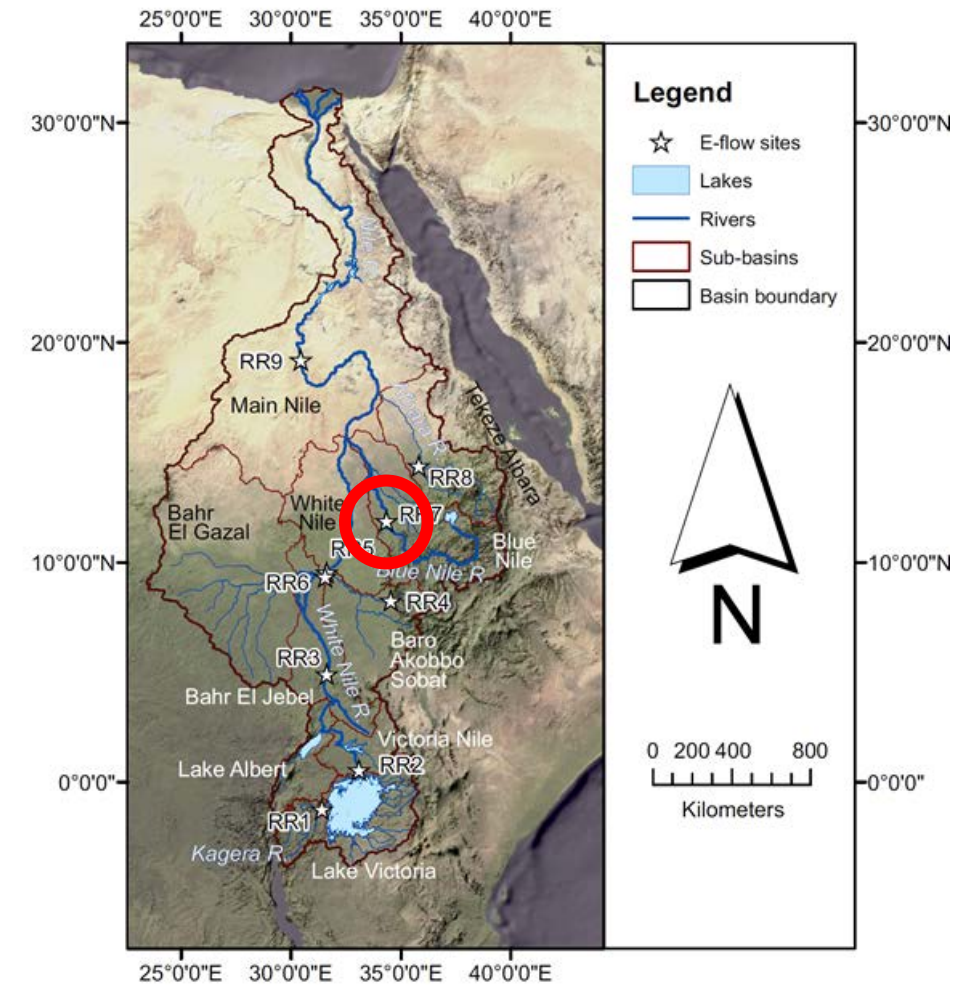
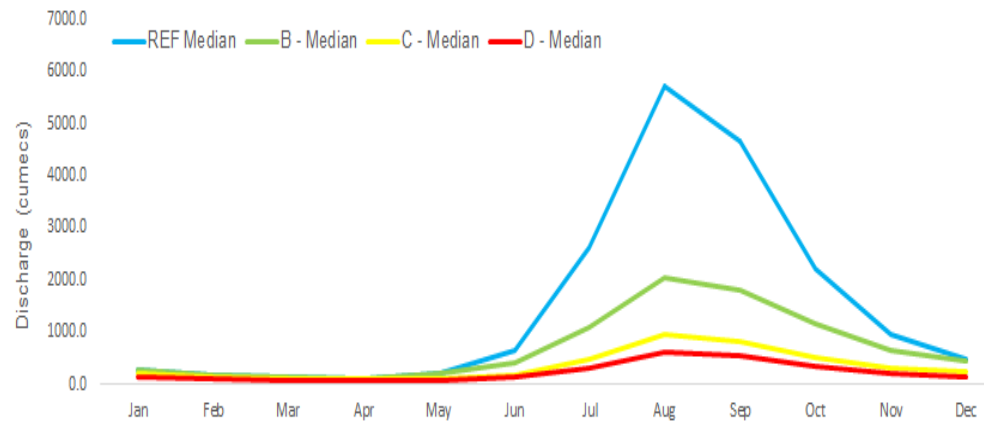
← Low confidence eflow

RR	River	Flow Component	Percentage EFR per Ecological Class		
			B	C	D
6	White Nile (Malakal)	Drought flows	Included in Maintenance Low flows		
		Maintenance (or base) flows Low (or dry) period	47.5%	34.1%	27.4%
		Maintenance (or base) flows high (or wet) period	16.8%	9.2%	7.0%
		Total	64.3%	43.2%	34.3%

COARSE EFLOW ASSESSMENT FOR SELECTED SITES IN THE NILE BASIN

Blue Nile River outcomes:

RR	River	Reference (MCM)	% Requirement				Volume Requirement (MCM)			
			Low flows	Drought flows	Floods	Total	Low flows	Drought flows	Floods	Total
RR7	Lue Nile	49 712	32.4	15.4	9.6	41.9	16 115	7 690	4 756	20 871



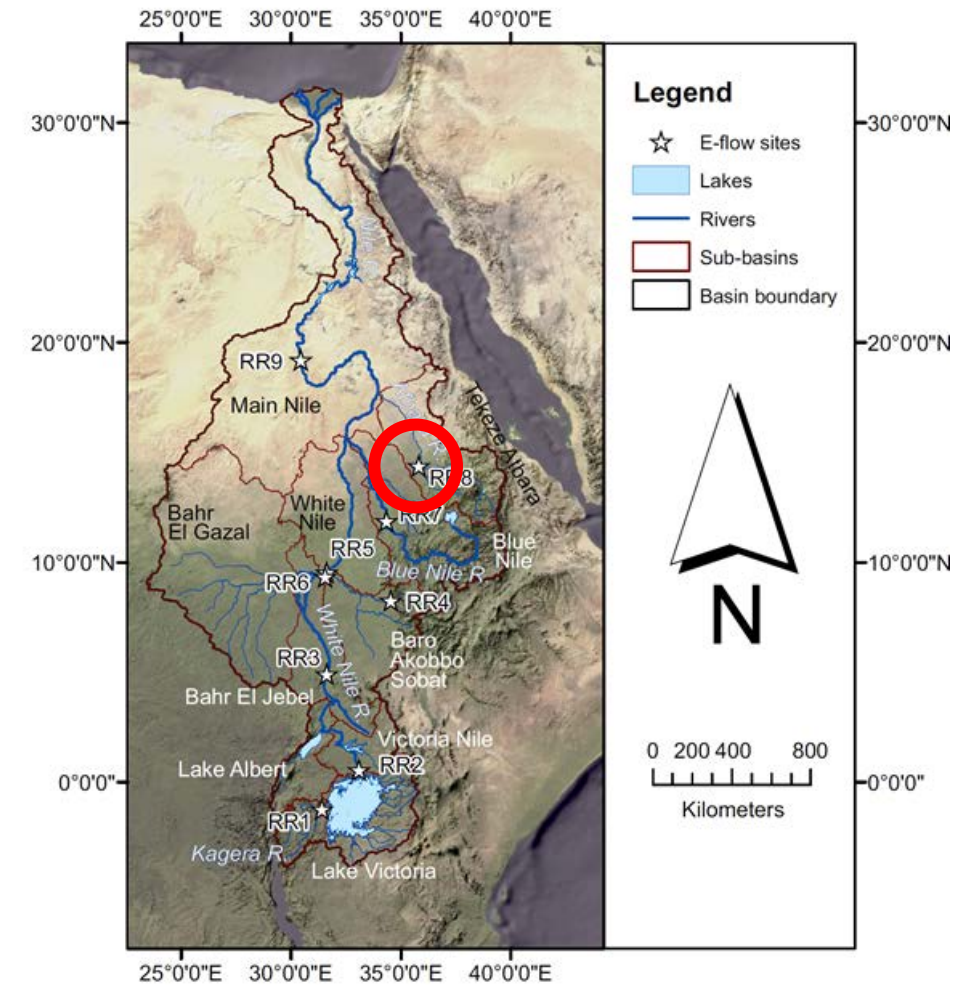
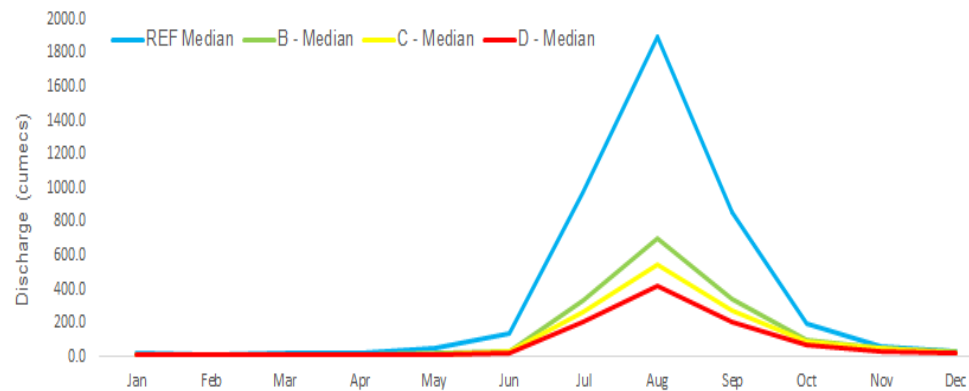
← Low confidence eflow

RR	River	Flow Component	Percentage EFR per Ecological Class		
			B	C	D
7	Blue Nile River (Roseries)	Drought flows	15.4%	12.7%	10.3%
		Maintenance (or base) flows Low (or dry) period	32.3%	19.8%	11.7%
		Maintenance (or base) flows high (or wet) period	9.6%	2.9%	2.3%
		Total	41.9%	22.6%	14.0%

COARSE EFLOW ASSESSMENT FOR SELECTED SITES IN THE NILE BASIN

Atbara River outcomes:

RR	River	Reference (MCM)	% Requirement				Volume Requirement (MCM)			
			Low flows	Drought flows	Floods	Total	Low flows	Drought flows	Floods	Total
RR8	Atbara	12 616	15.6	6.0	14.9	30.5	1 960	749	1 867	3 827



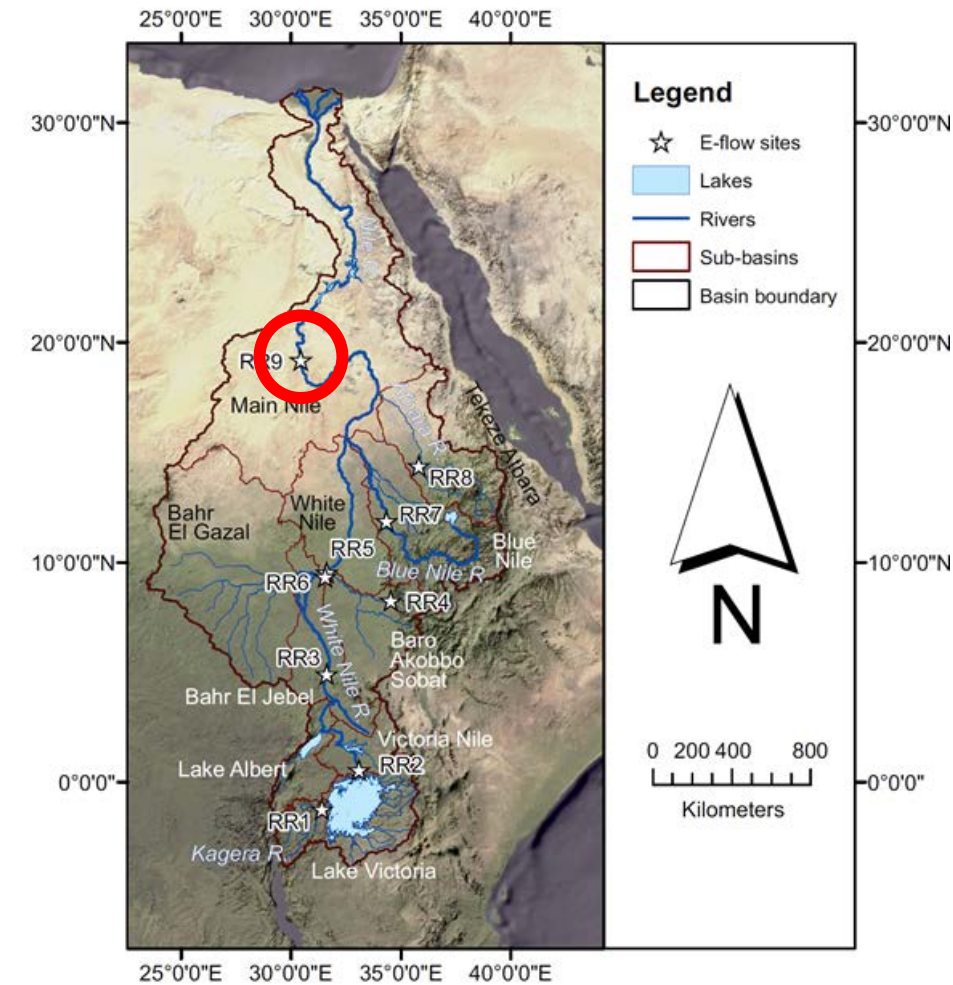
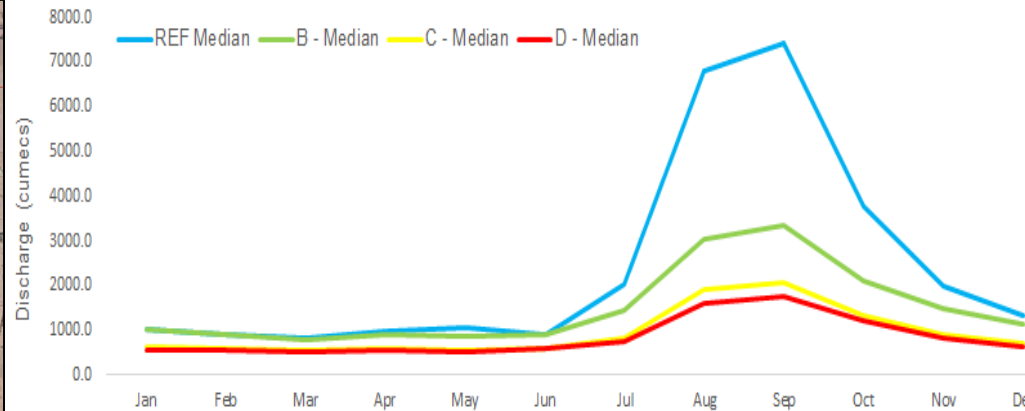
RR	River	Flow Component	Percentage EFR per Ecological Class		
			B	C	D
8	Atbara River (Kubor and Wad Elhiliew)	Drought flows	6.0%	6.0%	6.0%
		Maintenance (or base) flows Low (or dry) period	15.6%	13.2%	6.7%
		Maintenance (or base) flows high (or wet) period	14.9%	8.9%	6.9%
		Total	30.5%	22.1%	13.6%

← **Low confidence eflow** (here used desktop hydrological method only).

COARSE EFLOW ASSESSMENT FOR SELECTED SITES IN THE NILE BASIN

Main Nile River outcomes:

RR	River	Reference (MCM)	% Requirement				Volume Requirement (MCM)			
			Low flows	Drought flows	Floods	Total	Low flows	Drought flows	Floods	Total
RR9	Nile	77 513	41.3	13.2	13.6	55.0	31 969	10 209	10 554	42 523



RR	River	Flow Component	Percentage EFR per Ecological Class		
			B	C	D
9	Nile River (Dongola)	Drought flows	13.2%	13.2%	12.6%
		Maintenance (or base) flows Low (or dry) period	41.3%	23.4%	15.7%
		Maintenance (or base) flows high (or wet) period	13.6%	8.2%	5.5%
		Total	55.0%	31.6%	21.2%

← **Low confidence eflow** (here used desktop hydrological method only).



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**THANK
YOU!**

