



NILE BASIN INITIATIVE
INITIATIVE DU BASSIN DU NIL

The Nile Basin Initiative experience on climate change

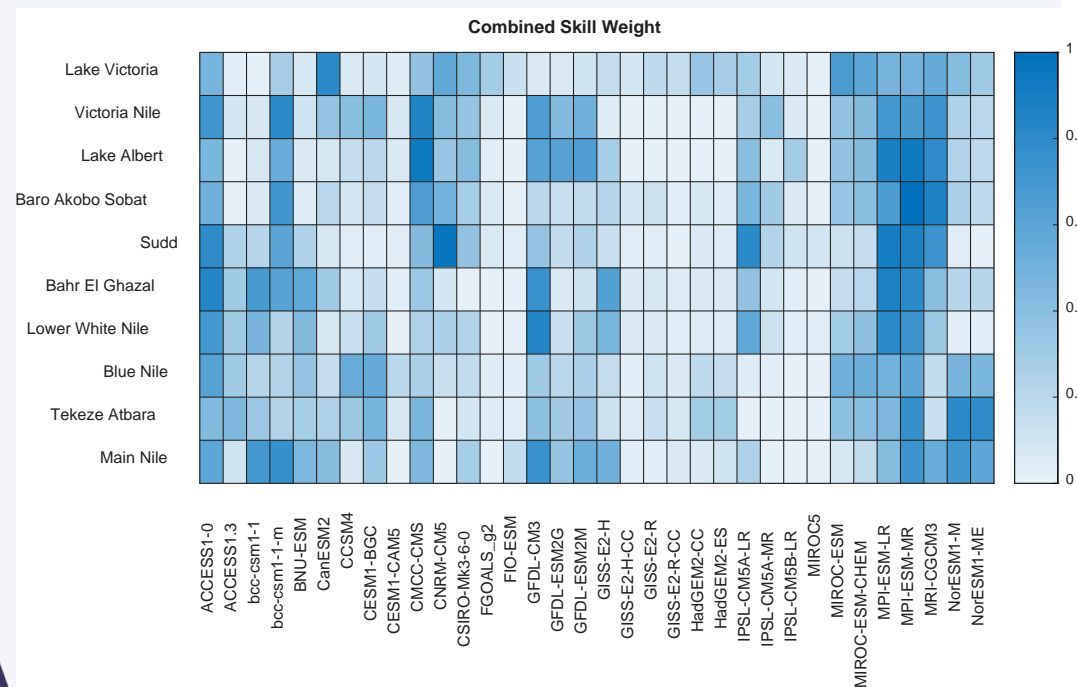
BY: Modathir Zaroug

Expected impact of CC on water resource

Basin Names: Lake Victoria										Table 3			
Independence		Skill		Rank Criteria						Temperature Extreme			
GCMs	Weight	GCMs	Weight	Seasonal variation		Annual variation		Close to consensus		Rainfall Extreme			
GCMs	Weight	GCMs	Weight	GCMs	Weight	GCMs	Weight	GCMs	Weight	GCMs	Weight		
'IPSL-CM5A-LR'	1.00	'CanESM2'	0.80	'ACCESS1-0'	0.88	'NorESM1-ME'	0.80	'GISS-E2-R-CC'	0.87	'CNRM-CM5'	0.70	'ACCESS1-0'	1.00
'MIROC5'	1.00	'MIROC-ESM'	0.66	'bcc-csm1-1-m'	0.77	'MIROC-ESM-CHEM'	0.71	'GFDL-ESM2G'	0.79	'GISS-E2-H'	0.69	'MIROC-ESM'	0.94
'NorESM1-ME'	1.00	'MIROC-ESM-CHEM'	0.59	'CNRM-CM5'	0.62	'MIROC-ESM'	0.68	'GISS-E2-H-CC'	0.73	'GISS-E2-H-CC'	0.66	'MPI-ESM-LR'	0.83
'IPSL-CM5B-LR'	0.93	'CNRM-CM5'	0.57	'MPI-ESM-LR'	0.58	'bcc-csm1-1-m'	0.66	'GISS-E2-R'	0.73	'GISS-E2-R'	0.65	'MIROC-ESM-CHEM'	0.81
'MRI-CGCM3'	0.80	'MRI-CGCM3'	0.55	'HadGEM2-CC'	0.54	'ACCESS1-0'	0.53	'GFDL-ESM2M'	0.63	'GISS-E2-R-CC'	0.64	'IPSL-CM5A-LR'	0.76
'GFDL-ESM2M'	0.76	'MPI-ESM-MR'	0.50	'bcc-csm1-1'	0.53	'bcc-csm1-1'	0.48	'CCSM4'	0.48	'bcc-csm1-1-m'	0.42	'CNRM-CM5'	0.69
'GFDL-ESM2G'	0.75	'ACCESS1-0'	0.48	'MIROC5'	0.43	'NorESM1-M'	0.47	'ACCESS1.3'	0.43	'NorESM1-M'	0.42	'bcc-csm1-1-m'	0.66
'GFDL-CM3'	0.75	'MPI-ESM-LR'	0.47	'CMCC-CM5'	0.37	'MPI-ESM-LR'	0.45	'GFDL-CM3'	0.42	'NorESM1-ME'	0.42	'CanESM2'	0.56
'MPI-ESM-MR'	0.71	'CSIRO-Mk3-6-0'	0.45	'MIROC-ESM-CHEM'	0.37	'GISS-E2-R-CC'	0.41	'bcc-csm1-1'	0.34	'FGOALS_g2'	0.42	'CSIRO-Mk3-6-0'	0.53

Approach for selecting GCMs:

- Independence Weight Approach.
- Reproducing Seasonal and Annual Variability.
- Overall Skill Based weight.
- Agreement to Consensus Weight.
- Reproducing Extreme Statistics



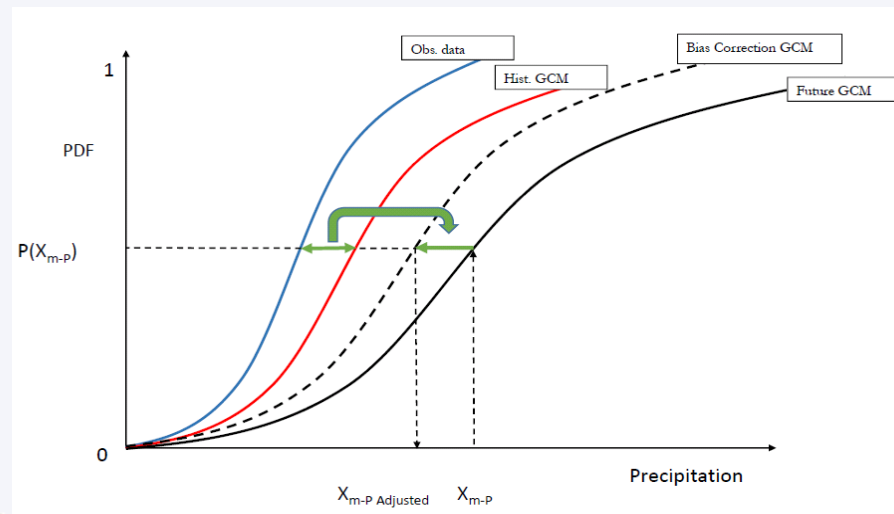
Example of selected GCMs:

NBI Criterion	Waterresources Planning			Flood/Wet Condition	Drought
	Skill	Seasonal Variability	Annual Variability	Rainfall Extreme (wet 10th percentile)	Rainfall Extreme (dry 10th percentile)
Lake Victoria	CanESM2	ACCESS1-0 bcc-csm1-1-m	NorESM1-ME MIROC-ESM-CHEM	IPSL-CM5B-LR GISS-E2-H-CC GISS-E2-H GISS-E2-R GISS-E2-R-CC GFDL-ESM2G CNRM-CM5	CNRM-CM5 NorESM1-Me NorESM1-M bcc-csm1-1-m CMCC-CMS bcc-csm1-1 GISS-E2-H GISS-E2-R-CC GISS-E2-R CCSM4
Victoria Nile	CMCC-CMS bcc-csm1-1-m MRI-CGCM3 ACCESS1-0	CESM1-CAM5 MIROC5	GISS-E2-R-CC	GISS-E2-H-CC IPSL-CM5B-LR GISS-E2-H GISS-E2-R-CC GISS-E2-R CNRM-CM5	FGOALS_g2 CMCC-CMS HadGEM2-CC CESM1-BGC GISS-E2-R GFDL-CM3 GISS-E2-R-CC CNRM-CM5 GISS-E2-H GISS-E2-H-CC CCSM4 CanESM2 ACCESS1.3 HadGEM2-ES

Expected impact of CC on water resource

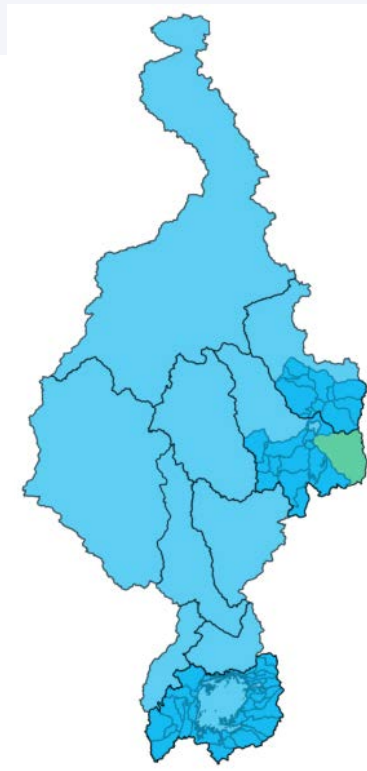
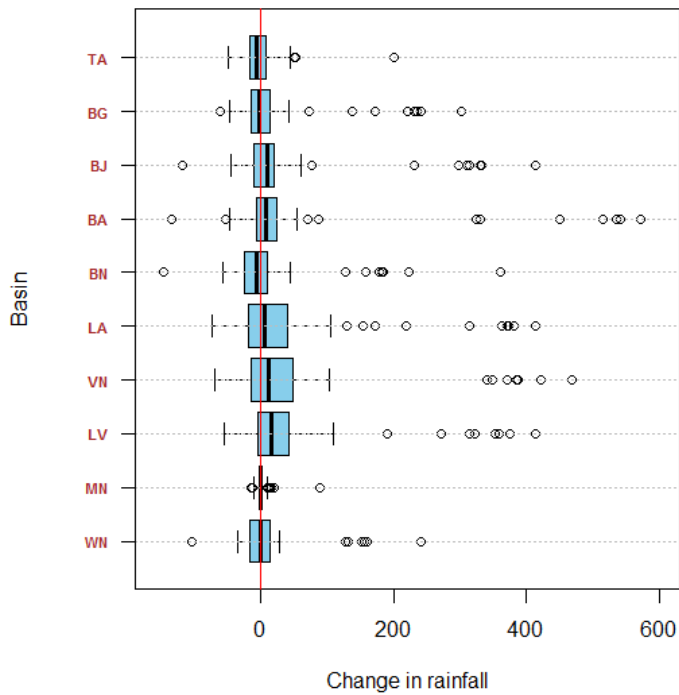
CC data preparation for impact studies over the Nile Basin

- Bias correction and downscaling of the GCMs (P and T) for RCP8.5 and 4.5
- Bias correction of the RCMs RCP8.5 and 4.5.

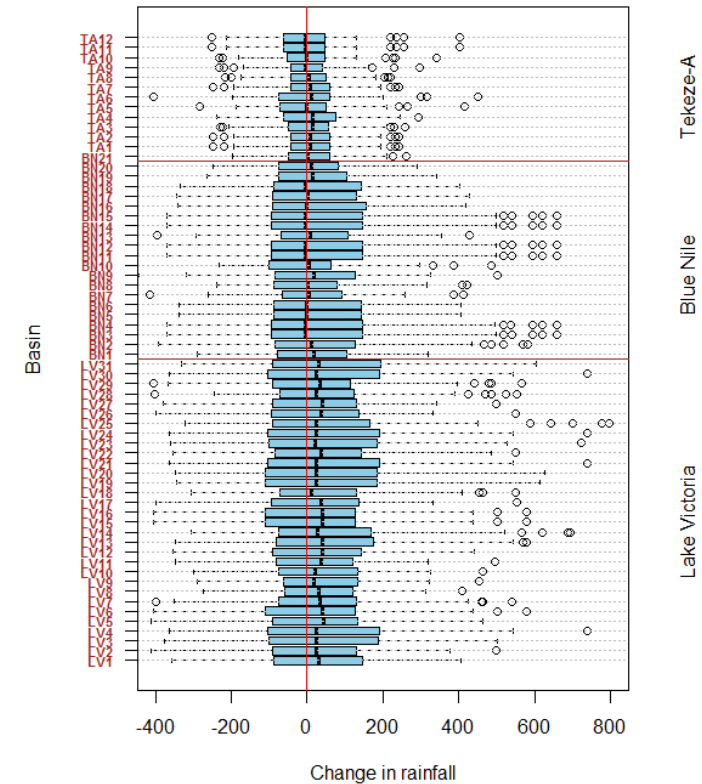


GCMs

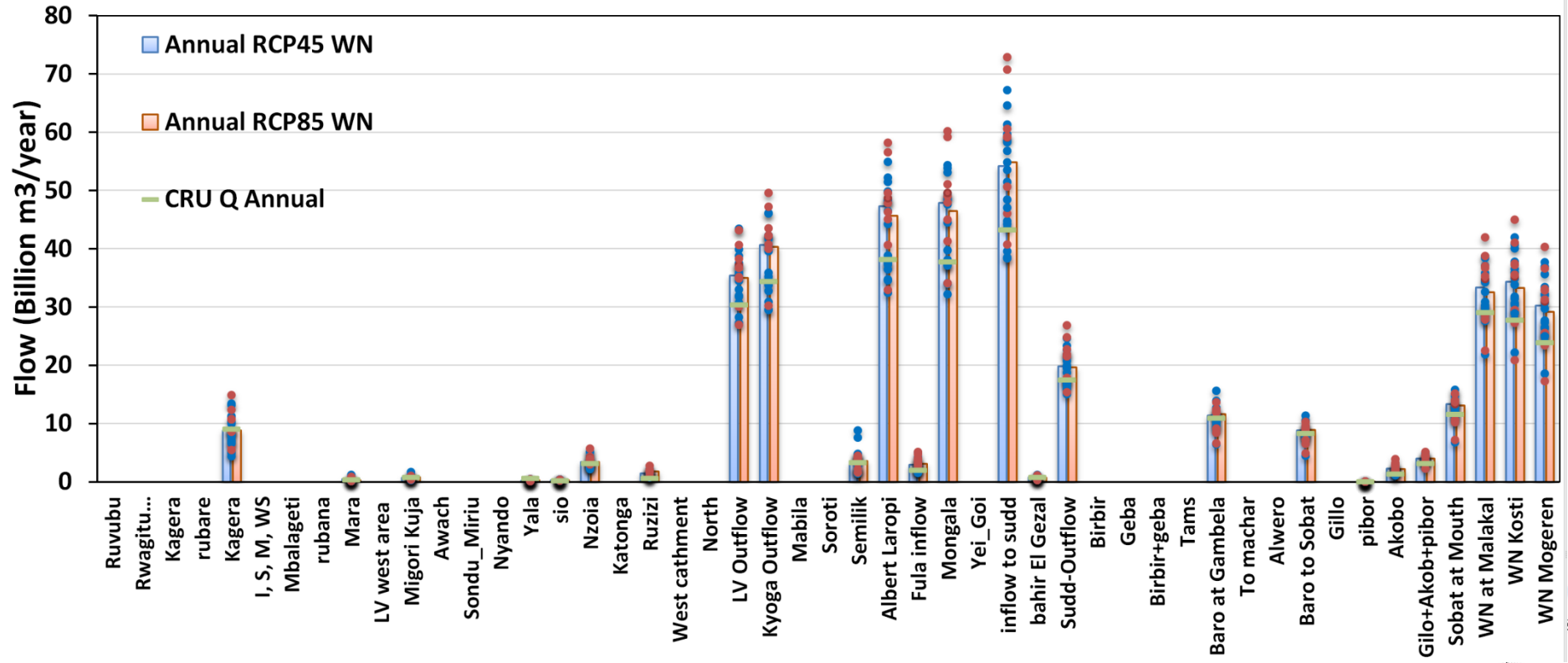
Rainfall over 10 Nile Basin catchments at 2050

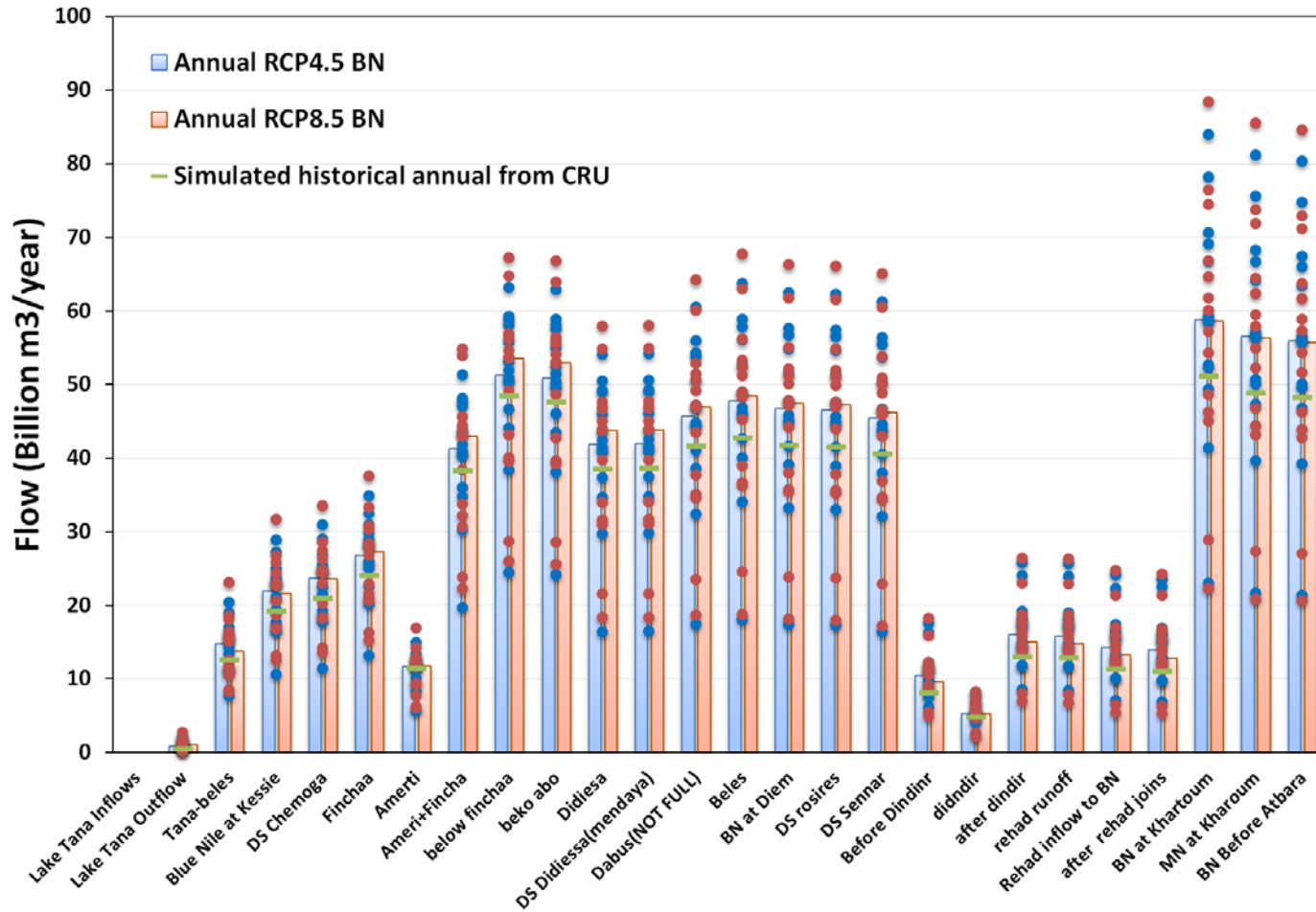


Rainfall over 64 Nile Basin catchments at 2050



Future hydrological scenarios over the Nile Basin





Nile Basin River Flow Forecasting System



- Provide basin-wide river flow forecasts
- Improve water resources management
- Reduce the impact of devastations to life and property
- Improve operational decisions
- Improve dams' coordination
- Improve planning decisions on cropping.

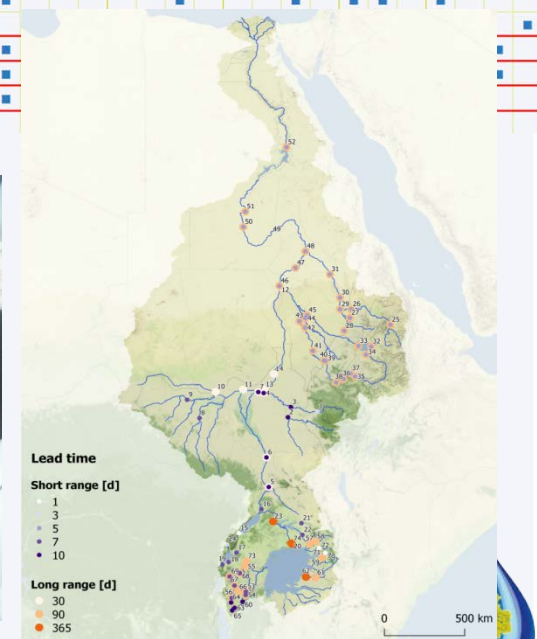
Preparatory phase

Review of available forecast systems (international and regional).

User Needs assessment.

Conceptual design.

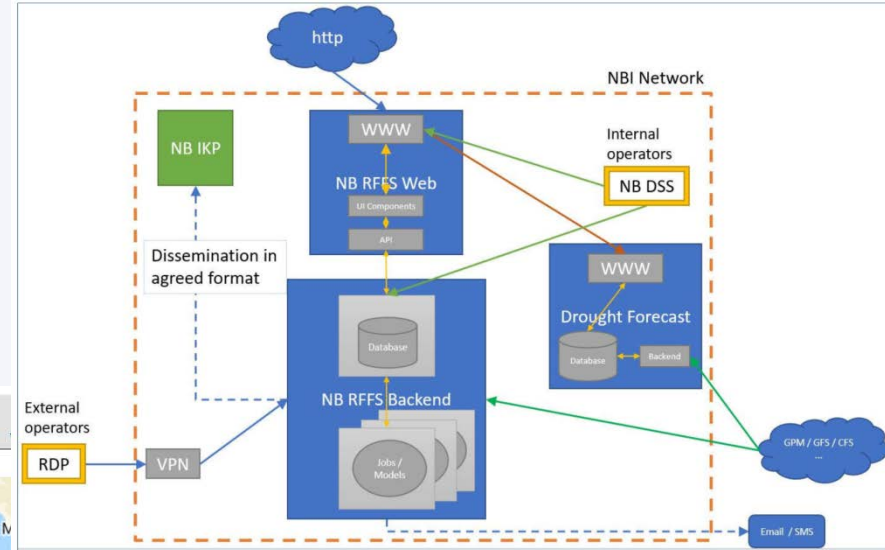
Forecast System Name and Location	Status			Lead-time			Coverage			Data			Methods			Users					
	Research	Operational (internal)	Operational (online)	<7 days	<20 days	>6 month	Basin	Country-wide	Transboundary	Global	Teleconnections	Ensemble Streamflow	Deterministic NWP	Ensemble NWP	Discharge regression	Hydrological Model	Routing model	Flood	Drought	Reservoir operation	Other
GloFAS - Global			■			■				■											
GLOFFIS - Global			■		■					■											
E-Hype - Europe			■		■																
EFAS - Europe		■			■																
EDO - Europe			■		■																■
HEFS - continental USA			■		■																
AFFS - continental Africa		■			■																
Short Term - Yellow River Basin			■					■													■
Short Term - Benue Basin		■			■																
KJ-IFS-OPT - Niger Basin			■		■																■
Hydromax - Meuse River			■		■																
Seasonal Forecast - Yakima Basin			■																		
Forecasts at the Zambezi River		■																			
FEWS - Australia																					■
FEWS - Mekong																					■
FEWS-FOEN - Switzerland		■																			



Nile Basin River Flow Forecasting system



<http://13.80.108.118/>

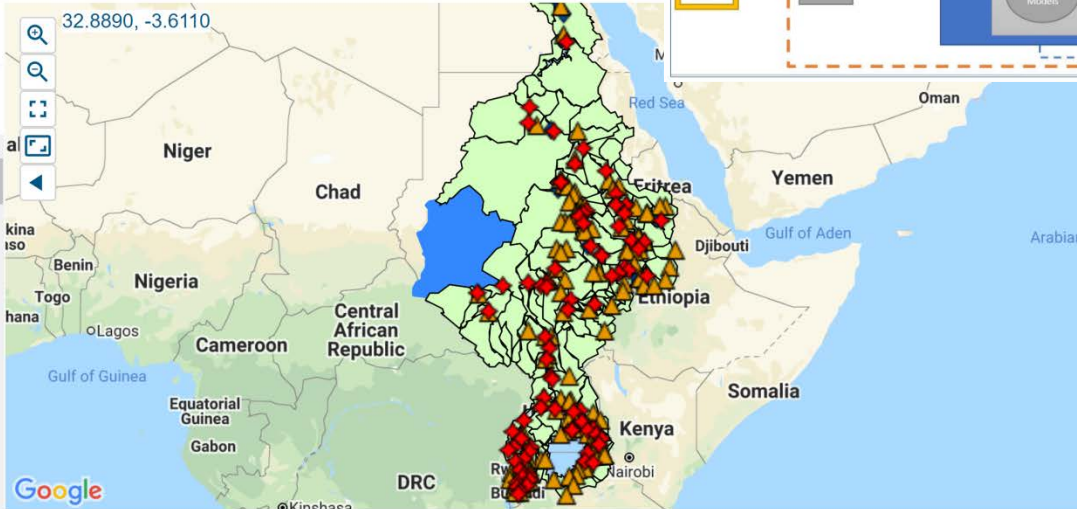


River Flow Forecasting S... Forecast ...

Select Groups
 (No group)

Stations
 Catchment Rainfall

C89 (BAS_Abobo)	142.05
C82 (BAS_Agawi)	77.75
C83 (BAS_Akobo)	92.36
C98 (BAS_Alwero)	96.59
C87 (BAS_Gilo nr Pugni...)	96.88
C103 (BAS_Baro 1 MPur...)	181.87
C99 (BAS_Baro 2 MPur...)	189.7
C107 (BAS_Baroat Ga...)	143.98
C93 (BAS_Birbir A)	168.94
C70 (BN_Beko_Abo)	163.07
C90 (BAS_Birbir R)	166.9
C202 (BN_Beles)	165.5
C203 (BN_Beshilo)	114.9
C78 (BN_Blue Nile at Kh...)	40.89
C92 (BAS_Birbir_Yubdo)	184.62
C193 (BN_DS Chemoga)	144.72
C96 (BAS_downstream...)	112.93

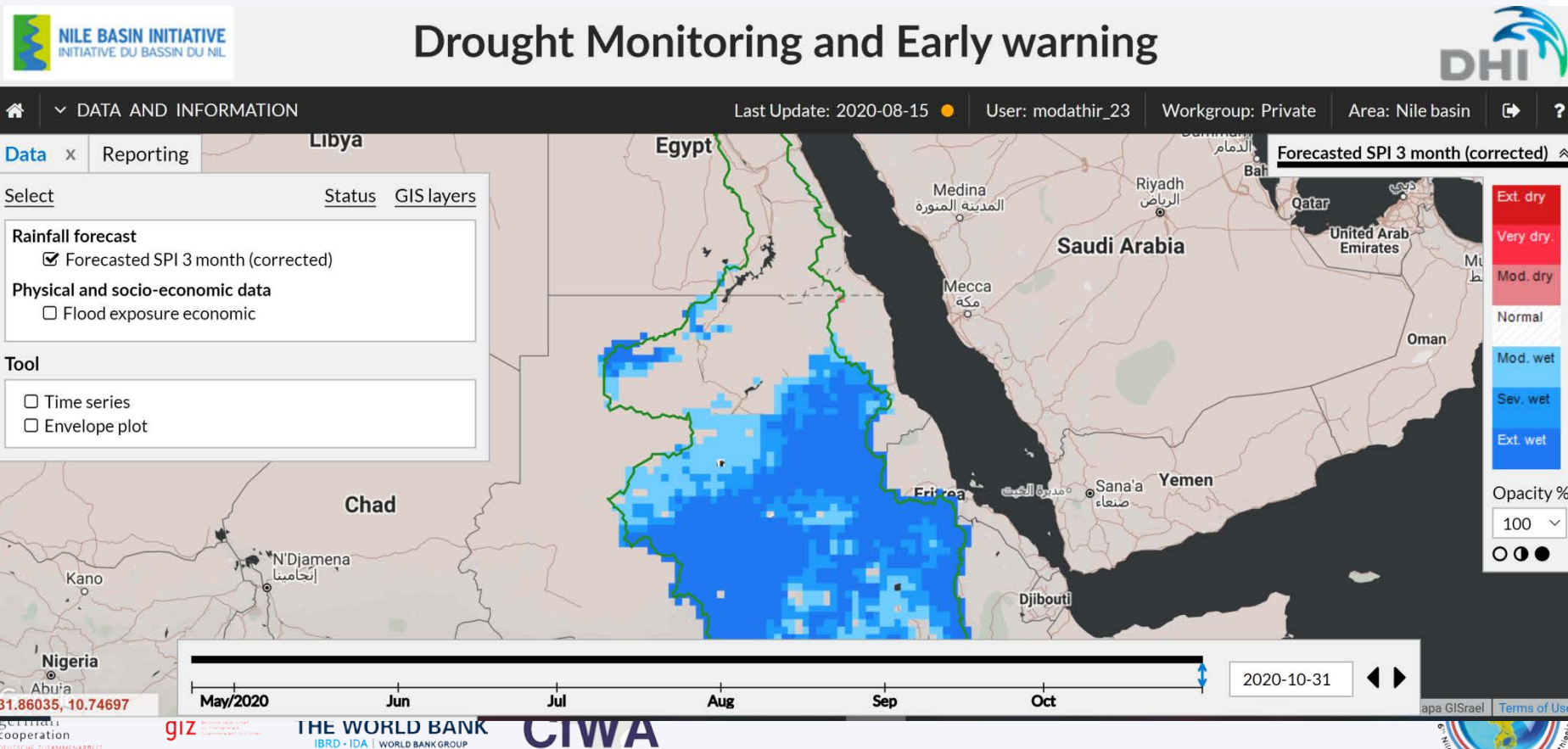


Drought monitoring and early warning



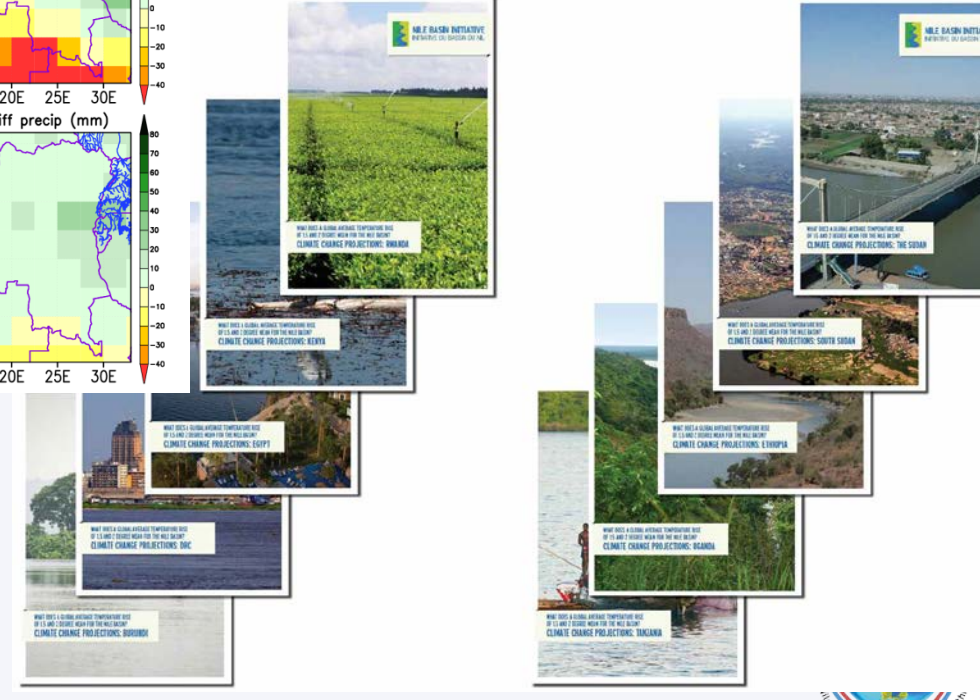
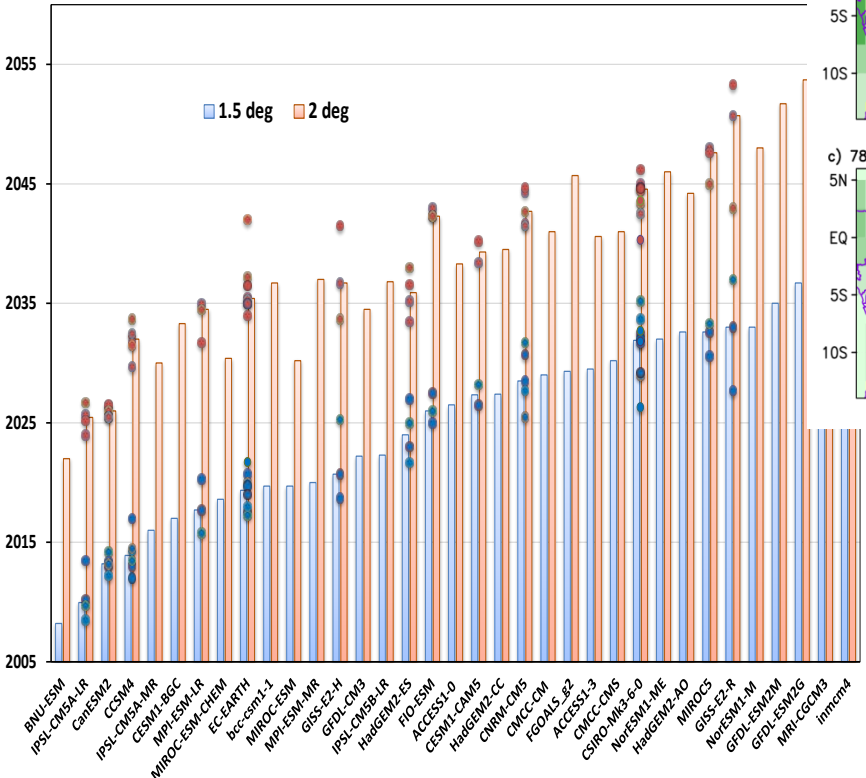
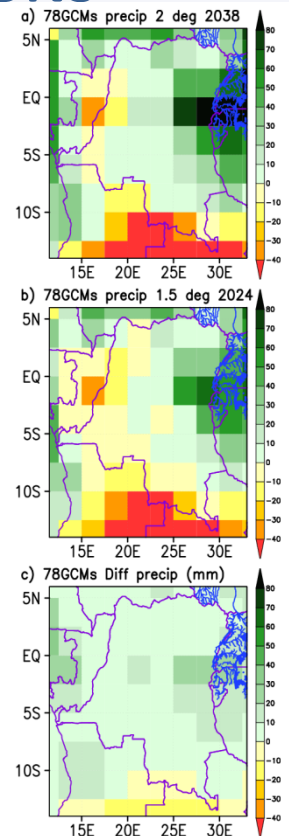
<https://www.flooddroughtmonitor.com/data>

Bi-weekly drought bulletin is generated.

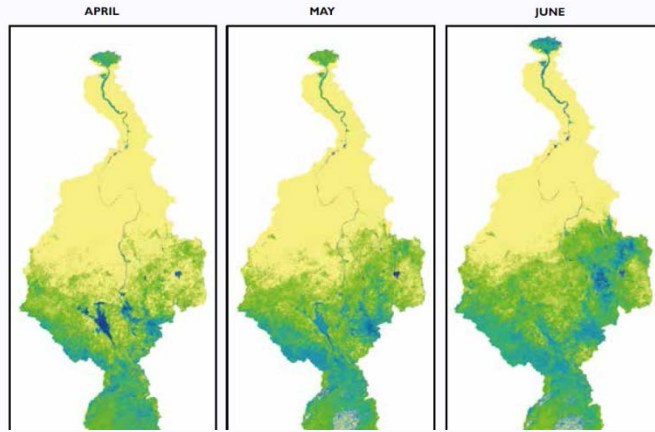
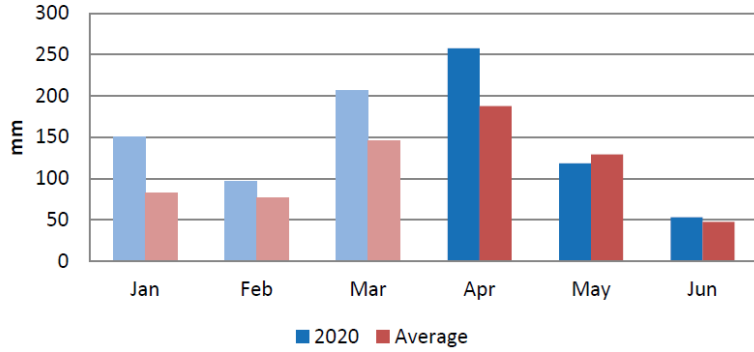


WHAT DOES A GLOBAL AVERAGE TEMPERATURE OF 1.5 AND 2 DEGREE MEAN FOR THE NILE BASIN CLIMATE CHANGE PROJECTIONS

No	Model	pre	No	Model	pre	No	Model	pre
1	IPSL-CM5A-LR	277	27	inmcm4	47	53	CNRM-CM5	-17.2
2	IPSL-CM5A-LR	194	28	EC-EARTH	46	54	HadGEM2-AO	-18.9
3	IPSL-CM5A-LR	184	29	CanESM2	45	55	GISS-E2-H	-22.6
4	IPSL-CM5A-LR	171	30	IPSL-CM5B-LR	41	56	CNRM-CM5	-26
5	MPI-ESM-LR	164	31	CCSM4	40	57	GISS-E2-R	-33.1
6	MPI-ESM-MR	124	32	CCSM4	34	58	HadGEM2-ES	-35.5
7	CanESM2	119	33	CESM1-CAM5	33	59	BNU-ESM	-38.3
8	MPI-ESM-LR	110	34	EC-EARTH	33	60	NorESM1-M	-45.2
9	MPI-ESM-LR	110	35	FIO-ESM	32	61	GISS-E2-R	-66.3
10	CESM1-BGC	92.5	36	ACCESS1-0	30	62	GISS-E2-H	-67.6
11	CCSM4	86	37	CMCC-CMS	28	63	CSIRO-Mk3-6-0	-86.1
12	CCSM4	84.6	38	HadGEM2-ES	22	64	GISS-E2-R	-95.3
13	bcc-csm1-1	84.1	39	CNRM-CM5	17	65	MRI-CGCM3	-106
14	CCSM4	83.4	40	FIO-ESM	17	66	CSIRO-Mk3-6-0	-114
15	CCSM4	80.3	41	CESM1-CAM5	16	67	CSIRO-Mk3-6-0	-118
16	IPSL-CM5A-MR	78.9	42	MIROC-ESM-CHEM	14	68	CSIRO-Mk3-6-0	-120
17	CanESM2	78.2	43	CNRM-CM5	12	69	GISS-E2-H	-121
18	CESM1-CAM5	72.6	44	HadGEM2-CC	11	70	CSIRO-Mk3-6-0	-136
19	FIO-ESM	65.5	45	CNRM-CM5	9	71	CSIRO-Mk3-6-0	-145
20	CanESM2	62.8	46	FGOALS_g2	6	72	CSIRO-Mk3-6-0	-156
21	CMCC-CM	58.9	47	HadGEM2-ES	1	73	CSIRO-Mk3-6-0	-157
22	EC-EARTH	58.7	48	MIROC-ESM	-3	74	CSIRO-Mk3-6-0	-191
23	GFDL-ESM2M	57.3	49	GFDL-ESM2G	-4	75	CSIRO-Mk3-6-0	-202
24	CanESM2	54.2	50	GFDL-CM3	-4	76	MIROC5	-237
25	ACCESS1-3	48.7	51	NorESM1-ME	-6	77	MIROC5	-240
26	EC-EARTH	47.5	52	HadGEM2-ES	-7	78	MIROC5	-279



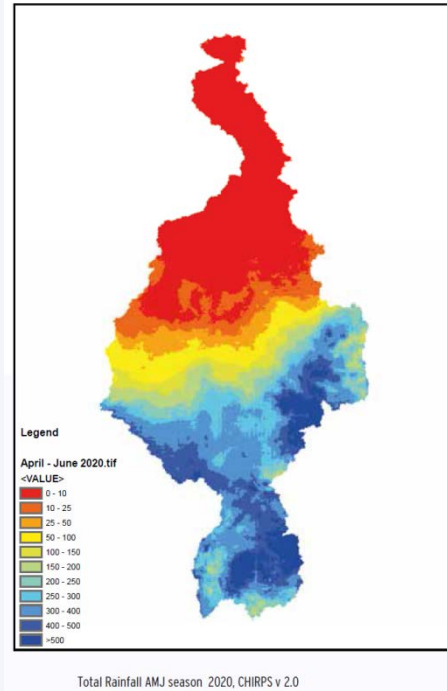
Rainfall in the Lake Victoria Subbasin (April - June 2020)
Compared to the Long term average



Legend
AET
mm/m

0 - 10
10 - 30
30 - 60
60 - 90
90 - 120
120 - 150
150 - 180
180 - 250
250 - 300

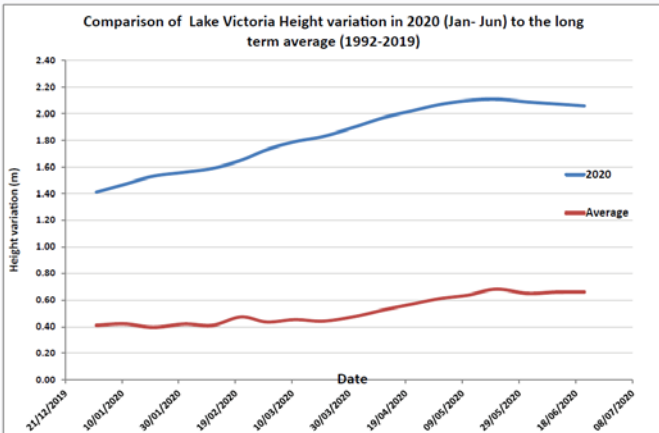
Basin monitoring Bulletin



Highlights

- ★ Highest amounts of rainfall were detected in the Eastern Nile Subbasins during May to June while the Equatorial lakes subbasins received the least amounts.
- ★ Satellite observations detected increasing ET for Eastern Nile Subbasins and reducing or relatively constant Actual Evapotranspiration for Equatorial lakes subbasins.
- ★ Height variation charts show an increase in water levels in Lake Victoria and Kyoga. This is attributed to the rainy season in the equatorial region. Lake Tana has reducing water levels that is attributed to the dry season in the Equatorial lakes subbasin.

**MONITORING THE NILE BASIN
USING SATELLITE OBSERVATIONS**
April - June 2020



NBI Climate Proofing Hub

- Intro
- About
- Foreword
- The Scope
- Target audience
- Functionalities

Climate Proofing guidance

This tool is the core of the guideline. It offers you step by step guidance, technical prescriptions, access to knowledge products and direct access to project cycle specific learning modules.
Read [more](#)...

Climate Services for climate proofing

This tool offers you to get in touch with experts and users of the guideline, share and discuss experiences, seek for advice and offer your services.
Read [more](#)...

Community of practice

This tool offers you to get in touch with experts and users of the guideline, share and discuss experiences, seek for advice and offer your services.
Read [more](#)...

Digital learning on climate proofing

This tool offers you the opportunity to search and configure your own training course related to climate proofing.
Read [more](#)...



CSI project is the umbrella under which climate services for infrastructure investment is taking place

- SECTOR POLICY, PLANNING & REGULATION
- PROJECT IDENTIFICATION
- PROJECT PREPARATION
- RESOURCE MOBILIZATION
- OPERATION & MAINTENANCE

Intro — Climate Proofing guidance

Project identification is the selection of the least cost project configuration from the available resources or alternatives and translate that into a suitable project for the stated purpose. The project identification stage typically consists of a reconnaissance study and prefeasibility studies. In some cases, project identification may be done as part of national or regional water resource inventories rather than a project specific study.

The findings of the project identification stage are documented in a reconnaissance report and prefeasibility report.

- Scoping
- Risk Assessment
- Risk Treatment
- Monitoring & Evaluation

1. Risk Assessment

Scope
Risk Assessment consists of identification, analysis and evaluation of risks and opportunities. The results of the Risk assessment are documented in a risk/opportunity register. At the project identification stage, each project alternative should have a separate risk register.

Process
The analysis may be qualitative, semi-quantitative or quantitative.

- **Prepare a risk/opportunity register.** This is a record of the potential risks and opportunities related to the project(s) focusing on climate sensitive issues. The risk register is the documentation of the outcome of the three steps (i.e., 1) Identification, 2) analysis/screening and 3) evaluation)
- **Identification of risks:** Identification of risks should ensure that no risk is unwittingly excluded. This should cover all potential climate stressors relevant to the project. Examples (link). The register should include the threats/opportunities associated with each climate risk and/or stressor and an estimate of the likelihood and potential loss/gain of each threat/opportunity. Figure 12 shows an example of a risk /opportunity register. Note that the list of stressors in the example are not exhaustive. The risk team and stakeholders must identify all the stressors and then list them.

- Intro video
- Manual
- Peer-learning & exchange
- Best practices
- Climate Service

Climate proofing guideline
Climate Risk Assessment.



NBI is progressing well in terms of data preparation for impacts studies.

It enables NBI to foster cooperation in the Nile Basin (around the topic of better informed decision making consider current and future available resources).



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THANK YOU!