NILE BASIN INITIATIVE
INITIATIVE DU BASSIN DU NIL

NILE BASIN WETLANDS STATUS REPORT

BY **GEORG PETERSEN**

Study context

- Nile Basin wetlands of transboundary significance: Inventory, Baseline Study and Framework Management Plan with a nested case study on the Sudd
  - Wetland mapping, inventory, atlas
  - Wetland hydraulic model development
  - Wetland ecosystem services assessment
  - Wetland biodiversity assessment
  - Wetland eflows assessment
  - Wetland management policies
  - Wetland framework management plan

plus Sudd diagnostic analysis study

Generation of knowledge of physical baseline conditions

Deliverables

- 0.1 Inception report
- 1.1 Technical Report inventory methodology
- 1.2 Inventory / Atlas
- 1.3 Report on Wetlands Monitoring Guidance
- 1.4 Geo-spatial inventory database
- 2.1 Hydraulic wetland models
- 2.2 Technical Report wetland modelling
- 2.3 Technical Paper wetland modelling and water budget
- 3.1 Ecosystem services assessment
- 3.2a Technical Report ecosystem assessment methodology
- 3.2b Inventory of baseline ecosystem services
- 4.1a Technical Report: Biodiversity assessment methodology and baseline
- 4.1b Inventory of baseline biodiversity assessment
- 5.1 Technical Paper: eflow methodological approach
- 6.1 Technical paper: Description of policy choices
- 6.2 Technical Paper: Scenario study of management options
- 7.1 Nile Basin Wetland Framework Management Plan
- 8.1 Technical Report: Sudd Diagnostic Analysis Study
- 8.2 Technical Report: detailed eco-hydrological planning model for the Sudd
- 8.3 Technical Report: Sudd Options Study
- 8.4 Technical Report: Sudd Wetland Management Strategy and Action Plan
- 9.1 Consultative workshops; Specialist meetings; TAC meeting
- 9.2 Training / awareness sessions
- 9.3 Six policy briefs / popular summaries

Wetland mapping

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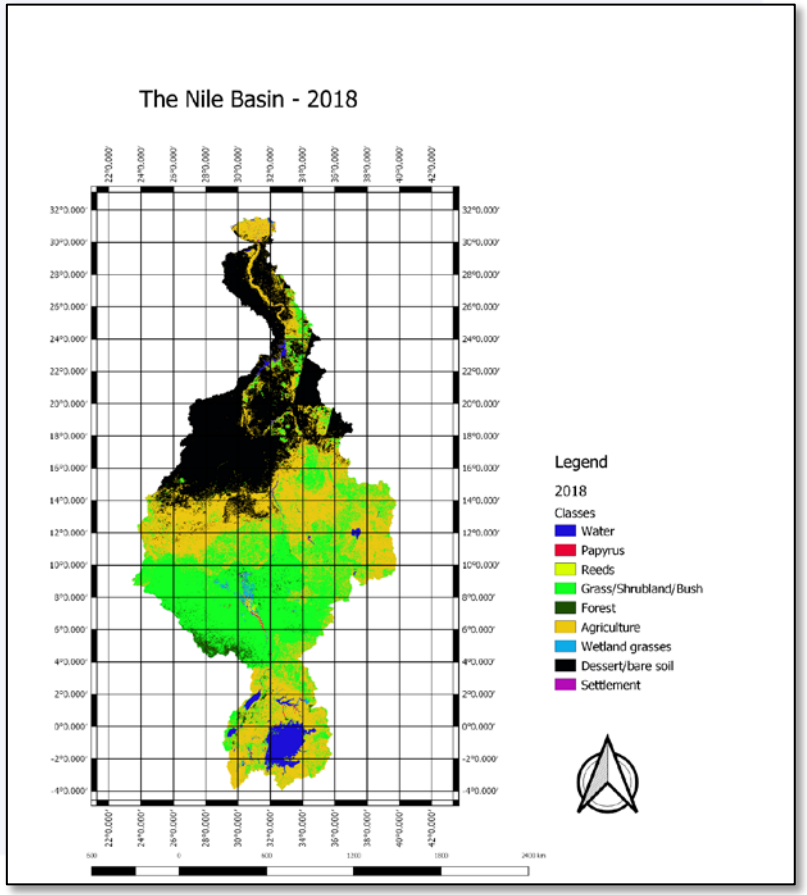
Tasks

- Provision of high-quality land cover and land use information for the Nile basin (-> improving quality of the 2009 study)
  - ✓ 10m spatial resolution (compared to 30m in 2009) to provide more spatial detail
  - ✓ Separation of reeds, papyrus and flooded grassland to provide more thematic detail
  - ✓ Map production for 3 different epocs (±3 years): 1985, 2005 and 2015 to permit change analysis
- Further requirements
  - ✓ Data ready for GIS integration
  - ✓ Rigorous validation of final products
  - ✓ Transparent and objective methodology
  - ✓ Cost-efficient and repeatable methodology



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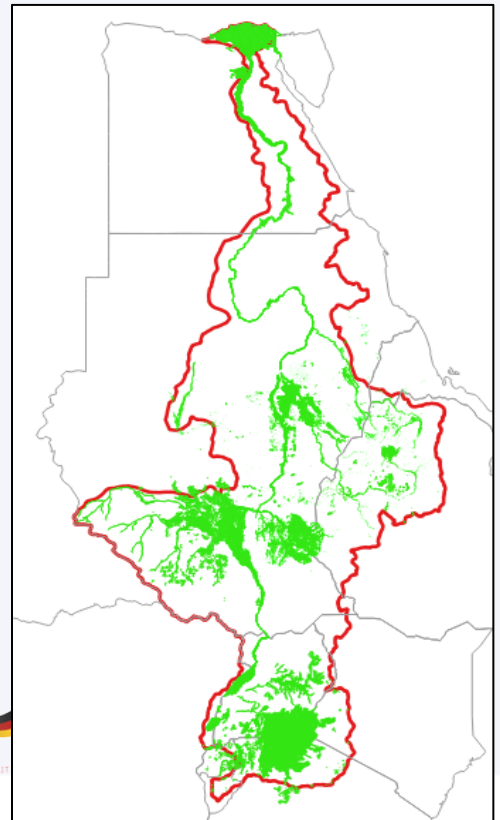
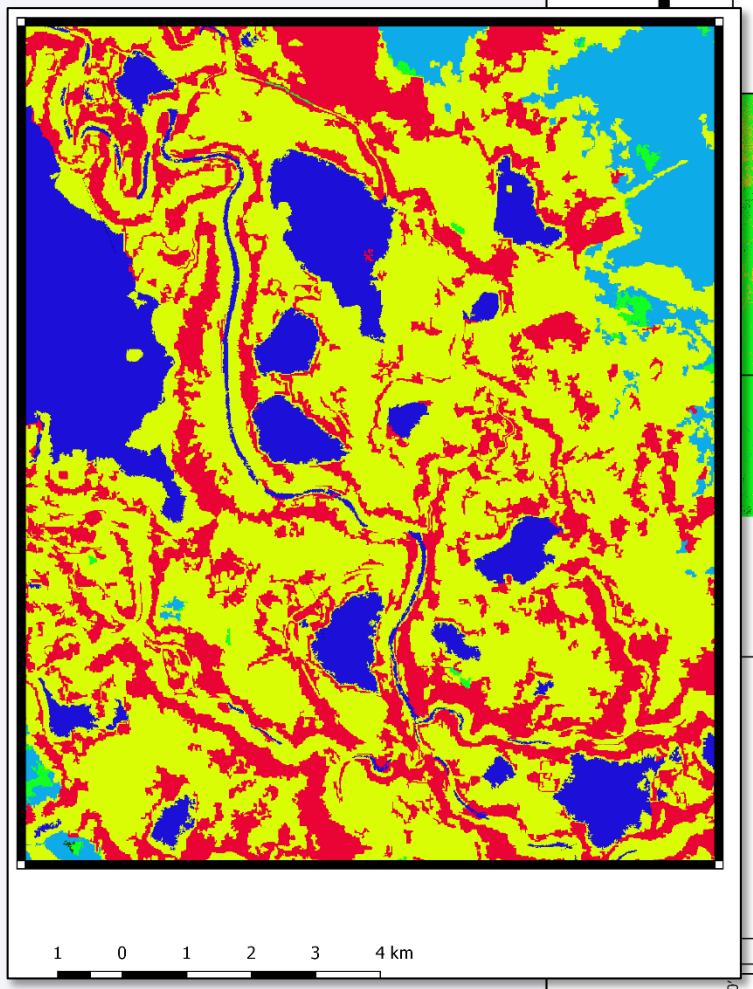
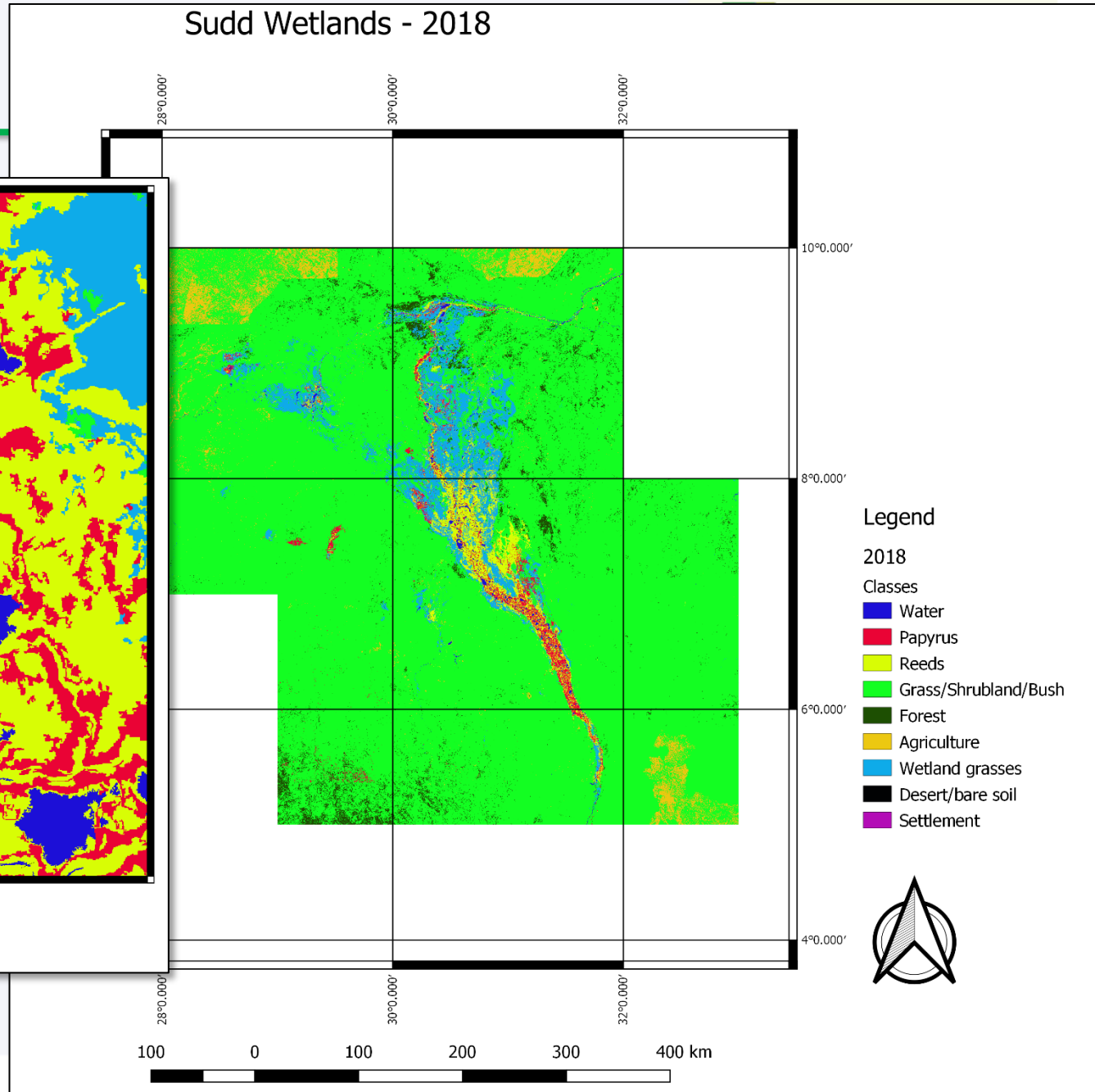
Wetland mapping

Example

Sudd 2018







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Wetland inventory

Nr	PhysFeat
Sub basin	GeomorphSoil
Wetland	Climate
WLGroup	Hydrology
Country	Water Quality
River/Lake	Biodiversity
Lat	Vegetation
Long	Fauna
Altitude	Birds
Area	Fish
Nearest Town	Class
Transboundary	PolicyFram
Ramsar	LandUse
IBA	Demography
	Ecosystem Services
	Drivers
	Changes

Wetland atlas

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NILE BASIN WETLAND ATLAS

3 / 136 47.5%

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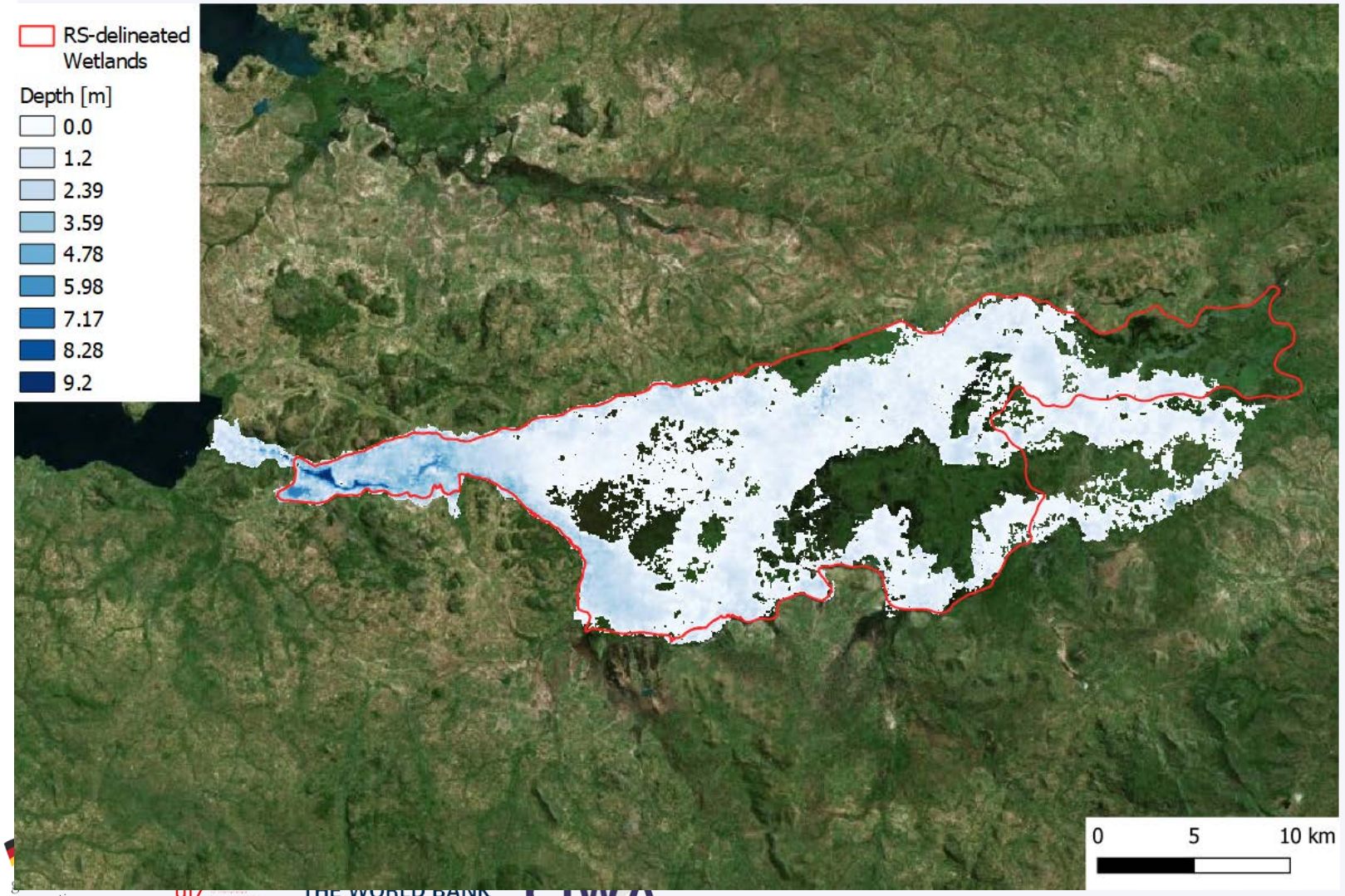
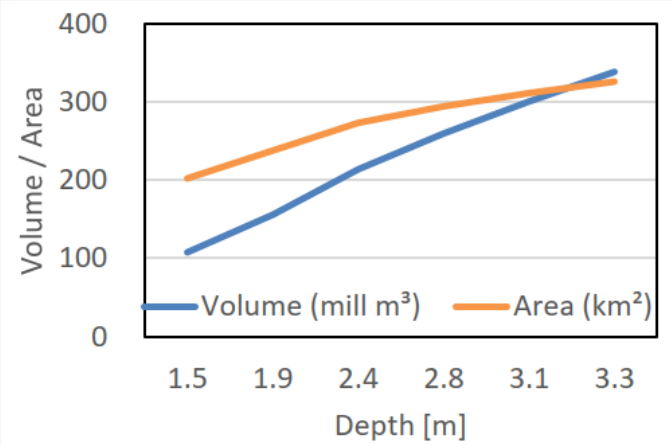
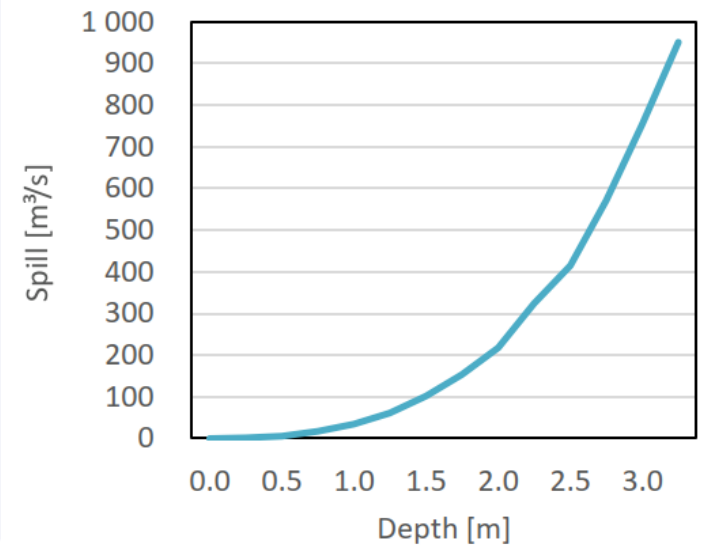
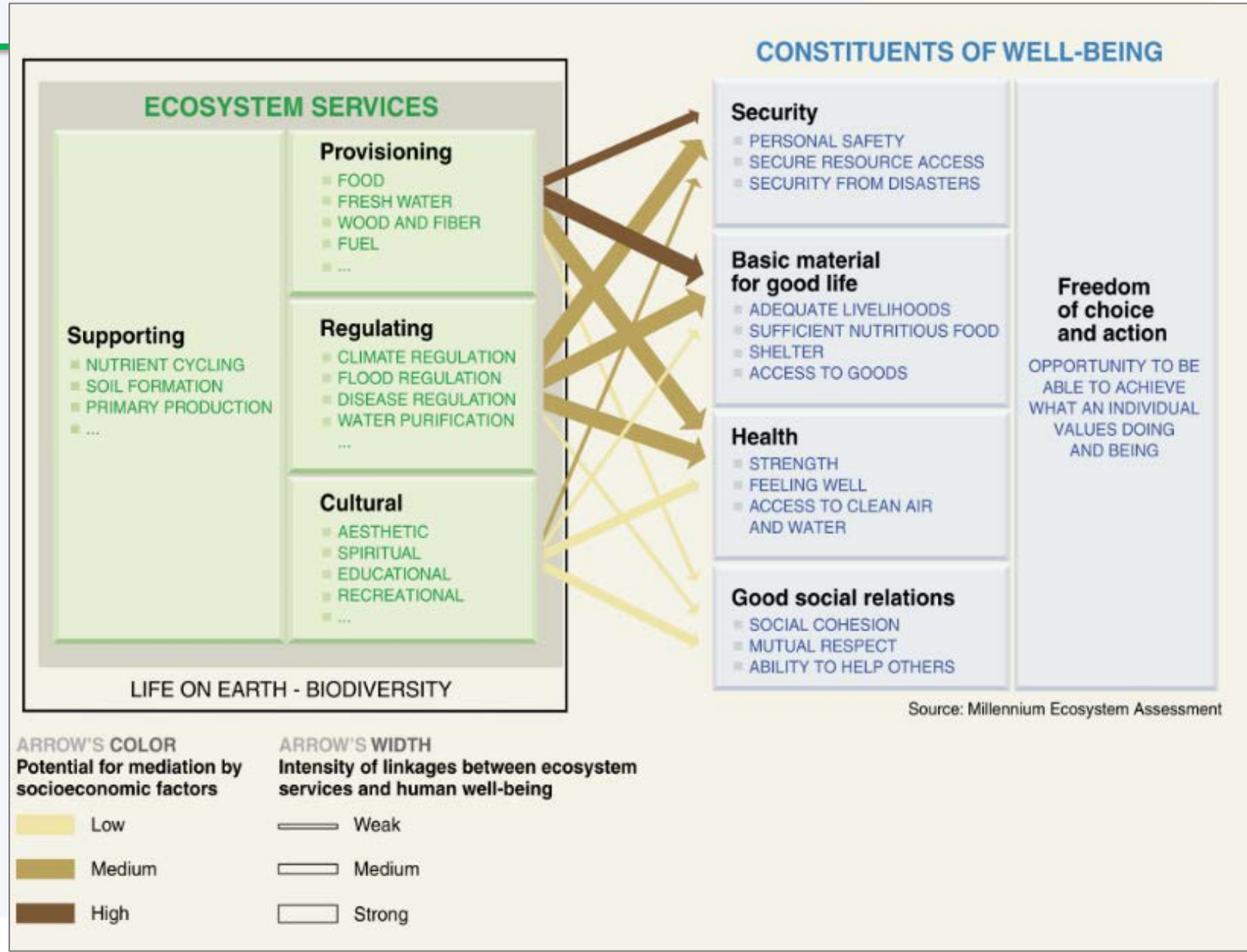
Wetland modelling







Ecosystem services assessment



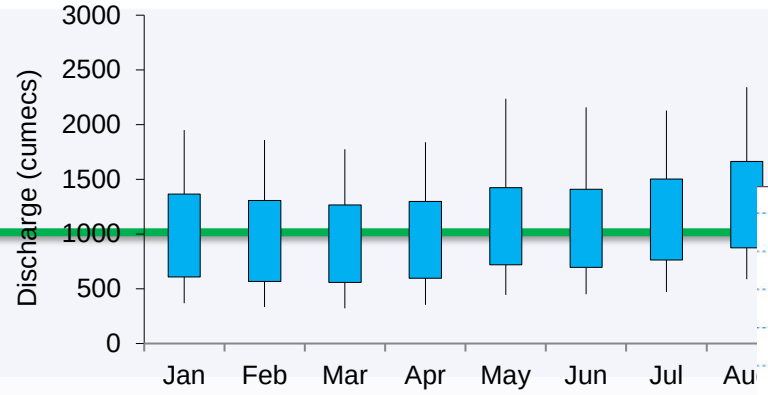
Source: Millennium Ecosystem Assessment

Biodiversity assessment

Wetland:	Critically Endangered	Endangered	Near Threatened	Vulnerable	Conservation Dependent
Bahr el Ghazal	3	5	13	11	5
Baro/Akobo Sobat Wetlands (Machar Marshes)	1	5	17	13	7
Dinder	4	4	16	13	5
Kagera	3	5	19	10	4
Lake Kyoga	3	7	18	9	3
Lake Tana	3	4	15	17	
Lake Victoria	58	20	37	49	5
Mara	47	8	16	31	2
Nile Delta	5	7	19	6	
Semliki	5	13	32	18	4
Sio Nzoia Yala Nyando	50	10	20	36	1
Sudd	4	5	17	15	6

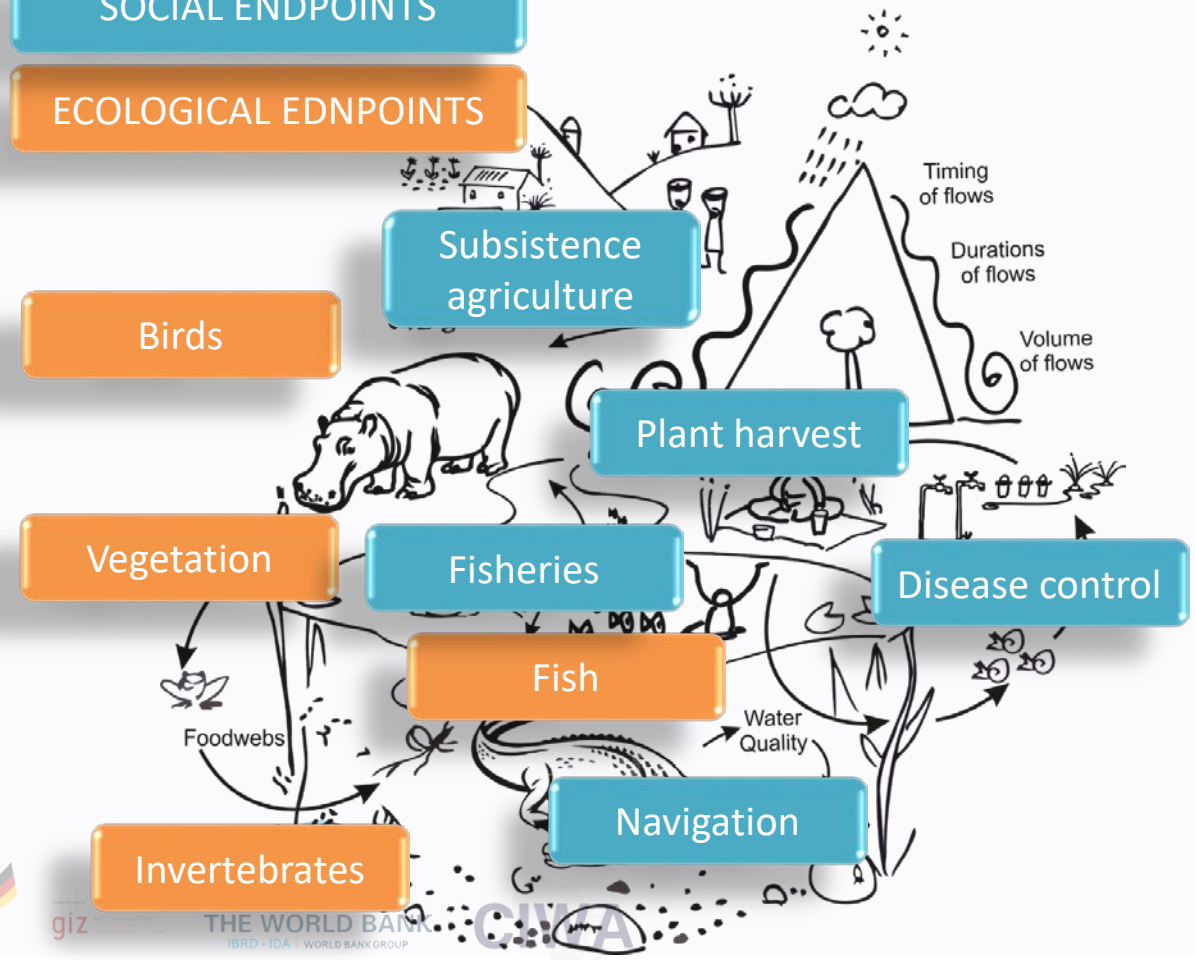
Eflow assessment

1. VISION
2. DATA & MAPS
3. RISK REGIONS
4. CONCEPTUAL MODEL
5. RANKING SCHEME
6. RISK CALCULATION
7. UNCERTAINTY
8. EST. HYPOTHESES
9. TEST HYPOTHESES
10. COMMUNICATE OUTCOMES



SOCIAL ENDPOINTS

ECOLOGICAL EDNPOINTS



Subsistence agriculture

Birds

Plant harvest

Vegetation

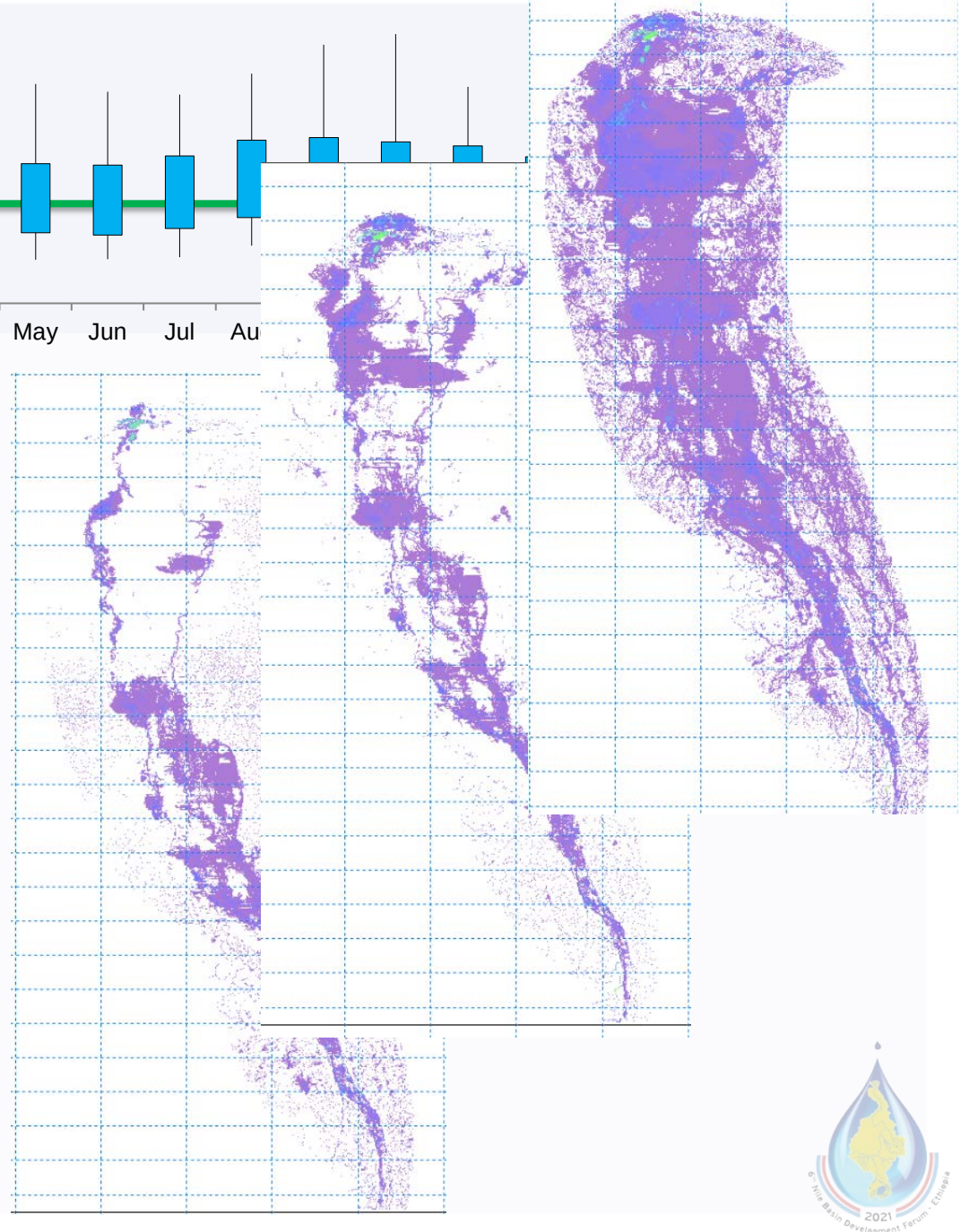
Fisheries

Disease control

Fish

Navigation

Invertebrates



Management policies

Step 1:	**Obtain direct output from DSS - daily / monthly timeseries for baseline and scenario flows**
Step 2:	Conduct seasonality check
Step 3:	Use timeseries flow data to generate depth duration data
Step 4:	Integrate duration data with ecological matrix of rules to produce a vegetation response
Step 5:	Use ecological response to calculate ecosystem services output
Step 6:	Calculation of Wetland Integrity & optional Land Use Scenario Facility

Step 1

	Time	R535|Water level [m]
1	01/01/1950 00:0...	0.7
2	01/02/1950 00:0...	0.46416
3	01/03/1950 00:0...	0.19669
4	01/04/1950 00:0...	0
5	01/05/1950 00:0...	0
6	01/06/1950 00:0...	0.01883
7	01/07/1950 00:0...	0.18101
8	01/08/1950 00:0...	0.45578
9	01/09/1950 00:0...	0.8754
10	01/10/1950 00:0...	1.25382
11	01/11/1950 00:0...	1.44633
12	01/12/1950 00:0...	1.40659
13	01/01/1951 00:0...	1.31993
14	01/02/1951 00:0...	1.20129
15	01/03/1951 00:0...	1.05314
16	01/04/1951 00:0...	0.87902
17	01/05/1951 00:0...	0.7135
18	01/06/1951 00:0...	0.70387
19	01/07/1951 00:0...	0.71439

Step 2

PD-Baseline											Seasonality Index:		1.89
No Classes	12	1	2	3	4	5	6	7	8	9	10	11	12
.	Depth Class	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
<	0.12	6	6	6	6	6	6	6	6	6	6	6	6
<	0.25	8	3	13	5	5	4	24	8	0	0	1	1
<	0.37	6	3	[illegible]	[illegible]	3	2	10	[illegible]	[illegible]	0	0	3
<	0.50	4	14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13	[illegible]	4	4	12
<	0.62	8	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6	9	9	5
<	0.75	9	7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10	7	8
<	0.87	7	3	3	6	0	0	0	4	8	9	11	11
<	0.99	3	4	3	1	0	0	0	1	12	11	9	4
<	1.12	5	2	6	0	0	0	0	0	3	8	6	6
<	1.24	2	7	0	0	0	0	0	0	1	9	6	5
<	1.37	7	0	0	0	0	0	0	0	0	4	5	5
<	1.49	0	0	0	0	0	0	0	0	0	1	6	4
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		0.92	0.83	0.75	0.67	0.50	0.50	0.50	0.67	0.75	0.83	0.92	1.00
		W				D	D	D				W	W

Step 3

STEP 3:
1) Use daily / monthly depth data to generate depth duration data
2) Do for all data sets, baseline and scenarios

PD-Baseline		Scenario: Drier		Scenario: Wetter	
WaterLevel [m]	%	WaterLevel [m]	%	WaterLevel [m]	%
0	[illegible]	[illegible]	[illegible]	0,00	0,13
0	0,26	[illegible]	[illegible]	0,00	0,26
0	0,38	[illegible]	0,38	0,00	0,38
0	0,51	0,00	0,51	0,00	0,51
0	0,64	0,00	0,64	0,00	0,64
0	0,77	0,00	0,77	0,00	0,77
0	0,90	0,00	0,90	0,00	0,90
0	1,03	0,00	1,03	0,00	1,03
0	1,15	0,00	1,15	0,00	1,15
0	1,28	0,00	1,28	0,00	1,28

Step 4

Response Rule Matrix	Inundation Duration (% Year)																			
Depth (max flood)	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
0	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR	GR	GR	GR	GR	GR	GR	GR	GR	RE	PA
0.25	TR	TR	TR	TR	TR	TR	TR	TR	TR	TR	GR	GR	GR	GR	GR	GR	GR	RE	RE	PA
0.5	TR	TR	GR	GR	GR	GR	GR	GR	GR	GR	GR	GR	GR	GR	GR	GR	RE	RE	RE	PA
0.75	TR	GR	GR	GR	GR	GR	[illegible]	[illegible]	GR	GR	GR	[illegible]	GR	GR	GR	RE	RE	PA	PA	PA
1	TR	GR	GR	GR	GR	RE	[illegible]	[illegible]	[illegible]	[illegible]	RE	[illegible]	RE	RE	PA	PA	PA	PA	FR	FR
1.25	GR	GR	GR	GR	GR	RE	[illegible]	[illegible]	[illegible]	[illegible]	PA	[illegible]	PA	PA	PA	PA	PA	FR	FR	AQ
1.5	GR	GR	GR	RE	RE	PA	PA	PA	PA	PA	PA	PA	PA	PA	FR	FR	FR	FR	AQ	OW
1.75	GR	GR	GR	PA	PA	PA	PA	PA	PA	PA	PA	FR	FR	FR	FR	FR	AQ	AQ	OW	OW
2	GR	RE	RE	PA	PA	PA	FR	FR	FR	FR	FR	FR	AQ	AQ	AQ	AQ	AQ	OW	OW	OW
2.25	GR	RE	RE	PA	PA	FR	FR	FR	FR	AQ	AQ	AQ	OW	OW	OW	OW	OW	OW	OW	OW
2.5	RE	RE	PA	PA	FR	FR	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW
2.75	RE	PA	PA	PA	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW
3	RE	PA	PA	PA	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW	OW

Open Water
Aquatic Veg
Fringe
Papyrus
Reeds
Grass Floodpl
Trees Shrubs

Step 5

Table 2. Potential presence of ES (% of total area)			*Relative change (in %) in the potential presence of ES compare to PD-Baseline*			
Ecosystem service	**VU**	**PD-Baseline**	**Scenario: Drier**	**Scenario: Wetter**	**Scenario: Agriculture**	**Scenaria: HPP**
Provisioning ES						
Change of ES1 **(Fish)**	1, 2, 3	24,1	-10,0	26,4	-3,1	50,9
Change of ES2 **(Insects)**	1-5	100,0	0,0	0,0	-40,0	-15,0
Change of ES3, ES7 **(Wild Game, Fodder and Pasture)**	1-6	100,0	0,0	0,0	0,0	0,0
Change of ES4 – ES6 **(Fruits, Vegetables, Grains)**	2-6	[illegible]	4,1	-15,0	0,1	-45,9
Change of ES8 **(Farmland)**	2-5	[illegible]	[illegible]	26,4	-3,1	50,9
Change of ES9 **(Fresh Water)**	1-5	100,0	0,0	0,0	-40,0	-15,0
Change of ES10 **(Fuel/Fiber/Raw Materials)**	2-6	95,9	4,1	-15,0	0,1	-45,9
Change of ES11 **(Medicinal Products)**	2-5	95,9	4,1	-15,0	-39,9	-60,9
Change of ES12 **(Genetic Materials)**	1-5	100,0	0,0	0,0	-40,0	-15,0
Change of ES13 **(Transport Infrastructure)**	1, 4	29,1	5,9	5,9	-9,1	25,9

Step 6

.	Select Wetland:	Bahr_el_Ghazal												
.	Select Scenario:	Integrity Calculator:		Baseline (Land Use Data from 2018)										
Veg	PD-Baseline	Step		water	papyrus	reeds	shrubland	forest	agriculture	wetland_grasses	dessert_bare_soil	settlement	Total
OW	0	1	Area (Ha)	3013	6157	8269	218643	34496	1684	40176	0	18	312456
AQ	4.1	2	Area (%)	1.0	2.0	2.6	70.0	11.0	0.5	12.9	0.0	0.0	100.0
FR	5.0	3	Weightings	1.00	1.00	0.90	0.80	0.50	0.15	0.95	0.10	0.10	
PA	5.0	4	Individual Contribution	0.01	0.02	0.02	0.56	0.06	0.00	0.12	0.00	0.00	0.79
RE	10.0	5	Integrity Score										**79.11**
GR	25.0											Ecological Category:	B/C
TR	50.9	Integrity Calculator:		[illegible]									
	100.0	Step		water	papyrus	reeds	shrubland	forest	agriculture	wetland_grasses	dessert_bare_soil	settlement	Total
		1	Area (Ha)	12819	31246	29683	141539	0	33088	62491	0	1590	312456
		2	Area (%)	4.1	10.0	9.5	45.3		10.6	20.0		0.5	100.0
		3	Weightings	1.00	1.00	0.75	0.60	0.50	0.15	1.00	0.10	0.05	
		4	Individual Contribution	0.04	0.10	0.07	0.27	0.00	0.02	0.20	0.00	0.00	0.70
		5	Integrity Score										**70.02**
												Ecological Category:	C

Framework management plan

Introduction

- Status Quo
- Required Effort
- Need for Framework Management Plan

Part 1 – Wetlands of Transboundary Significance

- Biophysical Status
- Guiding Principles
- Vision
- Purpose
- Scope

Part 2 – Strategic Action Areas

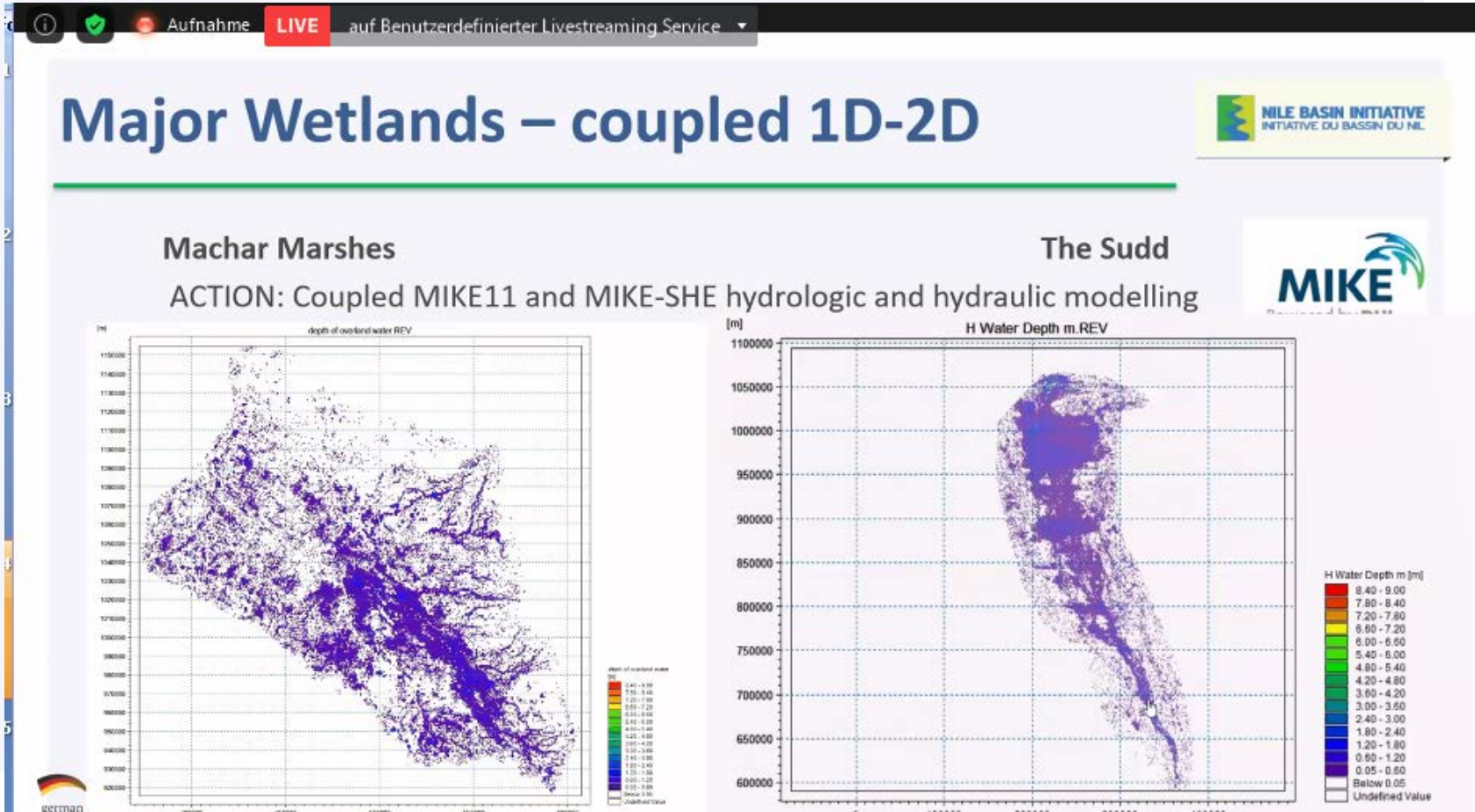
- Cross Border Wetland Management
- Climate Change Action
- Wetlands in Basin Planning
- Wetlands of Regional Significance
- Monitoring of Wetland Status
- Knowledge Management and Capacity Development
- Wetland Investment

Part 3 – Implementation Arrangements

- Governance
- Financial
- Monitoring

Sudd case study

- Reflection of all topics in more detail
- Detailed modelling
- Eflow assessment
- On-ground activities with stakeholders
- Wetland management planning support



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