UFZ HELMHOLTZ Zentrum für Umweltforschung

GlobeWQ
Global Water Quality & Analysis Platform

Welcome to the GlobeWQ Webinar
15. September 2023, 11:00-12:30 CEST

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Housekeeping

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GlobeWQ Global Water Quality & Analysis Platform

The webinar will be recorded

Slides and recording will be available at:

www.globewq.info

Please post your questions in the chat

Question are collected for the Q&A session

Please mute your mic

Icons by Adioma

Programme

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GlobeWQ Global Water Quality & Analysis Platform

11:00-11:10	**The GlobeWQ project and the global water quality challenge** **Dietrich Borchardt** (UFZ)
11:10-11:25	**Insights from global water quality models – current state and future scenarios** **Martina Flörke** (RUB)
11:25-11:40	**Nitrogen pollution legacies in Europe** **Masooma Batool** (UFZ), **Rohini Kumar** (UFZ)
11:40-11:55	**Case studies - the implementation of the triangulation approach** **Karin Schenk** (EOMAP), **Christian Schmidt** (UFZ)
11:55-12:10	**The Lake Victoria case from a user perspective** **Andrew Gemmell** (The UMVOTO Foundation & SLR Consulting)
12:10-12:30	**Q&A**

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The GlobeWQ project and the global water quality challenge

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GlobeWQ Global Water Quality & Analysis Platform

Prof. Dr. Dr. h.c. Dietrich Borchardt

Head of Research Unit “Water Resources and Environment”

Helmholtz-Centre for Environmental Research – UFZ

Chair Aquatic Ecosystem Analysis and Management

TUD Dresden University of Technology

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GlobeWQ and SDG 6

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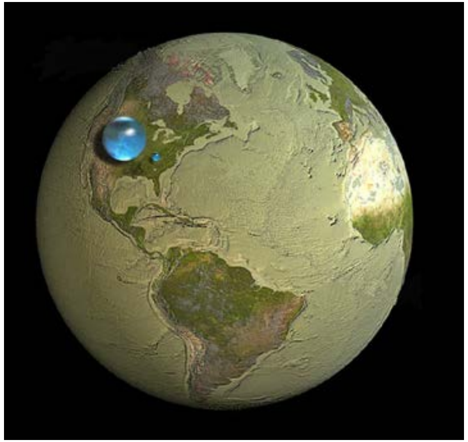

Ensure access to water and sanitation for all

- SDG 6 encompasses a broader scope than just water quantity, drinking water and sanitation; it includes aquatic ecosystems and ambient water quality.
- Good ambient water quality is essential for the health of aquatic ecosystems, human health and food security

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The GlobeWQ project

- The GlobeWQ project is associated with the "Global Resource Water" (GRoW) initiative
- Funding program (2017 – 2020) which was initiated by the German Federal Ministry of Education and Research (BMBF) to contribute to the United Nations' Sustainable Development Goals, especially SDG 6
- The funding measure's guiding principle is to connect global analyses with local solutions, emphasizing an integrated perspective on sustainable water management

GlobeWQ
and the World Water Quality Assessment

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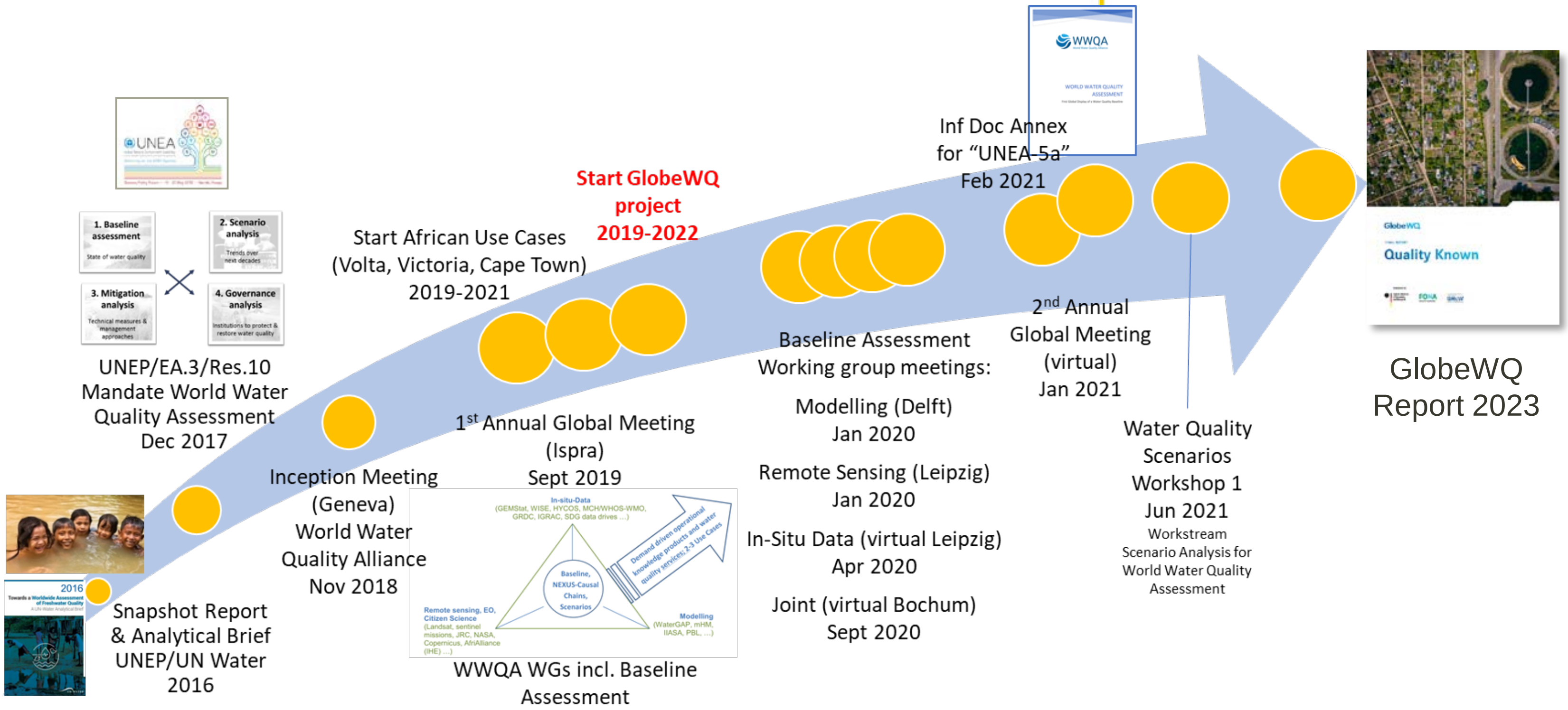

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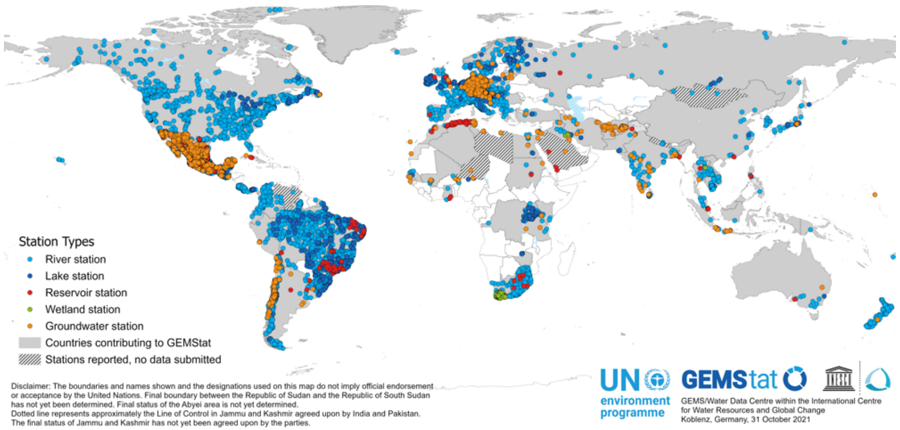
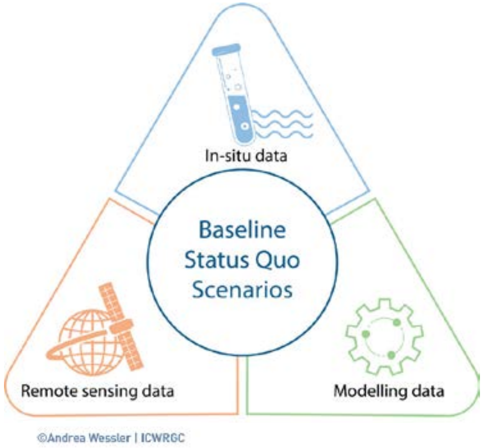
The GlobeWQ Project

Limited global coverage of in situ data



Triangulation Approach



Approach of GlobeWQ: science based improvement of water quality based on synthezised information from in-situ monitoring, modeling, and remote sensing

WWQA./ GlobeWQ Interplay

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UN Agenda
UN Resolution

UNEA
United Nations Environment Assembly of the United Nations Environment Programme
Delivering on the 2030 Agenda

SDG Agenda
SDG 6

WWQA
World Water Quality Alliance

Water quantity and quality in relation to health, food production, ecosystems in the context of socio-economic/climate change

In-situ Monitoring

GlobeWQ

Remote Sensing

Modeling

Case studies with global coverage

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GlobeWQ
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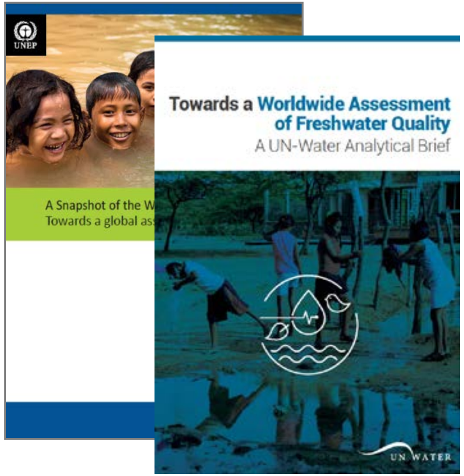
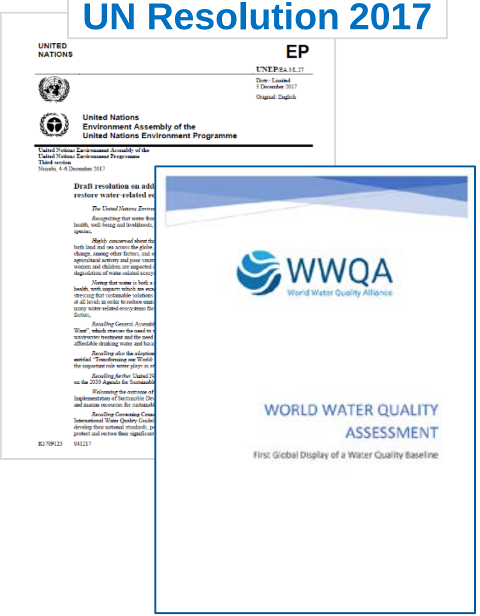
Pre-Study 2016

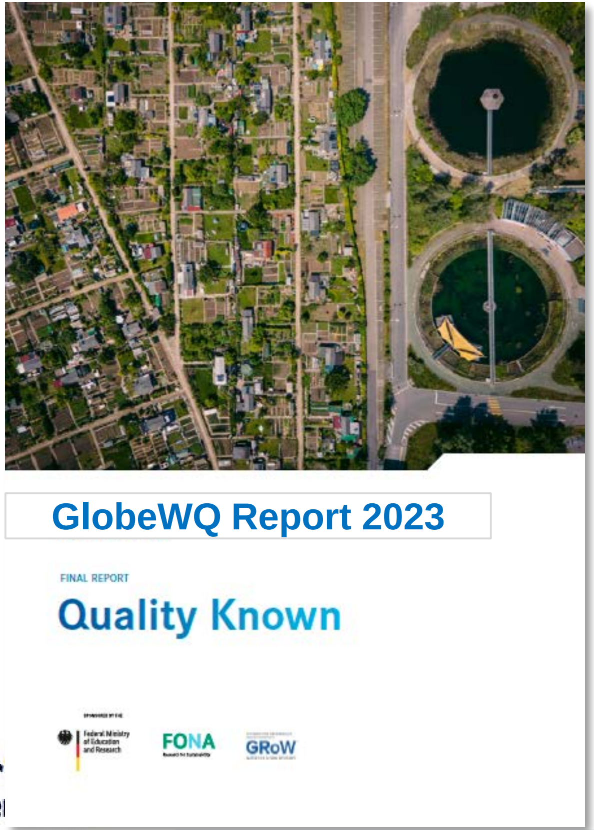


Policy Brief 2017

UN Resolution 2017



First global display 2021



GlobeWQ Report 2023

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EOMAP

Insights from global water quality models – current state and future scenarios

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Prof. Dr. Ing. Martina Flörke

Institute of Engineering Hydrology and Water Resources Management,

Ruhr Universität Bochum

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RUHR-UNIVERSITÄT BOCHUM

INSIGHTS FROM GLOBAL WATER QUALITY MODELS – CURRENT STATE AND FUTURE SCENARIOS

Martina Flörke
Engineering Hydrology & Water Resources Management

GlobeWQ Webinar, 15 September 2023

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GRoW
WATER AS A GLOBAL RESOURCE

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World Water Quality Alliance

Motivation

- **SDG6.3** *“By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally”.*
- **Snapshot of the World’s Water Quality (UNEP 2016)** *“The Snapshot presents a preliminary assessment of the current water quality situation, in particular in rivers and in developing countries, and proposes a methodological framework for further assessment.”*
- **Towards a Worldwide Assessment of Freshwater Quality (UN-Water 2016)** *“A scenario analysis that examines dynamic trends over the next decades in water quality and inland fisheries due to various socioeconomic driving forces.*
- **Water Quality Baseline (WWQA 2021)** *“First global display of a water quality and its impacts on ecosystem health, human health and food security as a result from networking activities.”*
- **IPCC (2022)** *“Water quality is affected by climate change. Water quality is briefly mentioned and the report refers to several local studies for a small number of water quality variables.”*

Why global scale?

- Water quality degradation is a global problem, which is further affected by global change
- To support SDGs research and measure of target achievement; opportunity to support the SDGs by understanding the interlinkages between the SDGs and water quality
- Modelling water quality at the global scale is important
  - to provide information in data sparse regions,
  - to identify robust hotspot regions of severe water quality status,
  - to better understand future (global) changes and
  - to quantify indicators and interlinkages between SDGs

Global/large-scale water quality models

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Table 2.2 Brief summary of the large-scale water quality models used in the current report.

Models	Simulated water quality parameters		Water body type[2]	Spatial aggregation of model outputs		Temporal aggregation of model outputs		Key references
	Parameter group	Parameters[1]		Resolution[3]	Coverage	Resolution[3]	Baseline year	
DRASTIC	Nutrients	NO_3^-	a	15 km	Africa	10-year	1990-2010	Ouedraogo *et al.* (2016)
GlobalAsGW	Geogenic contaminants	Arsenic	a	30 arcseconds	Global	NA (static)[4]	Pre-2019	Podgorski and Berg (2020)
GloWPa	Microorganisms	Cryptosporidium	b	0.5 degree	Global	Monthly	Around 2010	Vermeulen *et al.* (2019)
GREMiS	Others	Microplastics	b, d	Basin	Global	Annual	2000	van Wijnen *et al.* (2019)
IMAGE-GNM	Nutrients	TN, TP, Si	a, b, c	0.5 degree	Global and (sub-)national	Annual	1970-2015	Beusen *et al.* (2015), van Puijenbroek *et al.* (2019)
Insecticide model	Pesticides	Insecticides[5]	b	5 arcminutes	Global	NA (static)[4]	2000-2010	Ippolito *et al.* (2015)
MARINA-Global (multi-pollutant)	Nutrients	DIN, DON, DIP, DOP	b, d	Sub-basin	Global	Annual	2010	Strokal *et al.* (n.d., 2016, 2019), van Wijnen *et al.* (2017)
	Microorganisms	Cryptosporidium						
	Others	Microplastics, Triclosan						
MARINA (version 2.0)	Nutrients	DIN, DON, DIP, DOP	b, d	Sub-basin	China	Annual	2012	Wang *et al.* (2020a)
	Others	ICEP						
QUAL	Physical	Water temperature	b, c	0.5 degree	Global	Monthly	1980-2010	van Vliet *et al.* (2020)
	Organics	BOD						
	Salinity	TDS						
WaterGAP-WorldQual	Physical	Water temperature	b, c	5 arcminutes	Global	Monthly	1971-2010	Punzet *et al.* (2012)
	Nutrients	TP			Africa, Asia, Europe and Latin America		1990-2010	Voß *et al.* (2012), Reder *et al.* (2015), Fink *et al.* (2018)
	Organics	BOD						
	Salinity	TDS						
	Microorganisms	Faecal Coliform						
WFLOW-DWAQ	Others	Contaminants[6]	b, c	1 km	Europe	Annual	2017-2018	van Gils *et al.* (2020)

1. NO_3^-: nitrate, TN: total nitrogen, TP: total phosphorus, Si: Silica, BOD: biological oxygen demand, TDS: total dissolved solids, DIN: dissolved inorganic nitrogen, DON: dissolved organic nitrogen, DIP: dissolved inorganic phosphorus, DOP: dissolved organic phosphorus, ICEP: Indicator for coastal eutrophication potential.

Additional models: DynQual, mQM, GWAVA etc.

…ulation resolution due to aggregation or averaging.

(UNEP, 2021)

5. Vulnerability, hazard and risk potential for insecticide runoff, non-substance specific.
6. The model simulates the cumulative impact on ecology for 1785 chemical of emerging concern, including pharmaceuticals and pesticides.

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About the WorldQual model

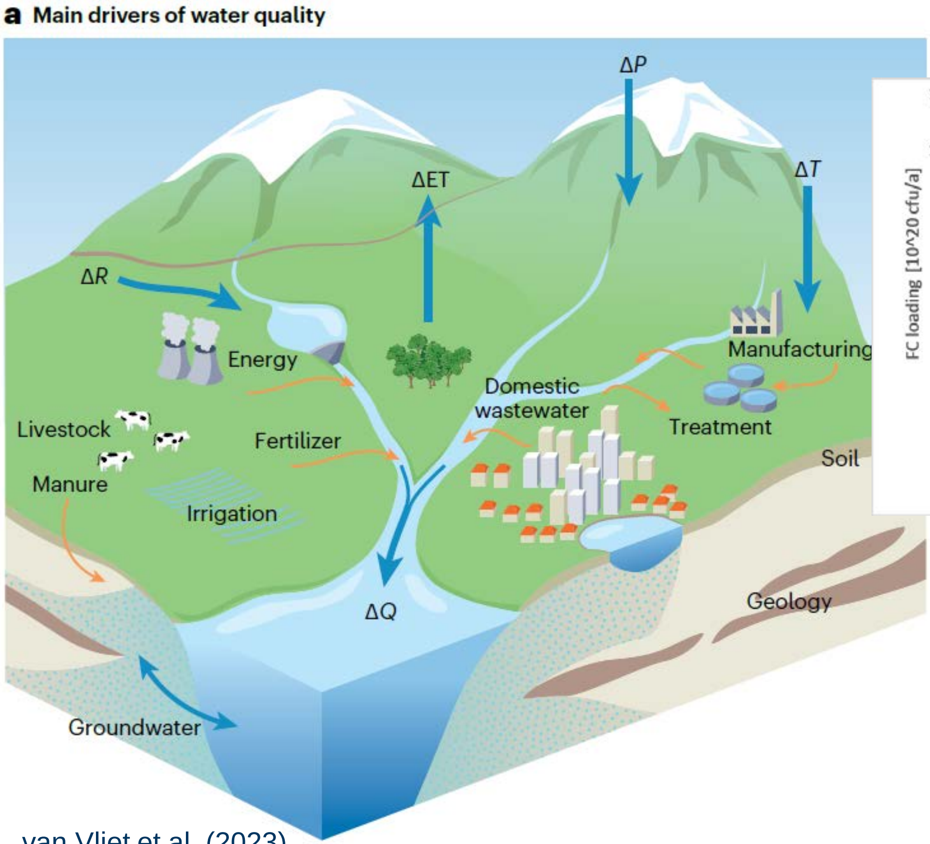
Model calculations…

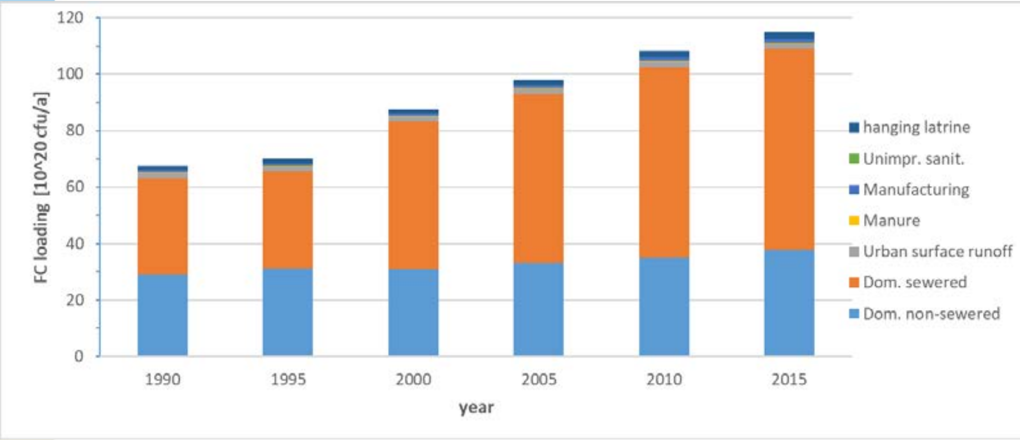
…a systems approach

Pollution loading ⇨ Dilution capacity of river + In-stream processes ⇨ Pollutant concentration in rivers

In-stream processes: decay as a function of water temperature (BOD); die-off of bacteria (FC) related to solar radiation and temperature, sedimentation of bacteria, retention (TP)

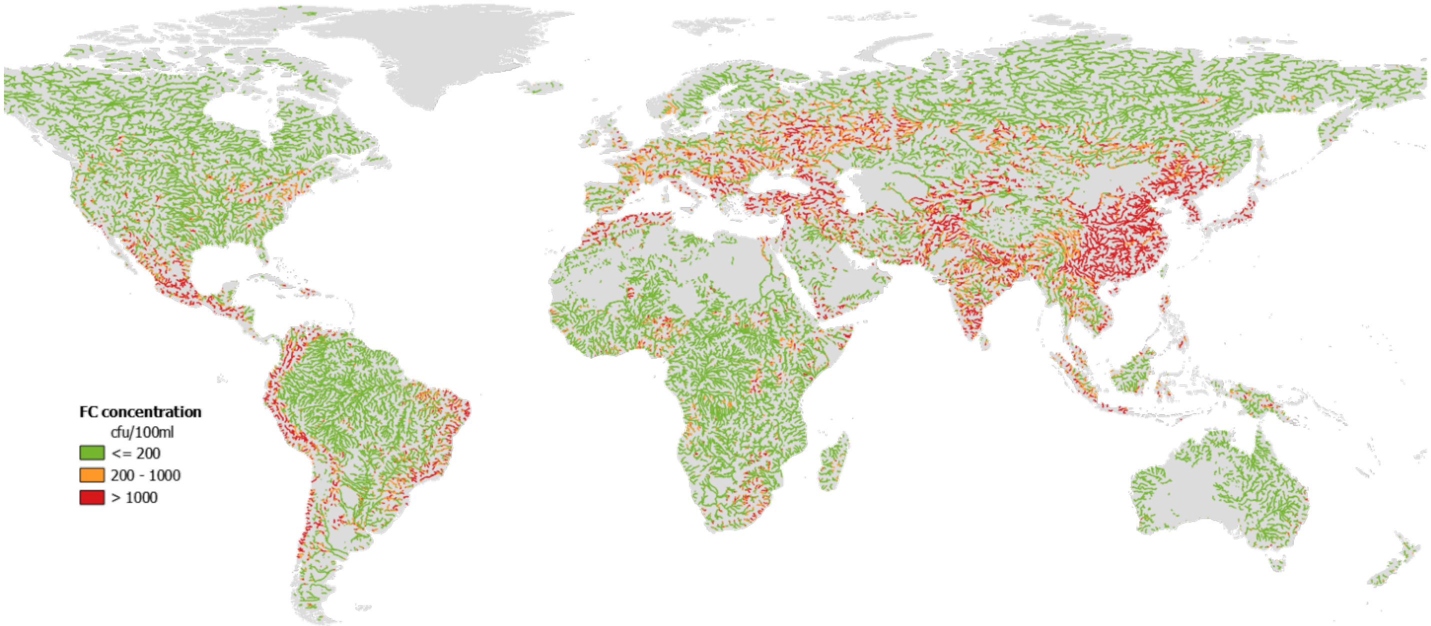
Past and current FC loadings





van Vliet et al. (2023)

Global estimates of FC concentrations in 2015 (median)

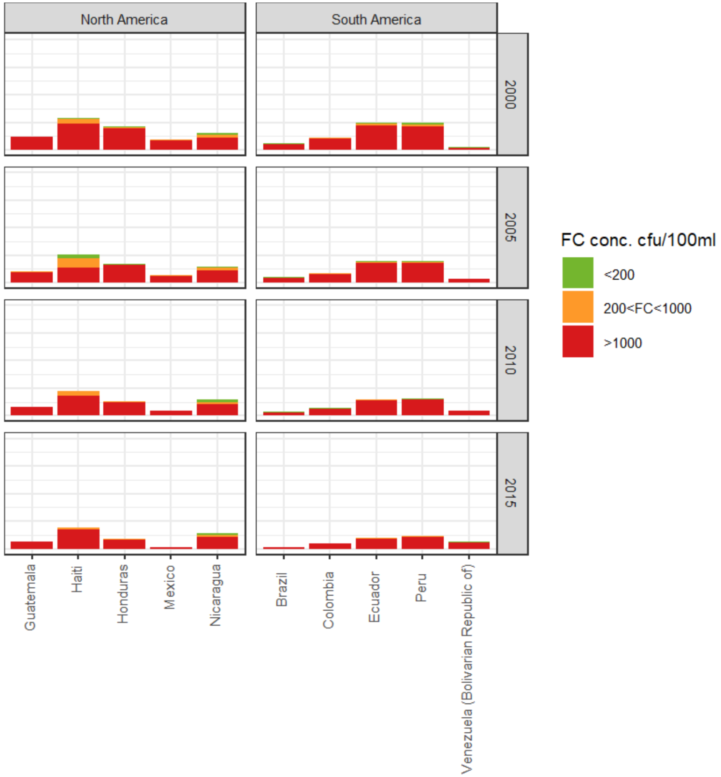


High FC concentrations (>1000 cfu/100 ml):

- Densely populated areas with insufficient or non-existent wastewater infrastructure
- Rivers with low dilution capacity

Population at risk

Population at risk considering unimproved drinking water supply (JMP country statistics)



(Rivera et al. in prep)

Future FC loadings

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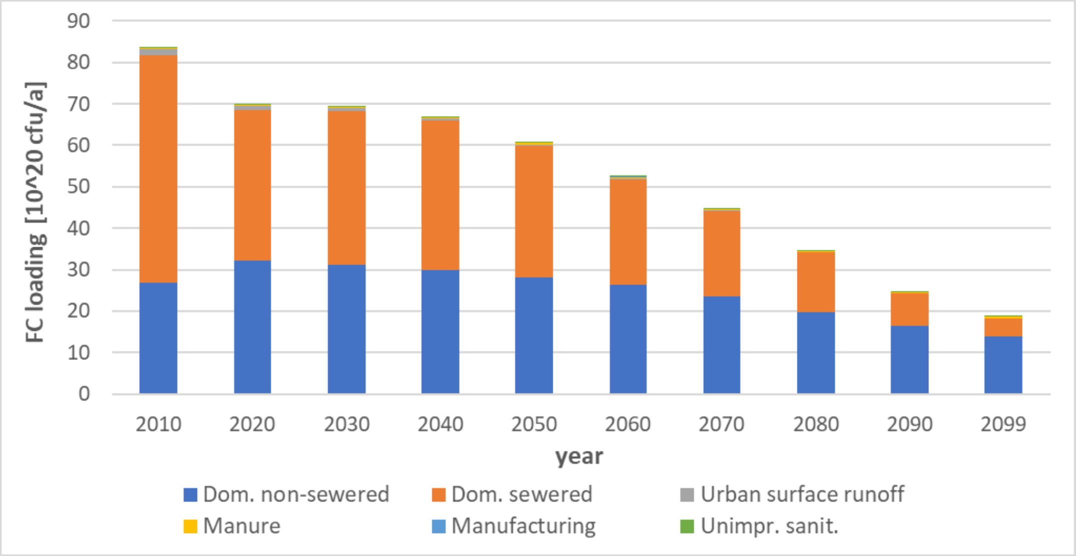

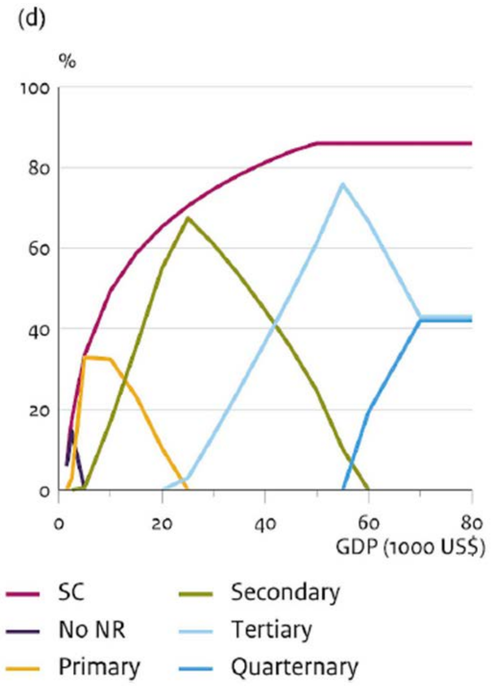

van Puijenbroek et al. (2019)

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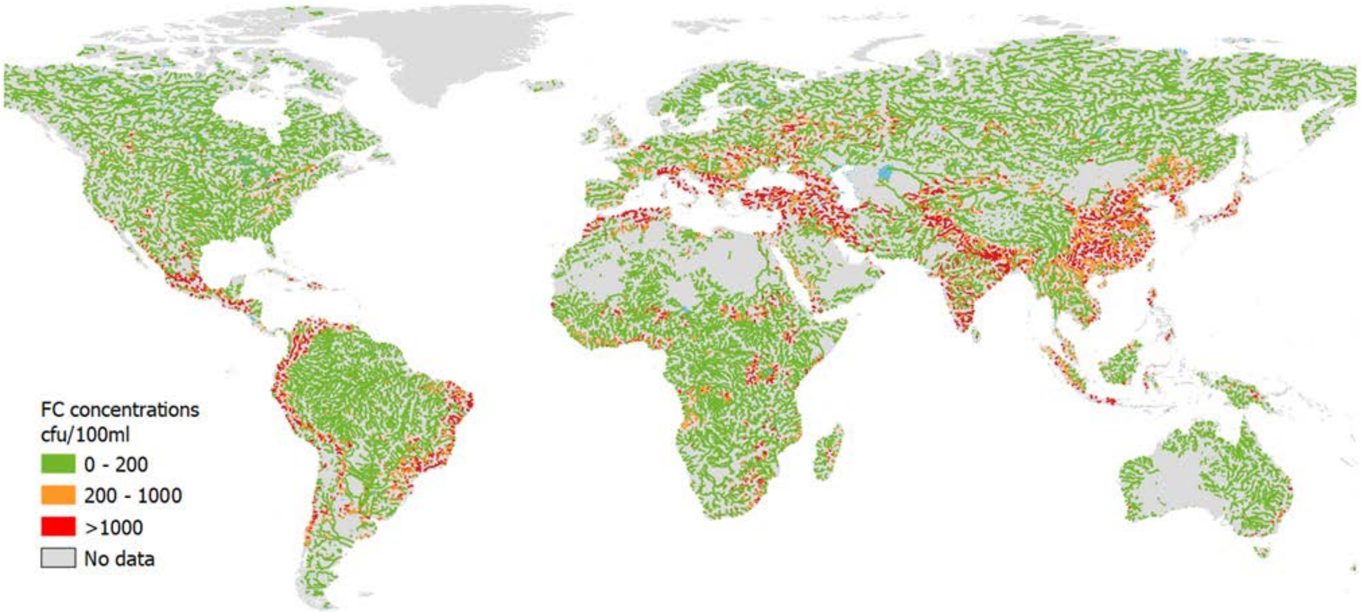
FC concentrations in rivers in 2030 (median)

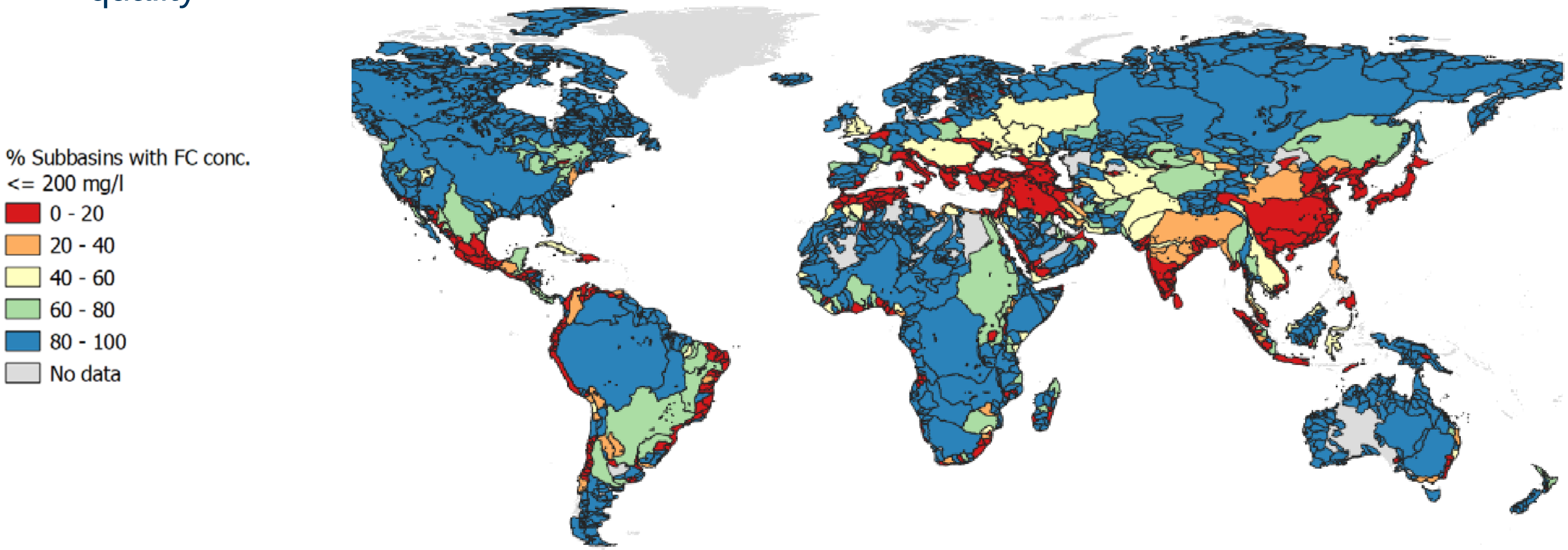
SSP2-rcp6.0, GCM models: GFDL-ESM2M,HadGEM2-ES,IPSL-CM5A-LR,MIROC5



- ➢ Improved sanitation reduces FC concentrations in Asia, USA, Europe
- ➢ Sanitation improves in almost all African countries beyond 2030
- ➢ Pace of sanitation improvement is too slow to become visible in Latin America

Indicator SDG 6.3.2 – FC in 2030

Indicator 6.3.2: “Proportion of bodies of water with good ambient water quality”



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Conclusions

- For FC, concentration hotspots are densely populated areas, in particular where wastewater treatment is limited and intensively managed agricultural land (manure)
- Wastewater production still increases, but reduction of FC loadings by improved wastewater treatment likely reduces the pressure on human health in Asia, USA, and Europe in 2030
- In Africa, a higher number of populations is expected to be at risk of getting in contact with FC in rivers in 2030 due to fast population growth and almost no sanitation improvements
- FC hotspots still present in 2030 due to the (very) slow pace in improved sanitation
- (Semi-)Arid regions seem to be more threatened due to higher pollution levels and lower dilution capacity
- There is still a strong need for regularly monitored, up-to-date and readily available data to do a thorough validation of the model
- Less information is available on water quality impacts

Major contributions reached & challenge

- **All model results** will become available for further analyses via the **GlobeWQ platform**
- **Water Quality Baseline (WWQA 2021)** *"First global display of a water quality and its impacts on ecosystem health, human health and food security as a result from networking activities."*
- **Scenario Analysis for World Water Quality Assessment (WWQA 2021-2022)** *"Development of fast-tracked or 'light' water quality scenarios in two workshops. Networking activity to kick-start the scenario analysis that will be part of the World Water Quality Assessment."*
- **ISIMIP – PROCLIAS (ongoing)** *"Global water quality as part of the global water sector. Development of a modelling protocol according to the ISIMIP3 standards. Opportunity to conduct model intercomparison studies and cross-sectoral studies (e.g. agriculture, energy, health, lakes etc.)."*
- **Challenge** *"Multi-model and multi-substances assessment"*

Nitrogen pollution legacies in Europe

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Masooma Batool and Dr. Rohini Kumar

Department of Computational HydroSystem (CHS)
Helmholtz Centre for Environmental Research GmbH - UFZ

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Long-term trajectory of nitrogen (N) surplus across Europe




Masooma Batool and Rohini Kumar
Department of Computational Hydrosystems (CHS)

26.10.2023

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What I will present today?

scientific **data**

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Data Descriptor | Open Access | Published: 10 October 2022

Long-term annual soil nitrogen surplus across Europe (1850–2019)

Masooma Batool, Fanny J. Sarrazin, Sabine Attinger, Nandita B. Basu, Kimberly Van Meter & Rohini Kumar

Scientific Data 9, Article number: 612 (2022) | Cite this article

1726 Accesses | 1 Citations | 13 Altmetric | Metrics

Introduction
Problem Statement

Long-term trajectories of nitrogen (N) surplus across Europe

Assessment of different typologies of N surplus across Europe

Exploring Different Typologies of Nitrogen Surplus in Europe: Towards Reducing Agricultural Nitrogen Pollution

Masooma Batool[1,*], Fanny J. Sarrazin[1], Andreas Musolff[3], Tam V. Nguyen[1], Xin Zhang[4], Sabine Attinger[1,2] and Rohini Kumar[1]

[1]UFZ-Helmholtz Centre for Environmental Research, Department of Computational Hydrosystems, Leipzig, Germany
[2]Institute of Environmental Science and Geography, University of Potsdam, Potsdam, Germany
[3]UFZ-Helmholtz Centre for Environmental Research, Department of Hydrogeology, Leipzig, Germany
[4]Appalachian Laboratory, University of Maryland Center for Environmental Science, Frostburg, MD, USA

Intensive agricultural practices and high livestock density contribute significantly to nitrogen (N) pollution in European Union (EU), causing negative environmental impacts. To tackle the N problem, the EU recently launched Farm to Fork strategy (F2F) within framework of the "Green Deal" that aims, among other targets, to halve nutrient losses by 2030 and for this prescribes a minimum reduction in fertilizer application of 20%. This study focuses on assessing N losses in agricultural areas using the soil N surplus as an indicator. We explore different typologies of EU landscapes that are identified based on their past and present N surplus characteristics using multidimensional clustering algorithm. Various scenarios for reducing N surplus are explored, focusing on decreasing N inputs from mineral fertilizer and animal manure while ad-

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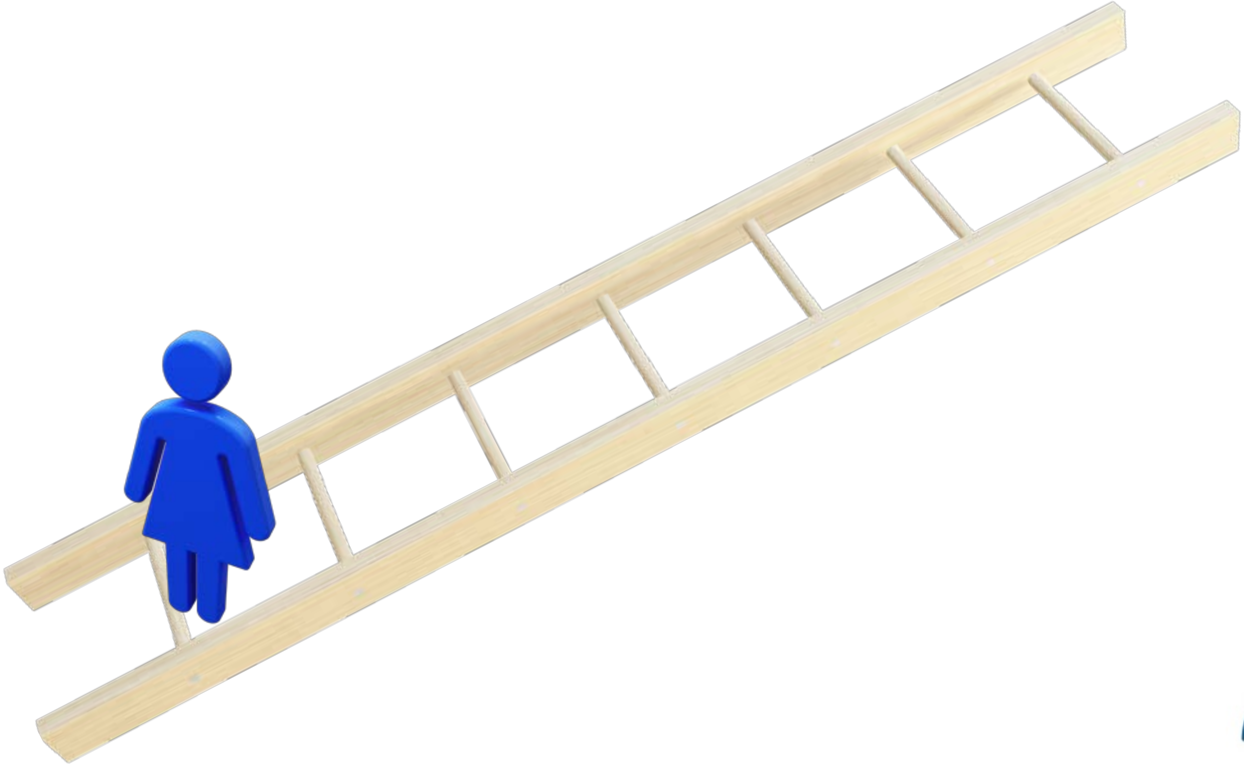
Introduction

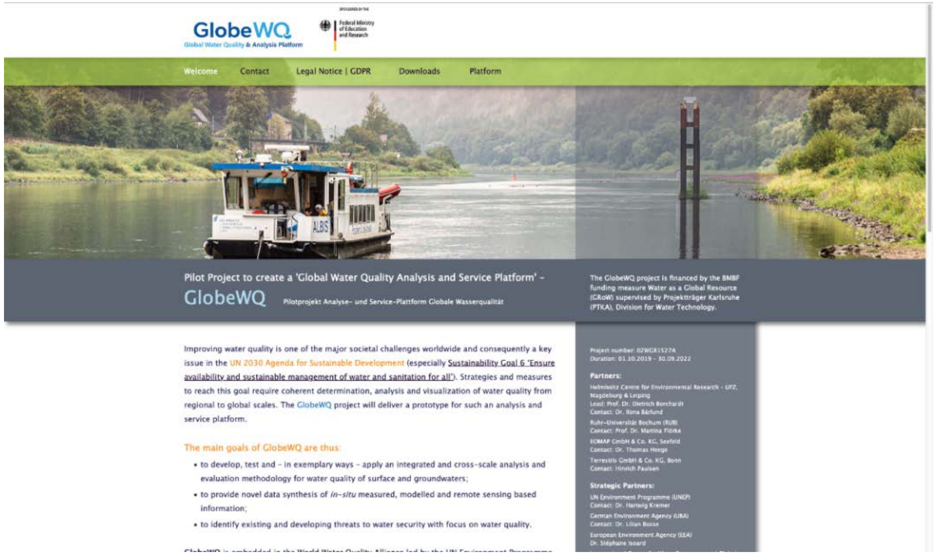


Towards improved assessment: Regional scale nutrients status

GlobeWQ project: Global Water Quality Analysis and Service Platform (GlobeWQ**)**

Our aims within the scope of project:

- Nutrient modelling at **regional scale**
- Understanding **long-term trajectory** of the different constituents of N surplus
- Study the long-term effect of the **N legacy stores** on nitrate levels over European landscapes



Introduction

Worldwide surface waters suffer from high concentration of **nitrogen (N) compounds,** due to large usages of agrochemicals that lead to:

- Deterioration of the water quality
- Loss of biodiversity
- Eutrophication

N levels can depend not only on the current net N inputs to the landscape, but also on the past net N inputs that have accumulated through time in soil and groundwater in so-called ”**legacy stores”**

Information on **long-term** annual net N inputs and **components of N surplus** is crucial to better understand N legacies and inform future management strategies

scientific **data**

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Long-term trajectory of nitrogen (N) surplus across Europe

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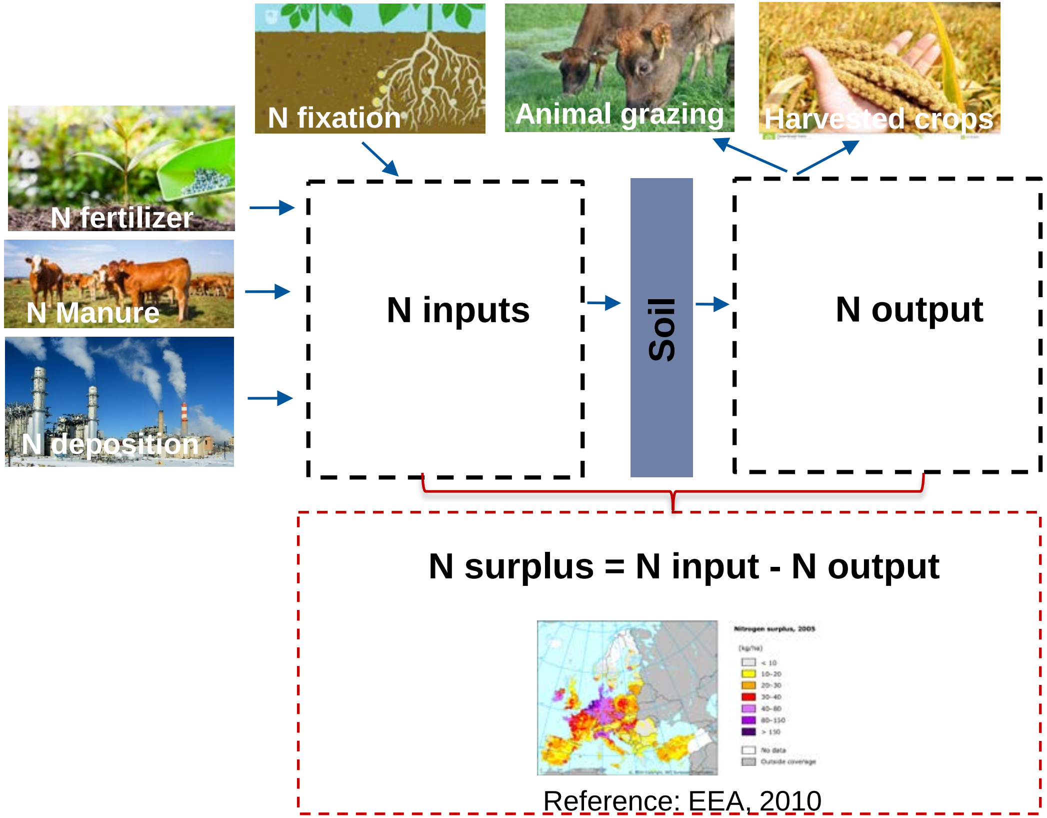
Nitrogen (N) surplus

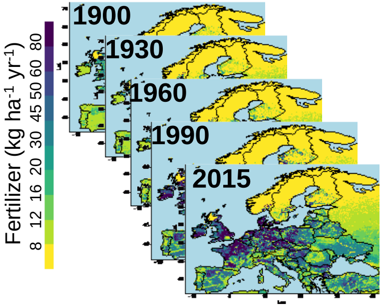
N surplus is the difference between N inputs (i.e. fertilizer, manure) and N outputs (i.e. N from harvested crops)

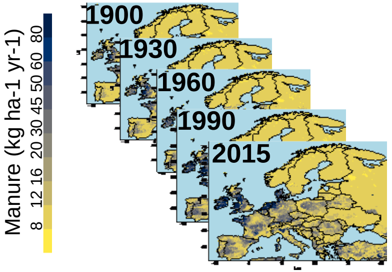
Existing datasets of N surplus:

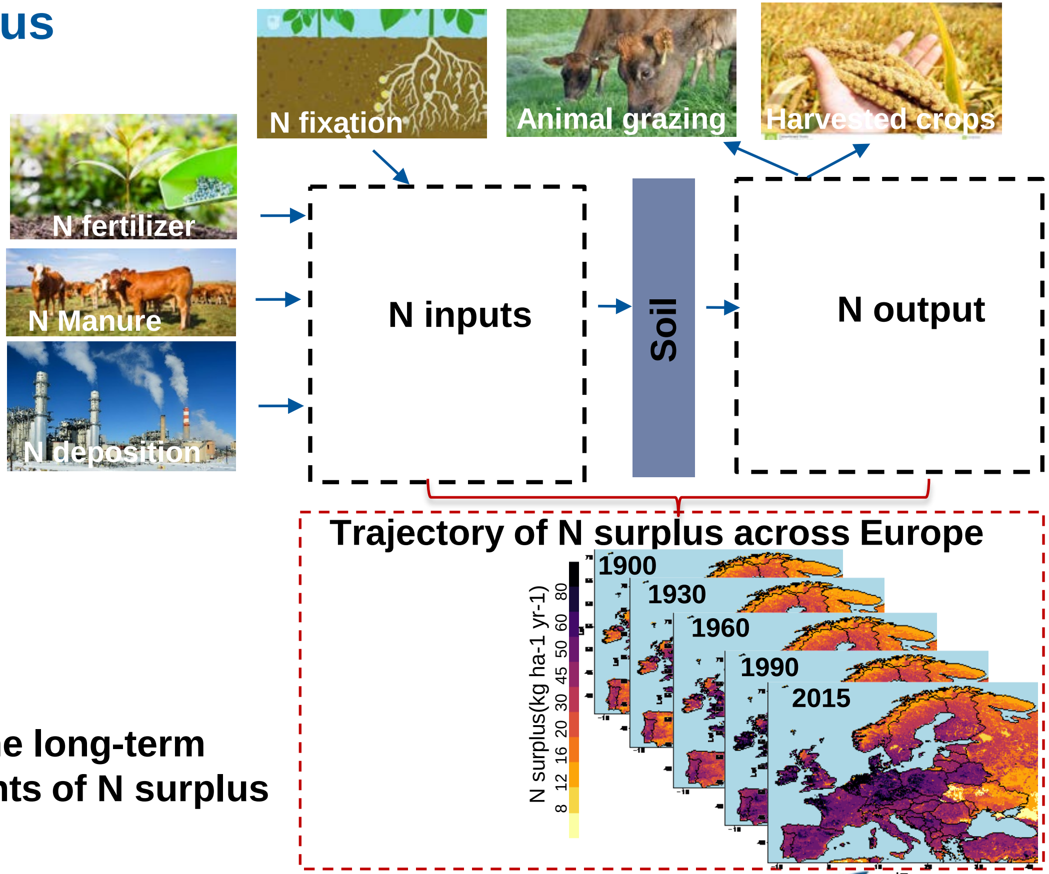
- Limited time periods
- At a coarser spatial resolution



Long term trajectory of N surplus

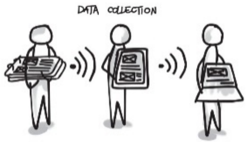






We constructed and analyzed the long-term trajectory of the different constituents of N surplus across Europe

Workflow

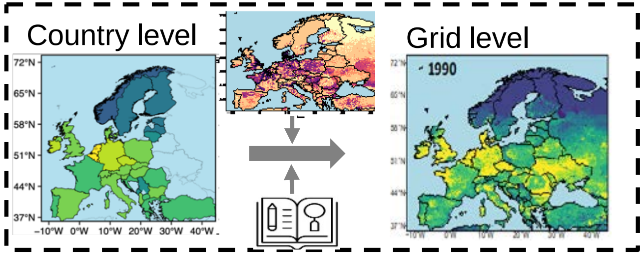


Step 1: Data collection

Global (HYDE)
Regional (European)
Country (FAOSTAT)
Grey literature …

Step 2: Data Harmonization

Harmonized and consistently produced dataset



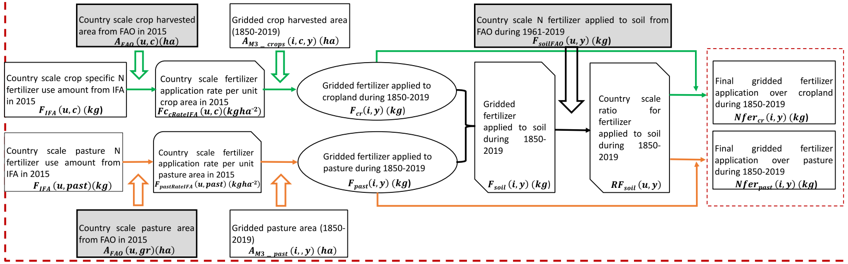
Step 3:Processing

Downscaling

Step 4: Assessment

Assessment of the resulting dataset

Example: Reconstruction of N fertilizer dataset



Uncertainty

N inputs

Fertilizer
→ Combination of 2 datasets

Manure
→ Combination of 4 datasets

(Fertilizer and Manure combined) →

Cropland
- 17 non-fodder crops
- 6 fodder crops

Pasture

N Fixation →

Cropland
- 17 non-fodder crops
- 6 fodder crops

Pasture

Forest
- Boreal
- Temperate

N deposition →

Cropland
- 17 non-fodder crops
- 6 fodder crops

Pasture

Forest
- Boreal
- Temperate

Non-vegetative
- Waterbodies
- Bareland

Urban

N output

N removal →

Harvested crops
- 17 non-fodder crops
- 6 fodder crops

N removal → Combination of 2 datasets →

Pasture
- Animal grazing
- Cutting of grass

16 datasets for N surplus across Europe during 1850-2019

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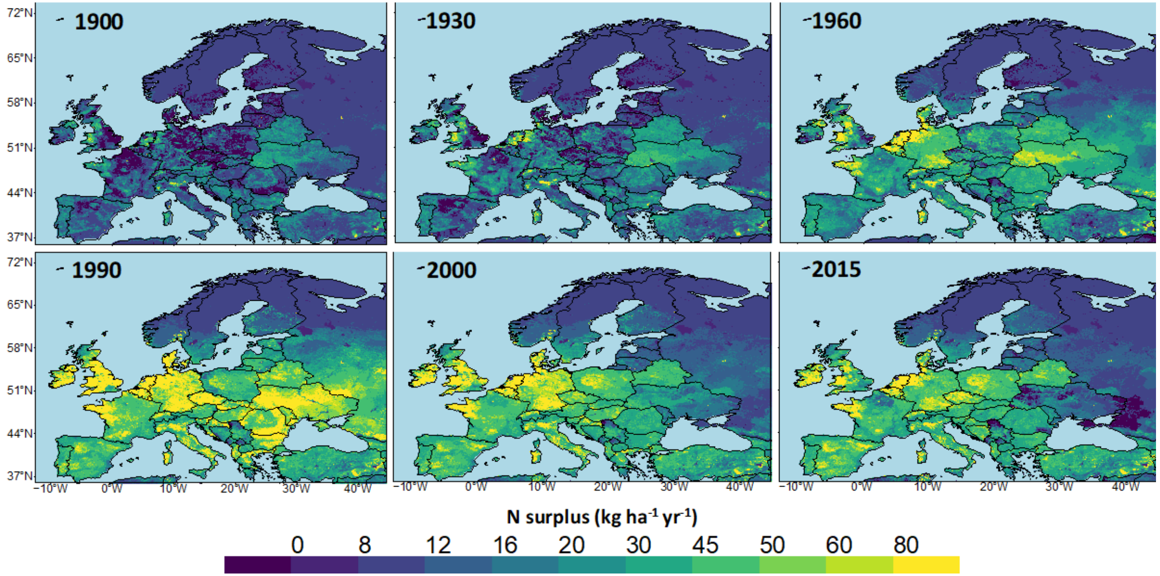
N surplus at grid level

Mean of 16 N surplus

Time period: 1850-2019
Time step: Annual
Spatial information:

- Extent (Europe)
- Resolution (5′ minute)

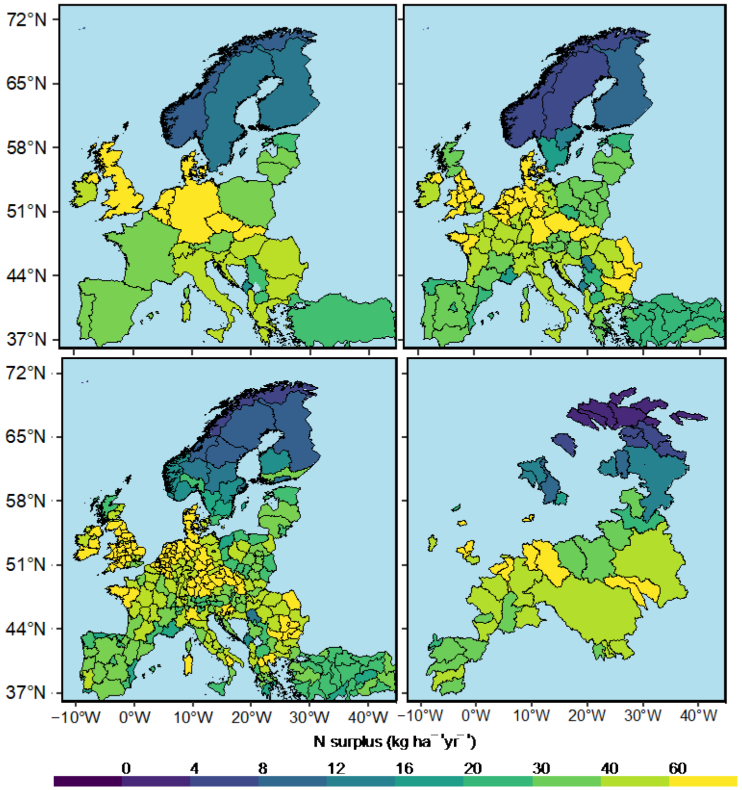


N surplus at aggregated levels

Political boundaries:

- NUTS (Nomenclature of Territorial Units for Statistics)

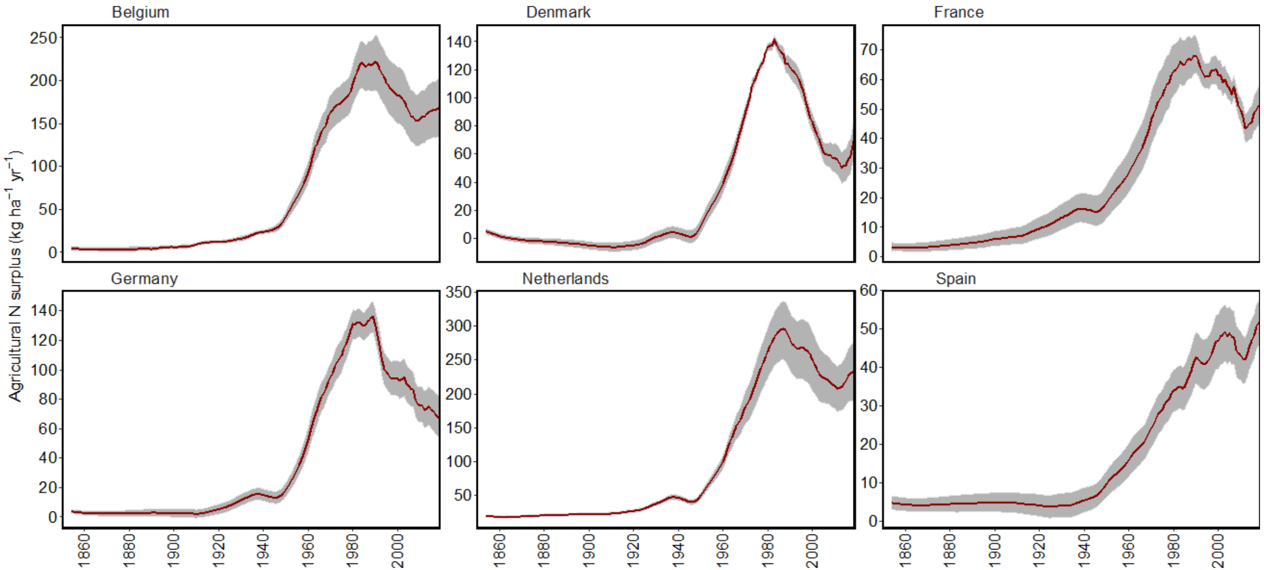
River basins



Uncertainty in N surplus (1850-2019)

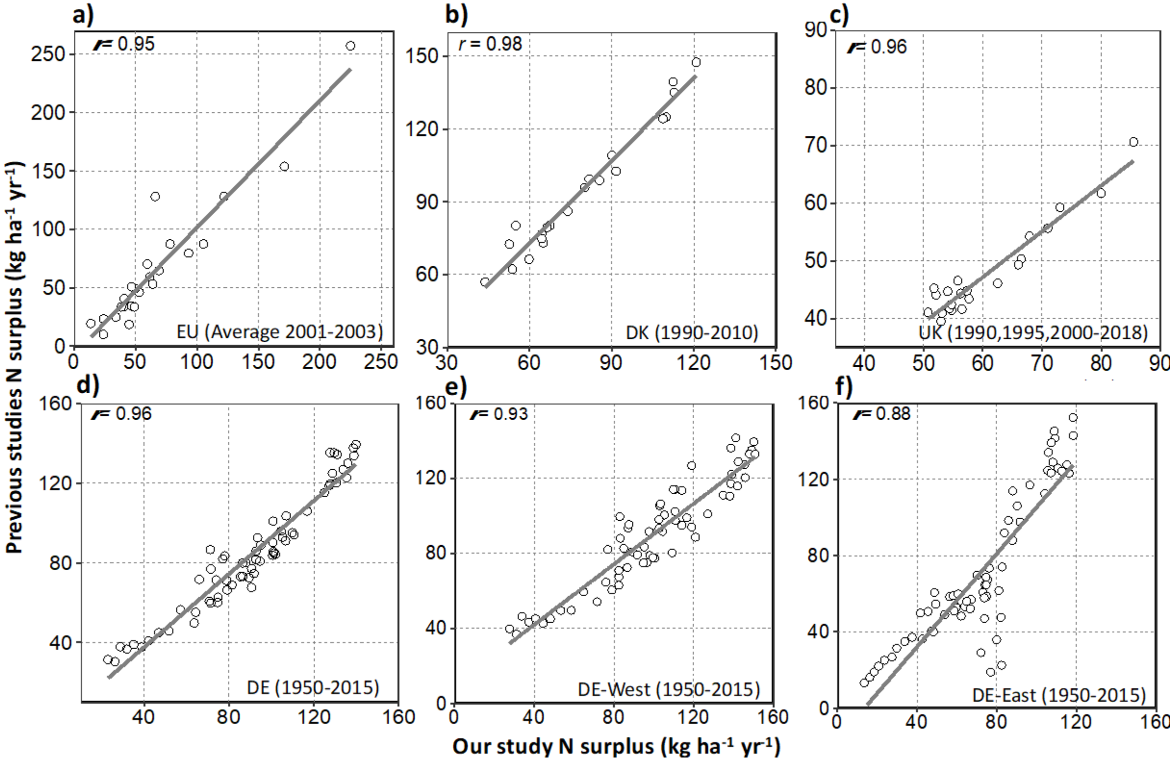
- Average of 16 different N surplus datasets

- Uncertainty in data sources and methodological choices

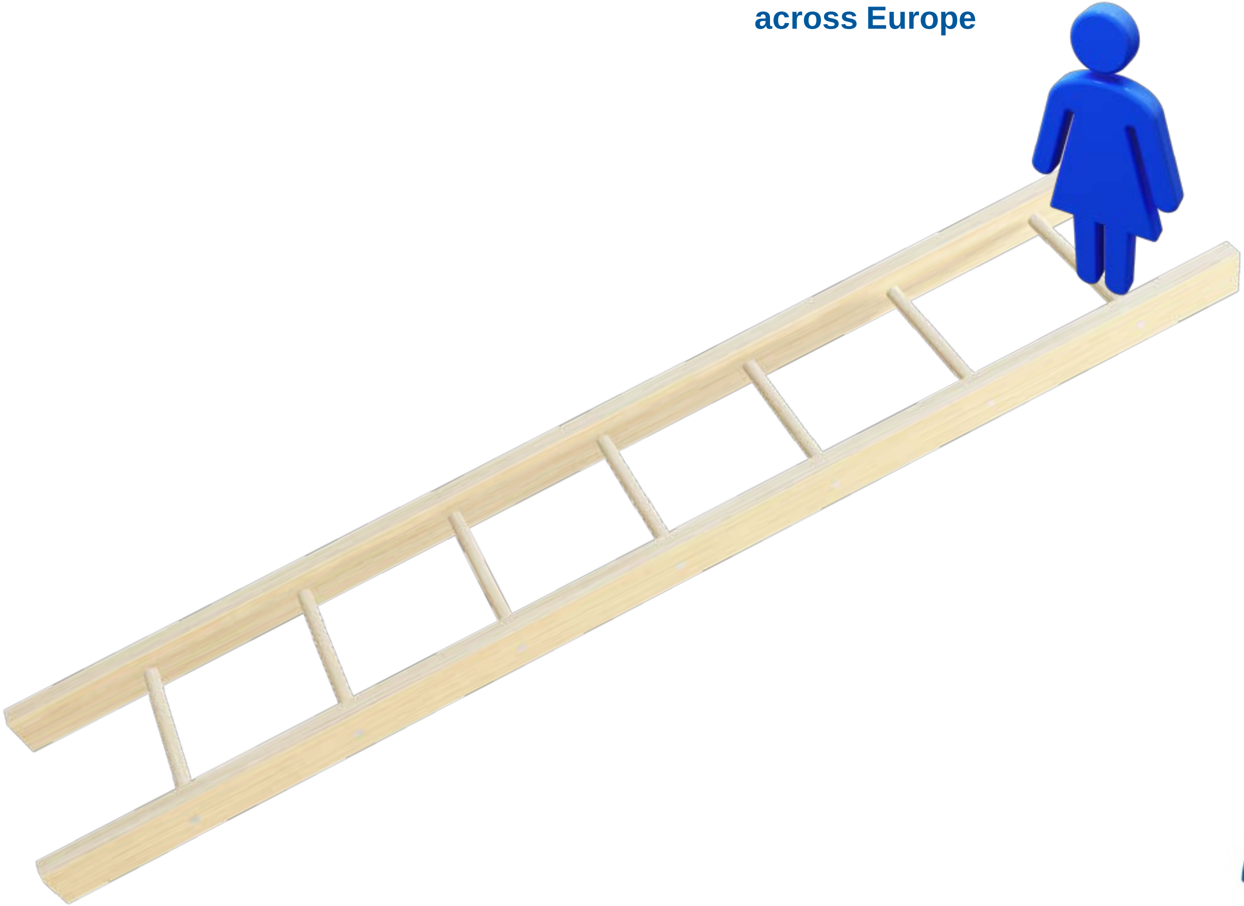


Comparison with previous studies: Country-level

Agricultural N surplus for different countries



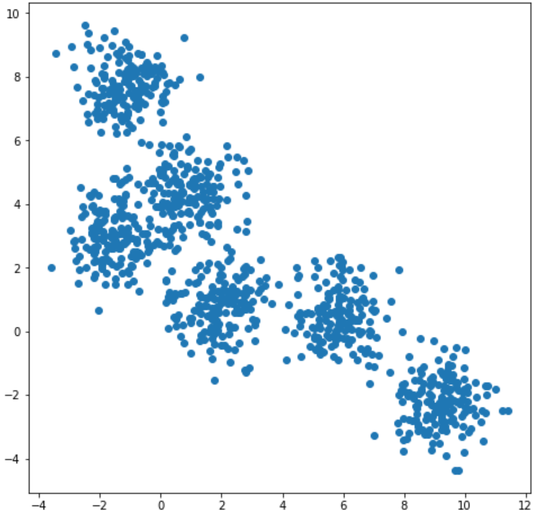
Assessment of different typologies of N surplus across Europe



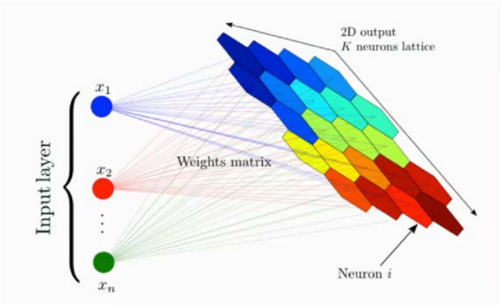
Applying clustering algorithm to identify different typologies of N surplus

To identify different typologies of N surplus in the EU, we applied a multidimensional clustering algorithm

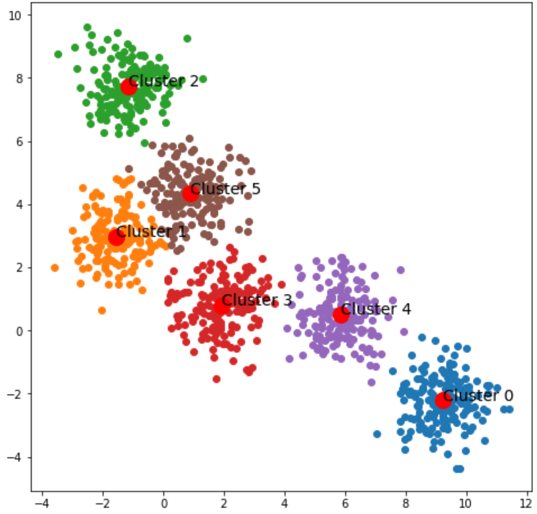
Inputs



Self Organizing Map(SOM)



Outputs

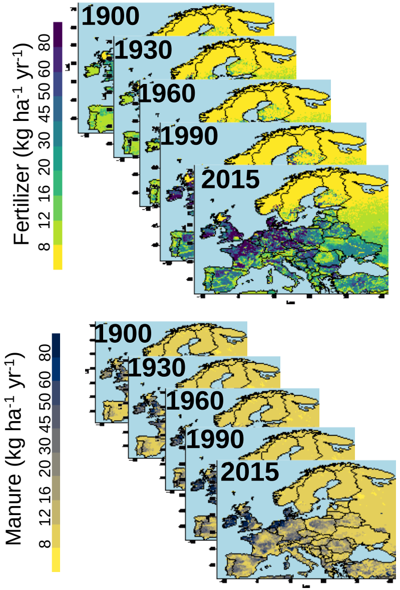


UFZ

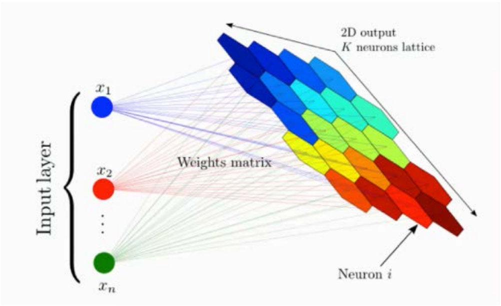
Four different typologies of N surplus were identified

We classified EU landscapes into four different typologies based on their commonly shared characteristics in terms of N surplus and its components

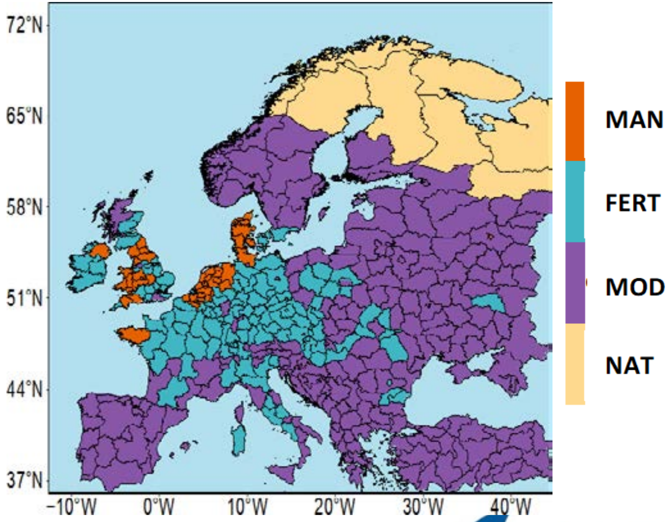
Inputs



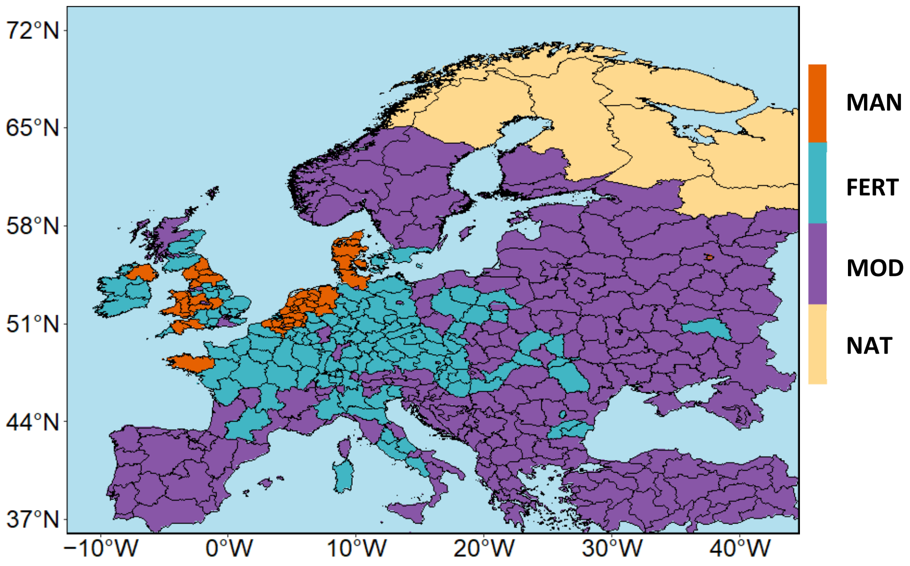
Self Organizing Map(SOM)

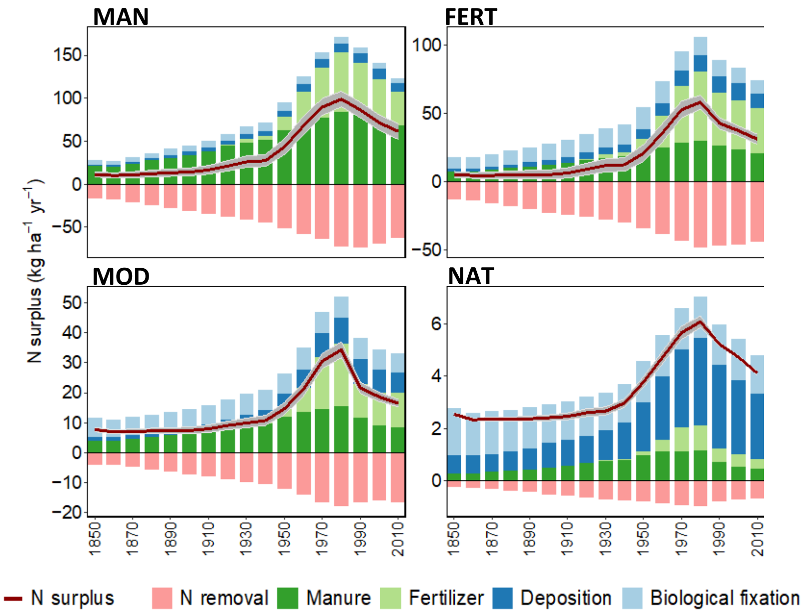


Outputs



N surplus and its components in identified typologies





MAN = Dominated by animal **man**ure

FERT = Dominated by mineral **fert**ilizer

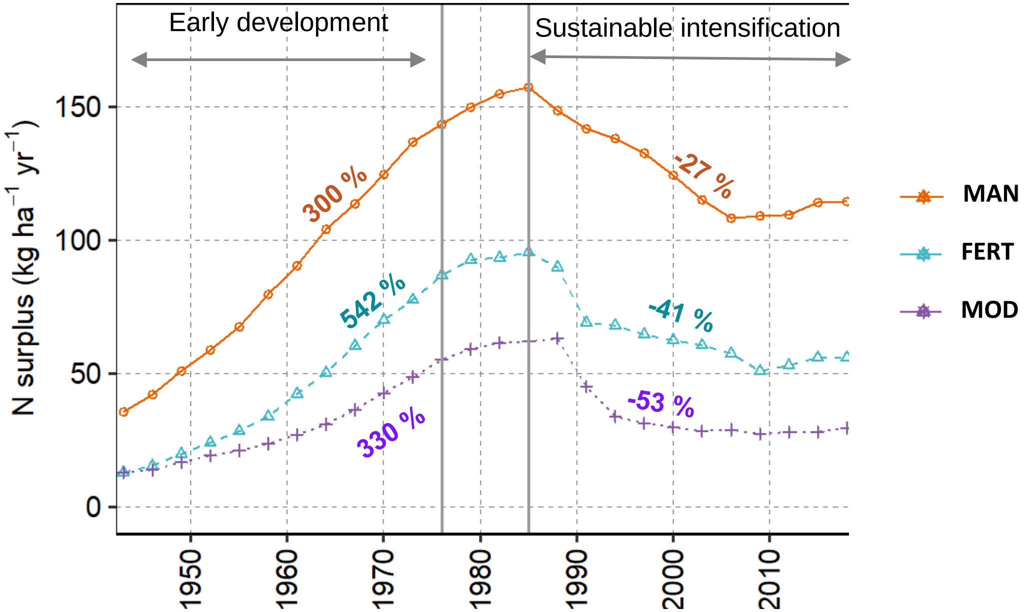
MOD = **mod**erate dominancy of both fertilizer and manure

NAT = Dominated by **nat**ural landscapes

Agricultural N surplus: Typologies differ among each other in different phases

Although the temporal pattern of N surplus was similar in all typologies, the magnitude of N surplus and the contribution of its components varied across typologies

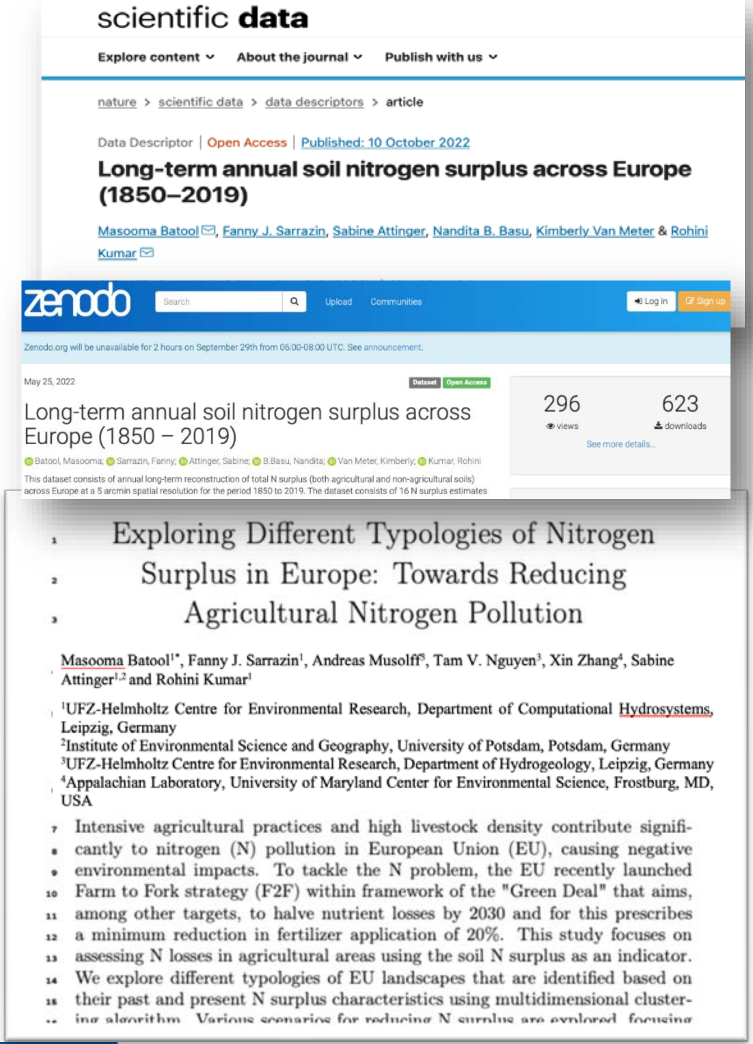
It highlights the need for regional-specific targets to reduce agricultural N pollution in Europe



Take aways

- Our long-term annual N surplus across Europe provides basis for comprehensive analysis of past and present estimates of N surplus across different European regions

- Landscapes in the EU are not equally burdened by N pollution
- Using a multidimensional clustering algorithm, we identified different typologies of N surplus in the EU
- We investigated different typologies of N surplus to determine whether a uniform approach to reducing mineral fertilizer use with the aim of halving N surplus by 2030, as proposed under EU Green Deal, would be effective across the EU


scientific data

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nature > scientific data > data descriptors > article

Data Descriptor | Open Access | Published: 10 October 2022

Long-term annual soil nitrogen surplus across Europe (1850–2019)

Masooma Batool, Fanny J. Sarrazin, Sabine Attinger, Nandita B. Basu, Kimberly Van Meter & Rohini Kumar

zenodo

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Zenodo.org will be unavailable for 2 hours on September 29th from 06:00-08:00 UTC. See announcement.

May 25, 2022 | Dataset | Open Access

Long-term annual soil nitrogen surplus across Europe (1850 – 2019)

Batool, Masooma; Sarrazin, Fanny; Attinger, Sabine; B.Basu, Nandita; Van Meter, Kimberly; Kumar, Rohini

This dataset consists of annual long-term reconstruction of total N surplus (both agricultural and non-agricultural soils) across Europe at a 5 arcmin spatial resolution for the period 1850 to 2019. The dataset consists of 16 N surplus estimates

296 views | 623 downloads | See more details...

Exploring Different Typologies of Nitrogen Surplus in Europe: Towards Reducing Agricultural Nitrogen Pollution

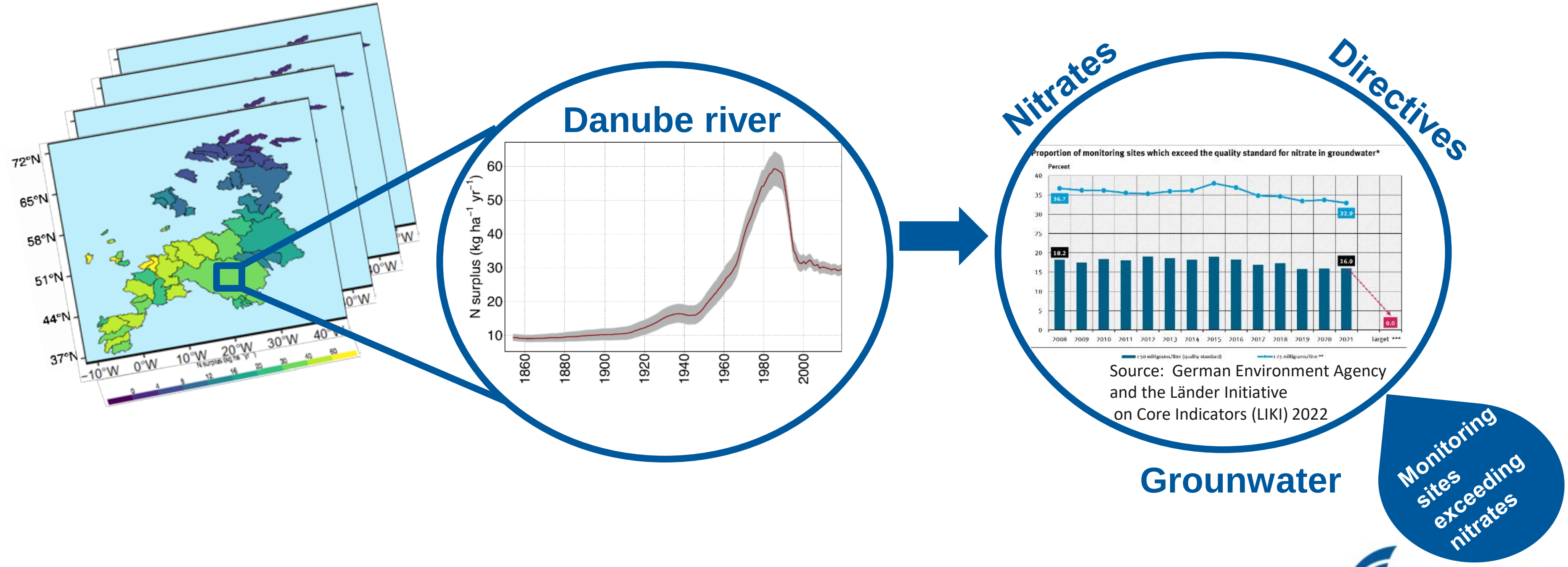
Masooma Batool[1*], Fanny J. Sarrazin[1], Andreas Musolff[3], Tam V. Nguyen[3], Xin Zhang[4], Sabine Attinger[1,2] and Rohini Kumar[1]

[1]UFZ-Helmholtz Centre for Environmental Research, Department of Computational Hydrosystems, Leipzig, Germany
[2]Institute of Environmental Science and Geography, University of Potsdam, Potsdam, Germany
[3]UFZ-Helmholtz Centre for Environmental Research, Department of Hydrogeology, Leipzig, Germany
[4]Appalachian Laboratory, University of Maryland Center for Environmental Science, Frostburg, MD, USA

Intensive agricultural practices and high livestock density contribute significantly to nitrogen (N) pollution in European Union (EU), causing negative environmental impacts. To tackle the N problem, the EU recently launched Farm to Fork strategy (F2F) within framework of the "Green Deal" that aims, among other targets, to halve nutrient losses by 2030 and for this prescribes a minimum reduction in fertilizer application of 20%. This study focuses on assessing N losses in agricultural areas using the soil N surplus as an indicator. We explore different typologies of EU landscapes that are identified based on their past and present N surplus characteristics using multidimensional clustering algorithm. Various scenarios for reducing N surplus are explored, focusing

Take aways

High nitrate levels in European groundwater often stem from historical N surplus, which accumulates over time and continues to impact water quality



Case studies –
the implementation of the triangulation approach

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GlobeWQ Global Water Quality & Analysis Platform

Karin Schenk and Christian Schmidt

EOMAP GmbH & Co. KG, Seefeld

Department of Hydrogeology

Helmholtz Centre for Environmental Research GmbH - UFZ

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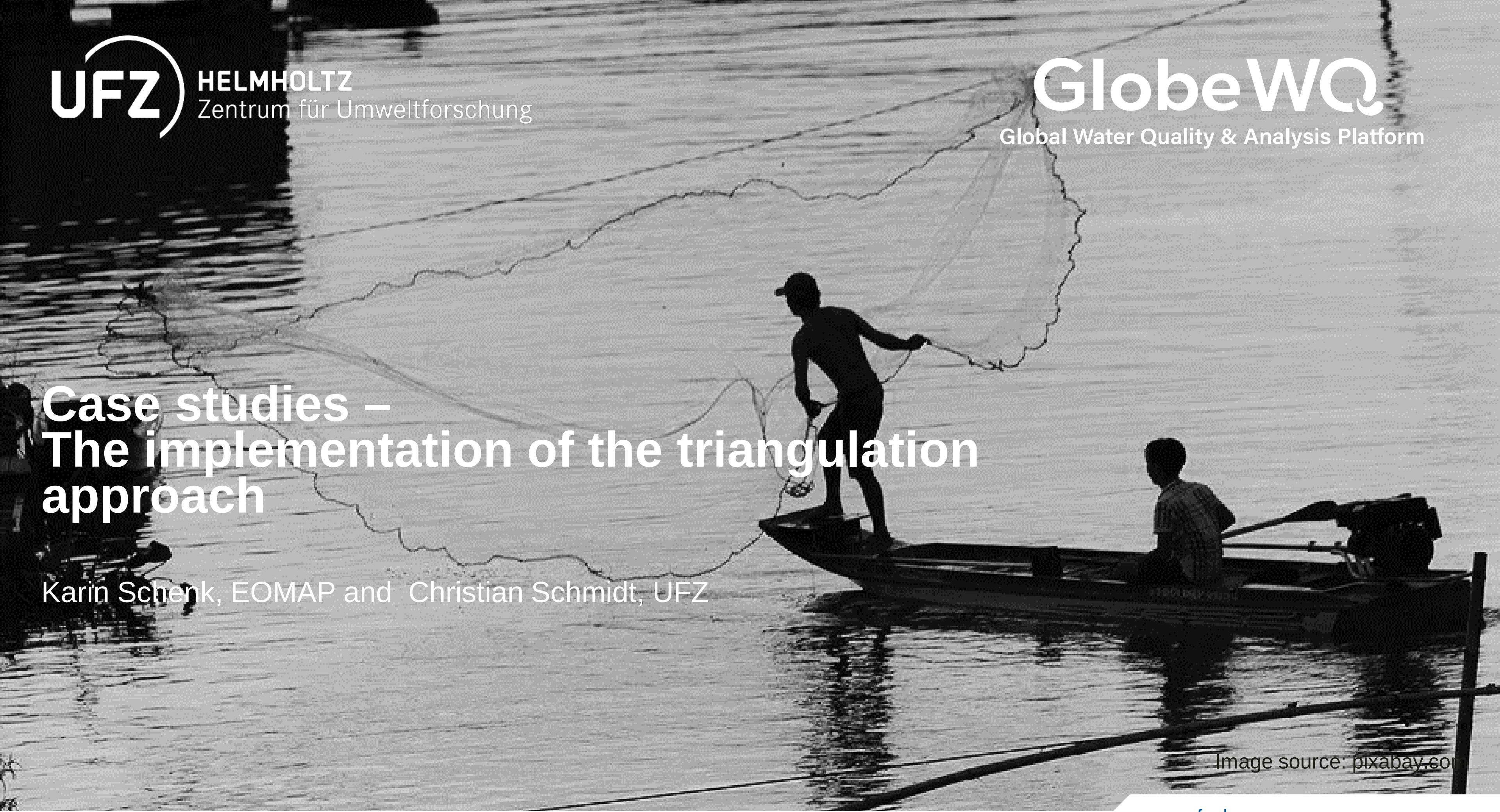

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Case studies – The implementation of the triangulation approach

Karin Schenk, EOMAP and Christian Schmidt, UFZ

Image source: pixabay.com

GlobeWQ Case studies

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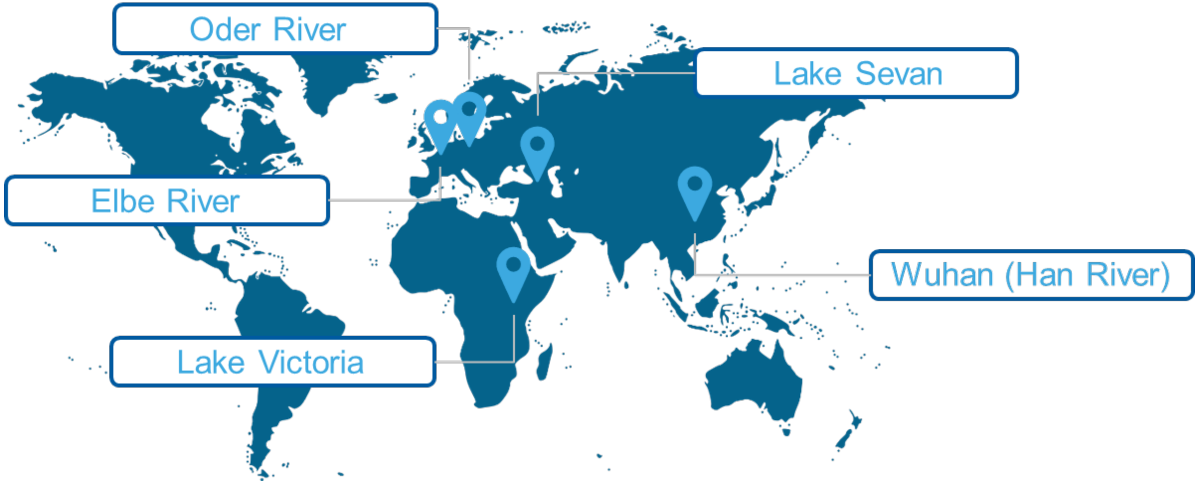
GlobeWQ Global Water Quality & Analysis Platform

Practical examples of the GlobeWQ platform prototype, methodologies, and tools, and in particular the demonstration of the triangulation approach



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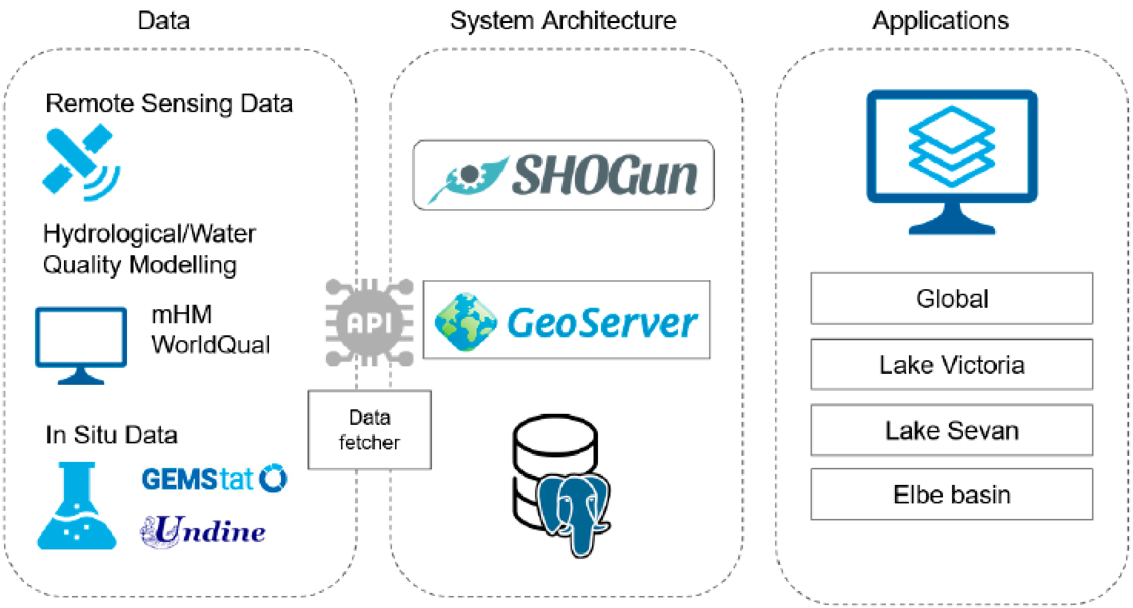
Technical implementation of GlobeWQ platform



Co-design of the GlobeWQ platform

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- Multiple workshops (primarily virtual) to engage with stakeholders for identifying information gaps and create tailored solutions
- GlobeWQ benefited from other projects and initiatives which paved the way to access to local stakeholders (WWQA Africa Use Case Project- Lake Victoria, Sevamod project- Lake Sevan)
- Continuous feedback from users is needed (and has been provided) for maintaining and improving user experience

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Technical implementation of GlobeWQ platform

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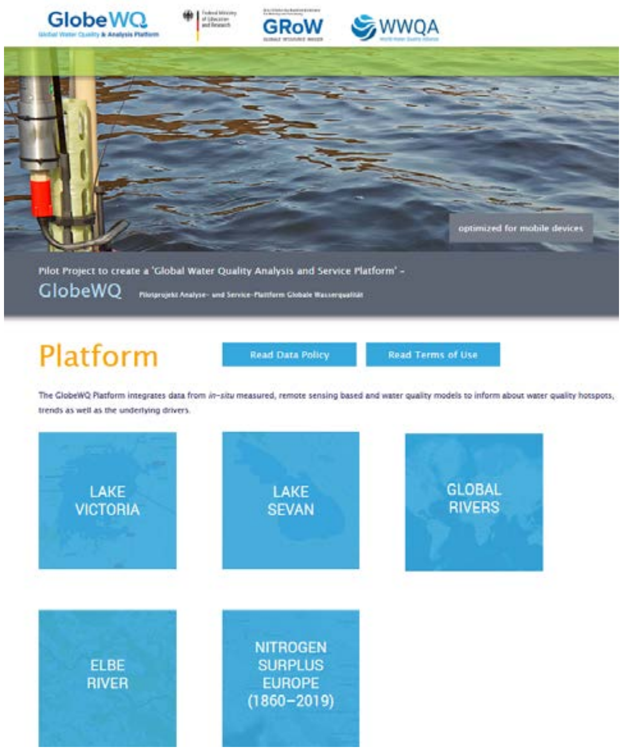
Global Water Quality & Analysis Platform



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The “Triangulation Approach”

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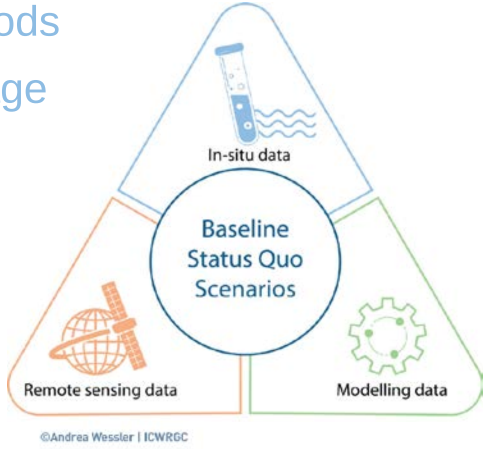
- High acceptance
- „Unconstrained“ parameters
- Ground truthing for other methods
- Limited spatio-temporal coverage



- Near realtime information
- High spatio-temporal coverage
- Limited number of parameters

- Predictions and scenarios
- Spatially and temporally continuous information
- Only as good as the input data

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Elbe

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Global Water Quality & Analysis Platform

Background

- Co-Design with the Flussgebietsgemeinschaft (FGG) Elbe
- FGG Elbe aims to implement the EU's Water Framework Directive for ecological and chemical status improvement of the Elbe

Challenge

- Long-term nutrient pollution
- Risk of algal blooms
- Only a few online WQ stations (UNDINE)

Image source: https://de.wikipedia.org/wiki/Elbe

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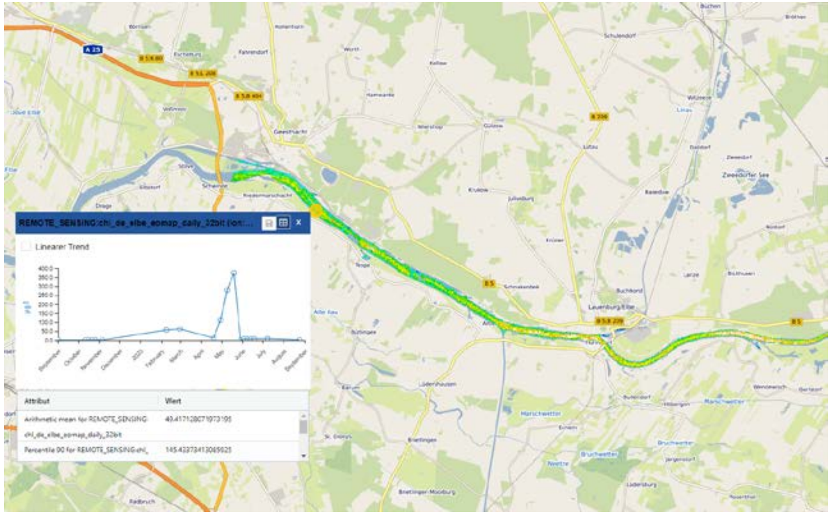
Elbe

Implementation

- Focus on timely water quality data
- Integration of real time in situ data from UNDINE stations
- Satellite data provides updated longitudinal patterns of water quality
- GlobeWQ platform is operational providing current state and spatio-temporal water quality patterns.



Lake Sevan

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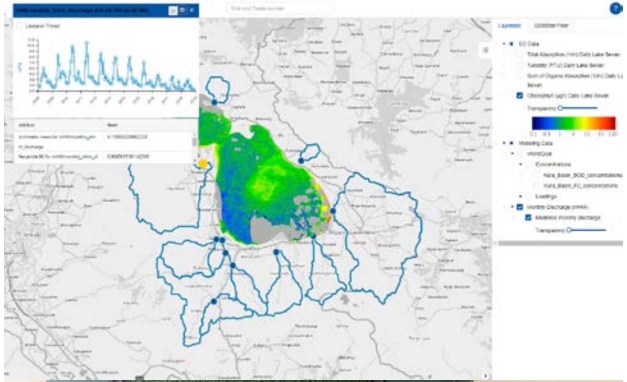
GlobeWQ
Global Water Quality & Analysis Platform

Background

- Lake Sevan is of national relevance for freshwater and food supply for Armenia
- GlobeWQ benefits from existing networks of other projects → Sevamod

Challenge

- Various pressures on water quantity and quality
- Information basis for improved lake and catchment management



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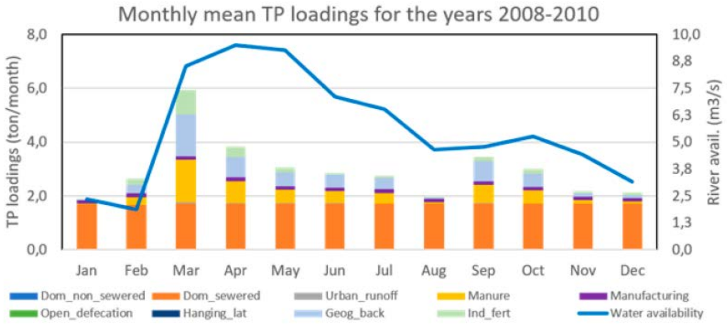
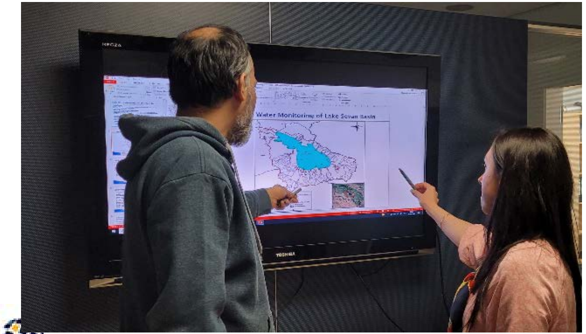
Sevan

Implementation

- Hydrological model (mHM) to quantify inflows into the lake
- Water quality model for phosphorus loadings (WorldQual)
- Remote sensing data products for the lake surface



Amalya Misakyan (Hydrometeorology and Monitoring Center of the Ministry of Environment of the Republic of Armenia, HMC) visits the UFZ to discuss details of the model set-up for Lake Sevan (Apr. 2022)



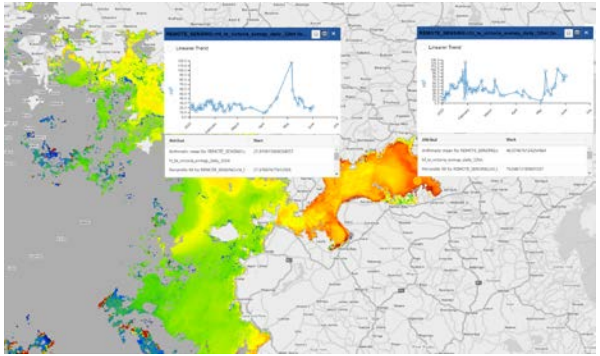
Lake Victoria

Background

- Significance for economies and livelihoods of Kenya, Tanzania, and Uganda→ fishery sector
- Stakeholder workshops with fishery organizations (supported by WWQA Africa use cases)

Challenge

- Multiple challenges, including oil spills, wastewater discharge, solid waste input, and nutrient pollution
- Harmful algal blooms→ risk for fish population
- Lack of data sharing policies and capacities



Lake Victoria

Implementation

- Operational incorporation of remote sensing data
- Interface to the GEMStat database
- Water quality model for phosphorus loadings (WorldQual) from tributaries
- Option to upload in situ on the GlobeWQ portal for visualization

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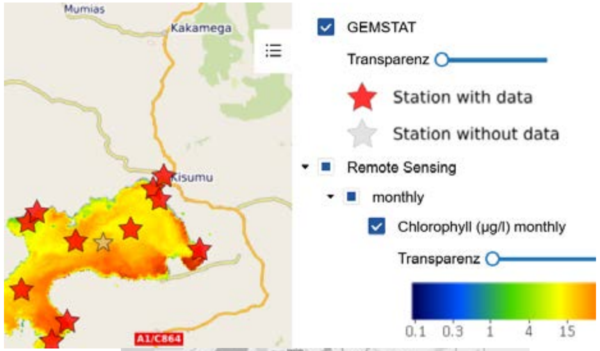

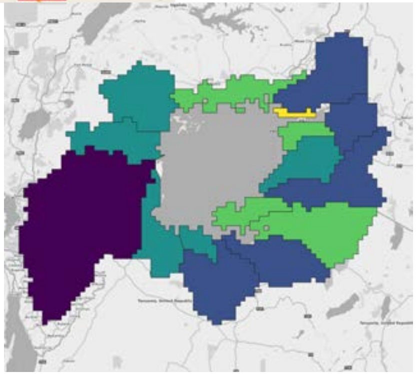

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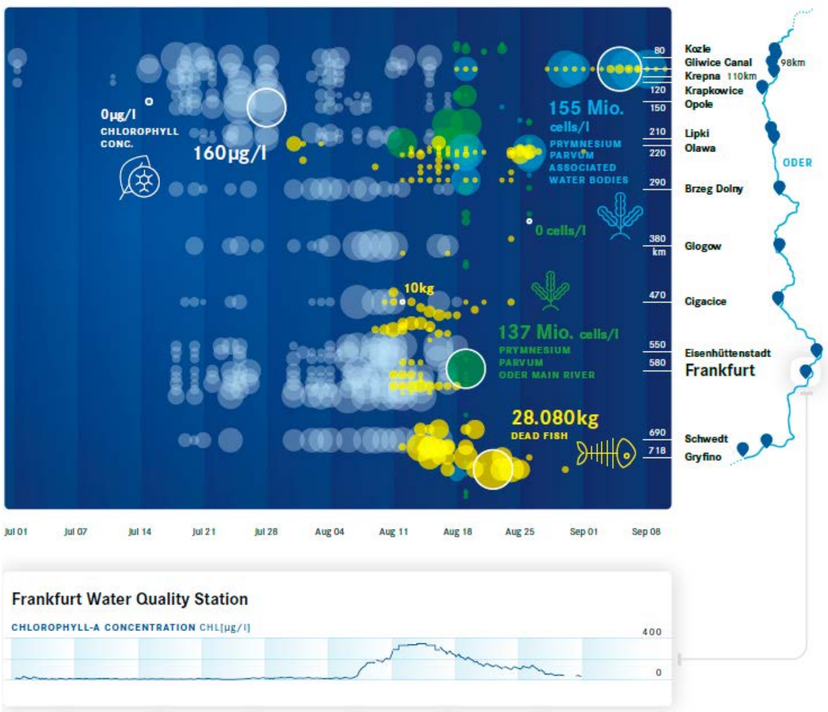
Ad-hoc case Oder

Background

- Mass fish die-off event in August 2022
- Integration of dead fish reportings, high resolution in situ data (Q, Water quality parameters) and high resolution satellite images to reconstruct space-time trajectory of the algal bloom and the fishkill

Spatio-temporal patterns of the algal bloom and the fishkill



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Early Warning System- Odra Fish Dying Event

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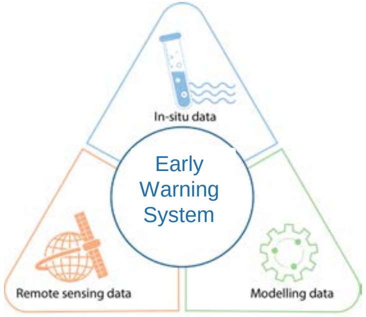
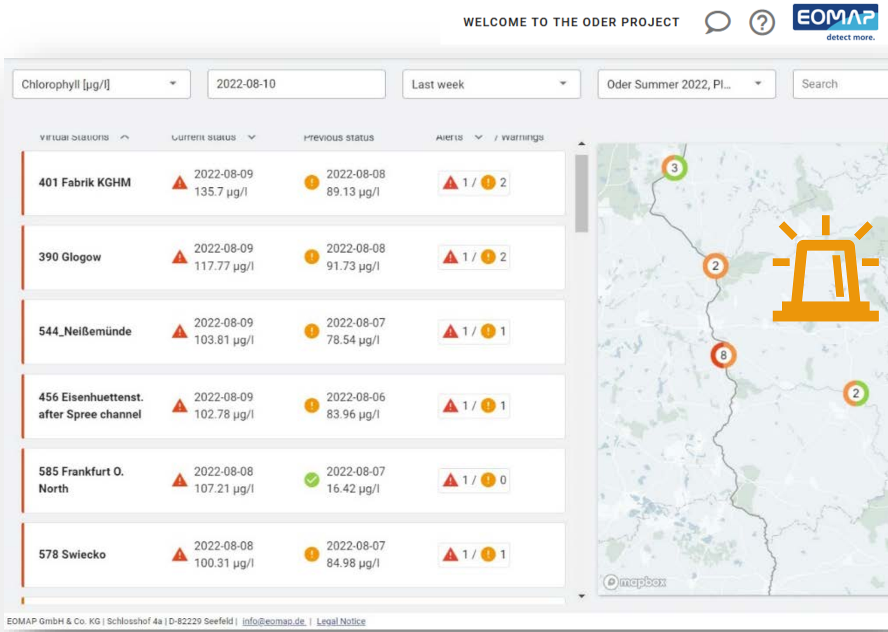
Factors/indicators:

1. Water level and discharge - nutrient concentrations
2. Water temperature
3. Solar radiation /sunshine duration
4. Algae concentrations contributing rivers
5. Salinity (for specific species)/ Water extent





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1) Low Water Level summer 2022

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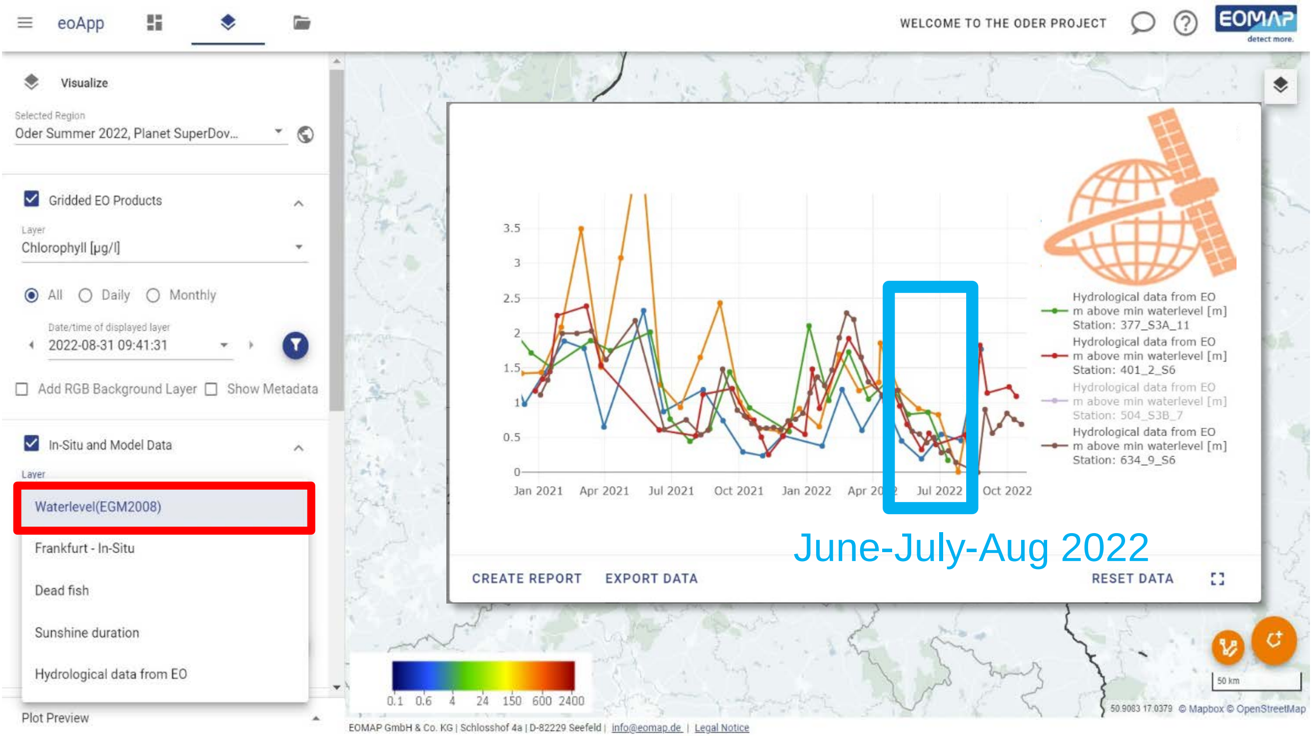
Factors/indicators:

1. **Water level and discharge - nutrient concentrations**
2. Water temperature
3. Solar radiation /sunshine duration
4. Algae concentrations contributing rivers
5. Salinity (for specific species)/ Water extent



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2/3) High Sunshine Duration and temperature

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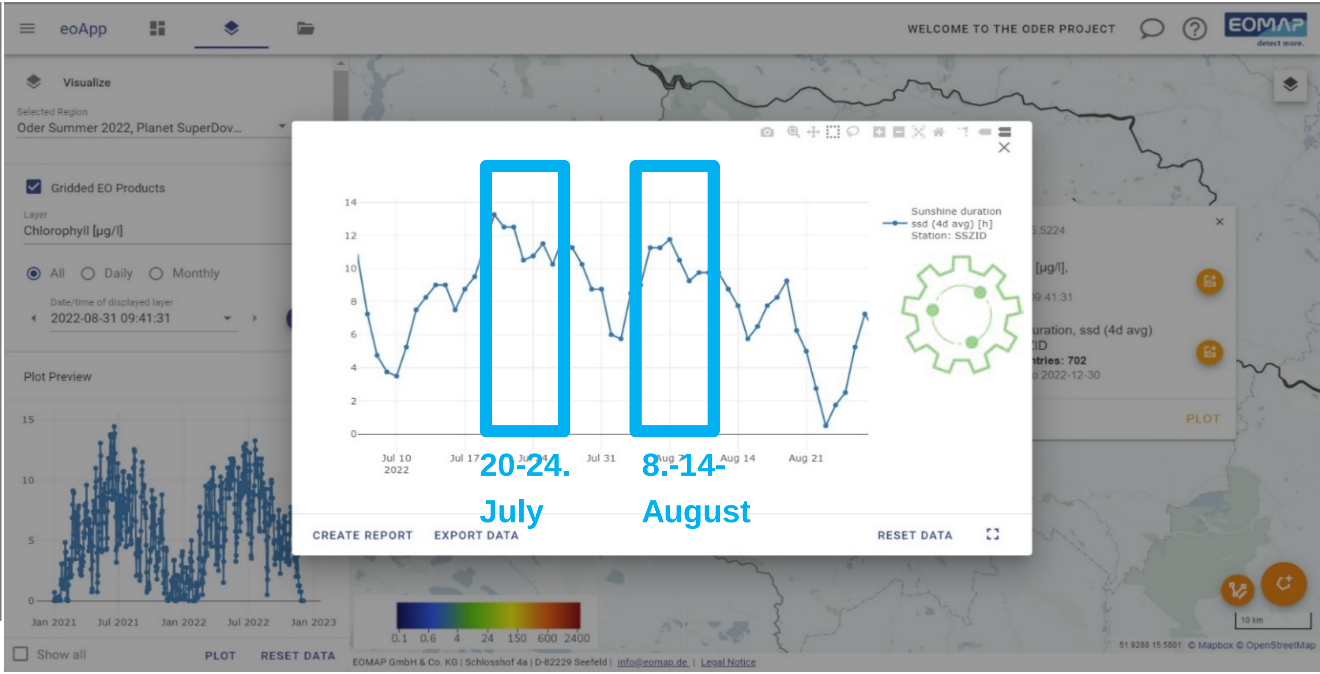
Factors/indicators:

1. Water level and discharge - nutrient concentrations
2. **Water temperature**
3. **Solar radiation /sunshine duration**
4. Algae concentrations contributing rivers
5. Salinity (for specific species)/ Water extent



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4) Very high resolution Algae concentrations

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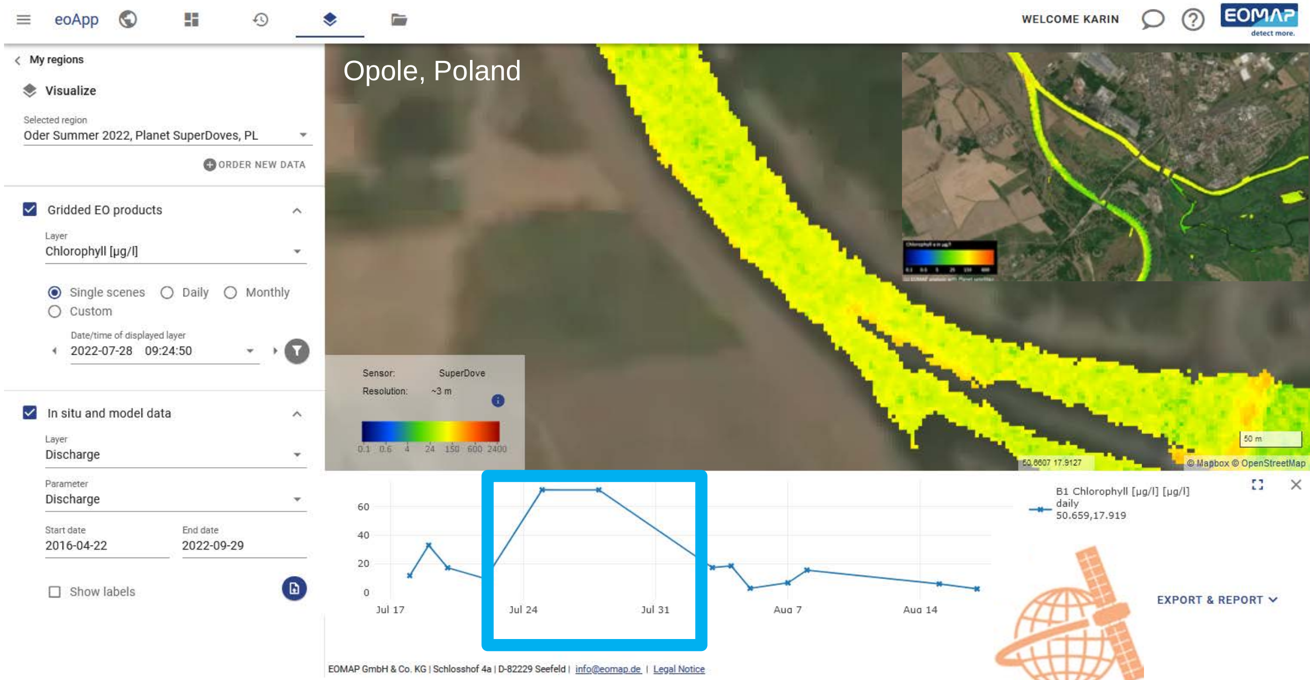
Factors/indicators:

1. Water level and discharge - nutrient concentrations
2. Water temperature
3. Solar radiation /sunshine duration
4. **Algae concentrations contributing rivers**
5. Salinity (for specific species)/ Water extent



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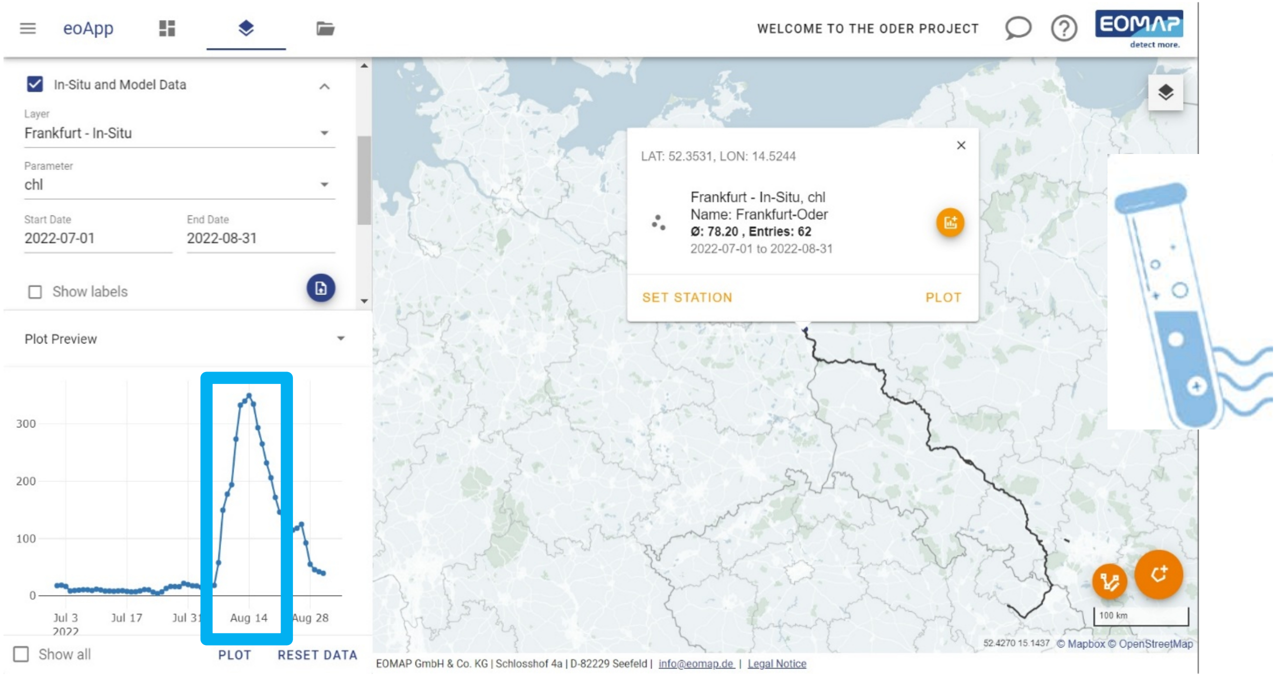
4) High Algae concentrations

Factors/indicators:

1. Water level and discharge - nutrient concentrations
2. Water temperature
3. Solar radiation /sunshine duration
4. **Algae concentrations contributing rivers**
5. Salinity (for specific species)/ Water extent



5) Introduction of Salinity/Water Extent

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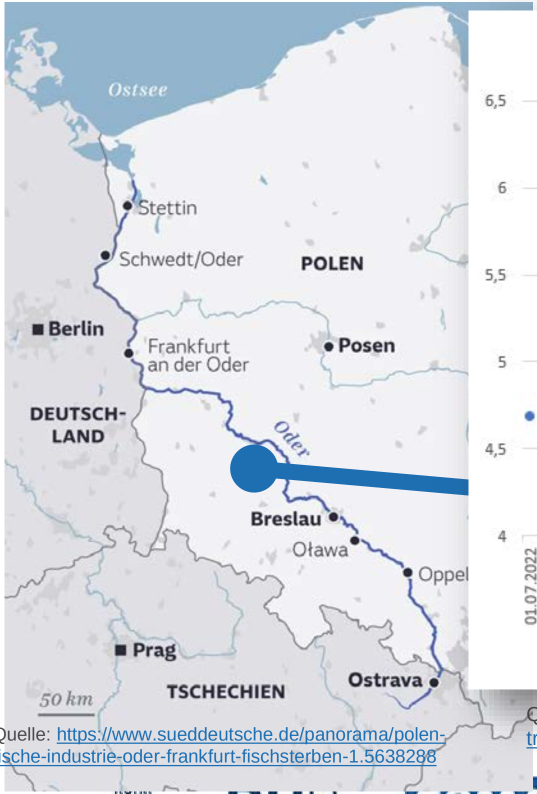
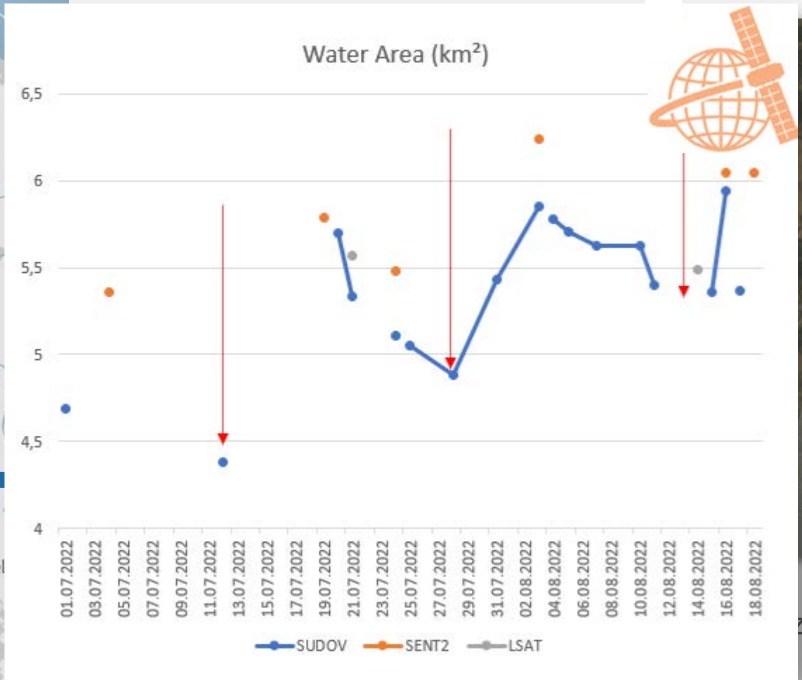
Factors/indicators:

1. Water level and discharge - nutrient concentrations
2. Water temperature
3. Solar radiation /sunshine duration
4. Algae concentrations contributing rivers
5. **Salinity (for specific species)/ Water extent**



Quelle: https://www.sueddeutsche.de/panorama/polen-fische-industrie-oder-frankfurt-fischsterben-1.5638288



Quelle: Planet; https://wroclaw.wyborcza.pl/wroclaw/7,35771,28801874,slona-woda-trafila-do-odry-w-glogowie-z-zakladu-hydrotechnicznego.html?disableRedirects=true

Early Warning System

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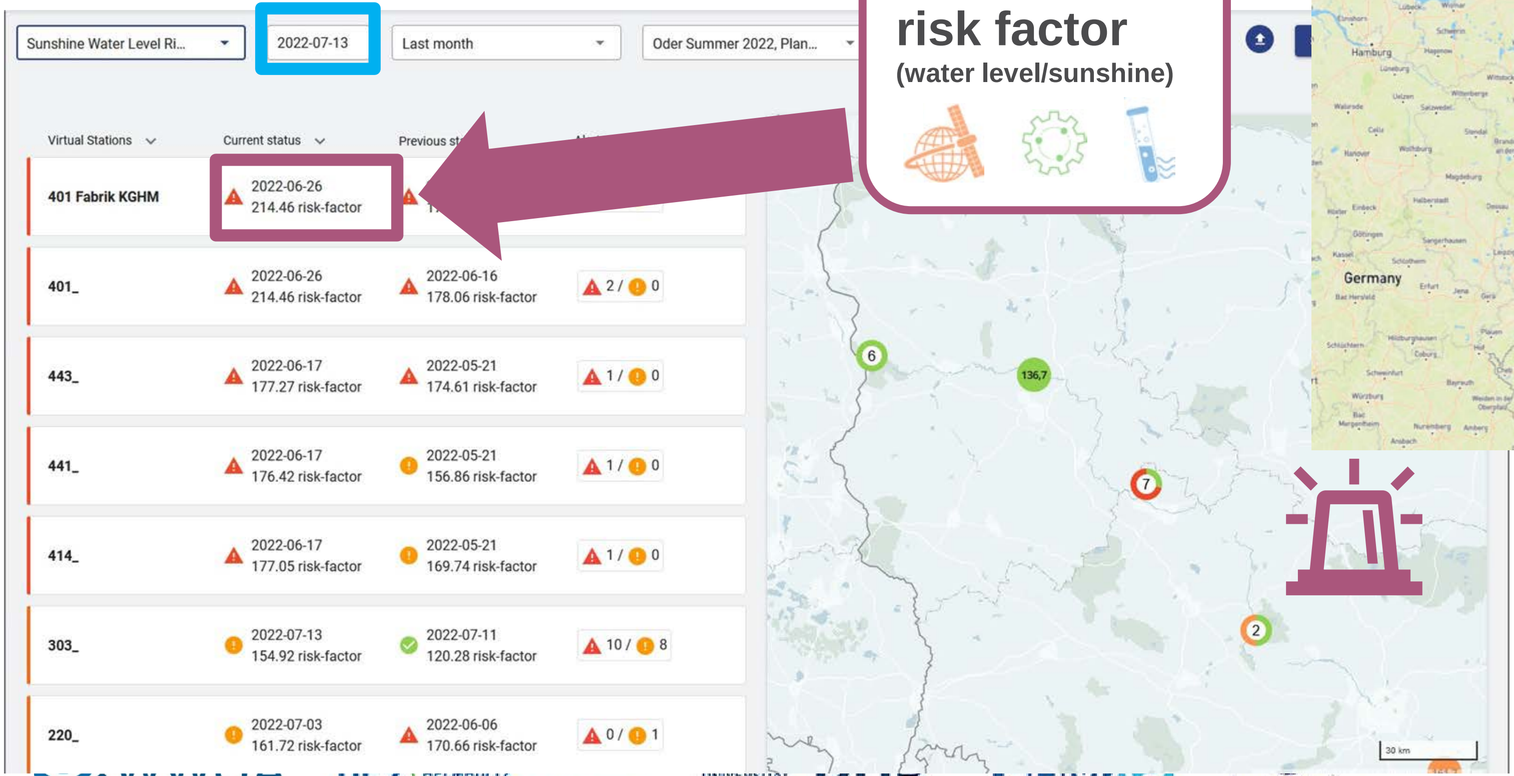
Combined risk factor
(water level/sunshine)



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Early Warning System

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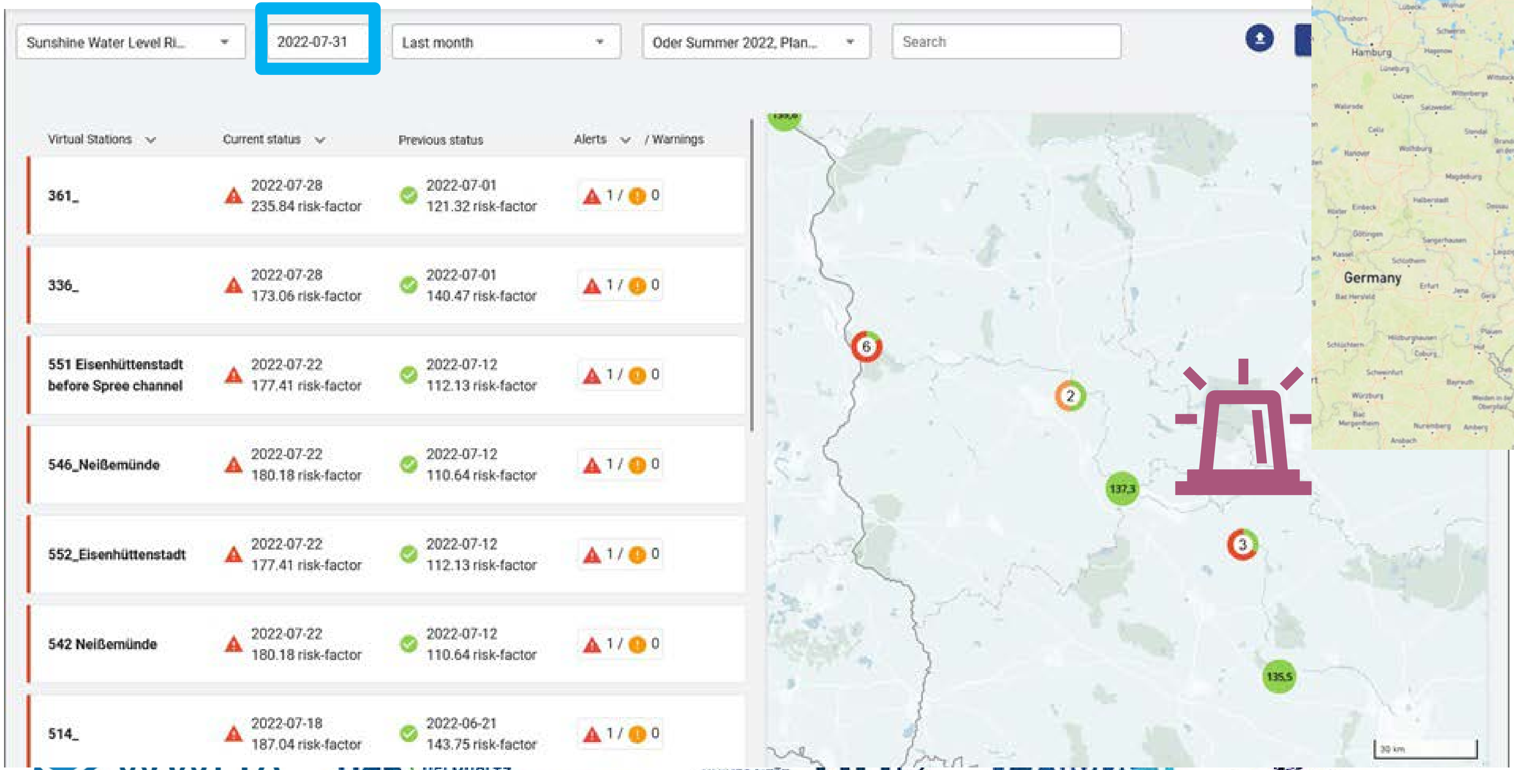

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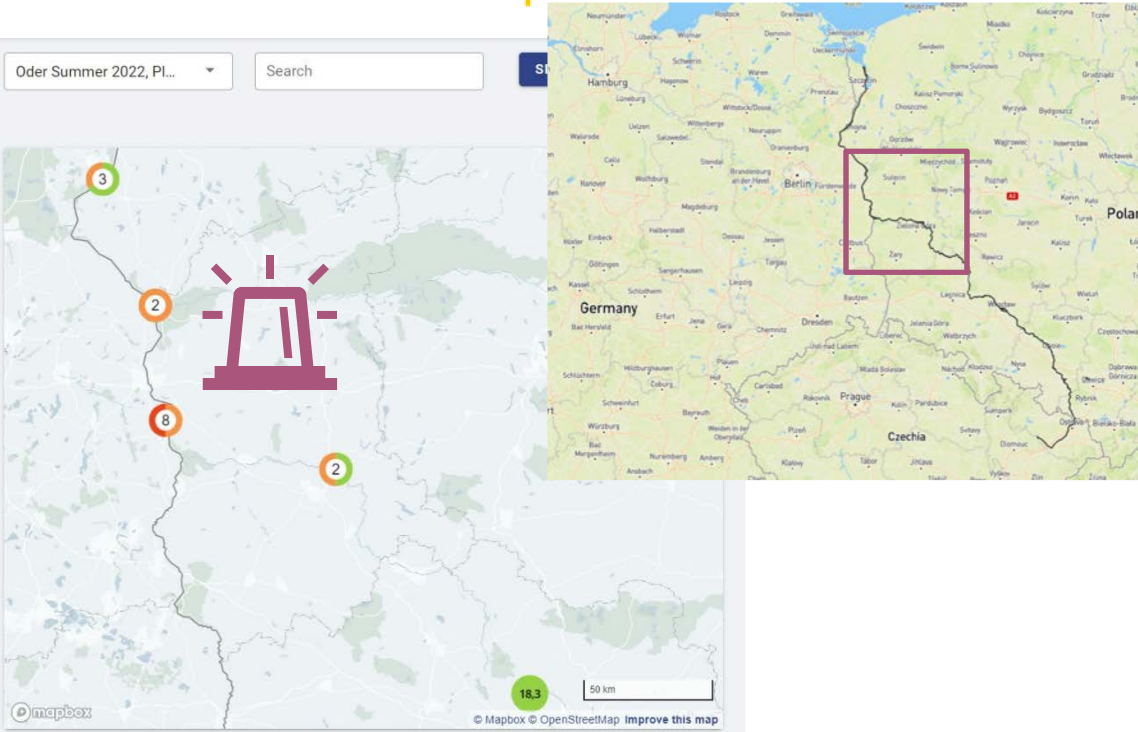
Early Warning System

Chlorophyll [µg/l] | 2022-08-10 | Last week | Oder Summer 2022, Pl... | Search

Virtual Stations	Current status	Previous status	Alerts / Warnings
401 Fabrik KGHM	2022-08-09 135.7 µg/l	2022-08-08 89.13 µg/l	1 / 2
390 Glogow	2022-08-09 117.77 µg/l	2022-08-08 91.73 µg/l	1 / 2
544_Neißemünde	2022-08-09 103.81 µg/l	2022-08-07 78.54 µg/l	1 / 1
456 Eisenhuettenst. after Spree channel	2022-08-09 102.78 µg/l	2022-08-06 83.96 µg/l	1 / 1
585 Frankfurt O. North	2022-08-08 107.21 µg/l	2022-08-07 16.42 µg/l	1 / 0
578 Swiecko	2022-08-08 100.31 µg/l	2022-08-07 84.98 µg/l	1 / 1



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The Lake Victoria case from a user perspective

Andrew Gemmell

The UMVOTO Foundation & SLR Consulting

Cape Town

WWQA
World Water Quality Alliance

WWQA Africa Use Cases

Stakeholder Engagement towards GlobeWQ Lake Victoria portal

Andrew Gemmell

September 2023

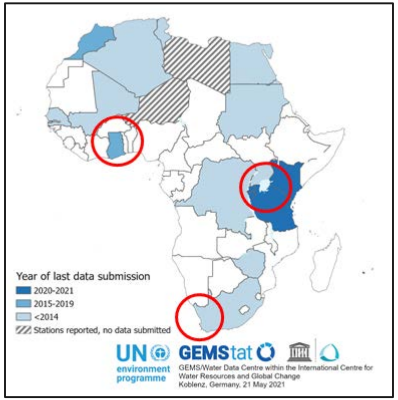
THE UMVOTO FOUNDATION

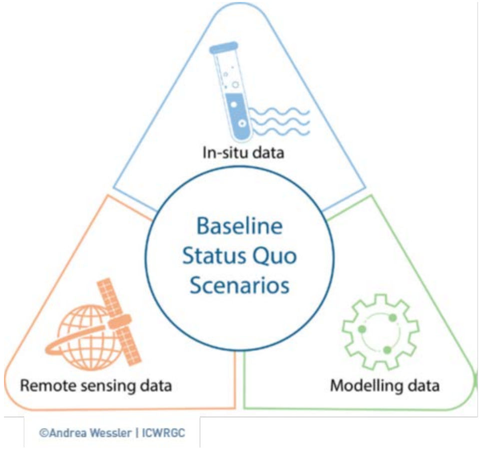
SLR

Background – WWQA Africa Use Cases

WWQA Africa Use Cases: A pilot to bridge from data to solutions.

Study Areas: Lake Victoria transboundary basin, the transboundary Volta River basin and Cape Town Aquifers





Aims:

- Integration of Triangle to derive current state of water quality.
- Multi-stakeholder driven process defining demand for water quality services ("using experience in global challenges to support local solutions")
- Provide evidence base that links water quality hotspots to solutions and investment

AGL-ACARE Lake Victoria Advisory Group

The multi-stakeholder process was initiated through various engagements over the last 4 years. Key in this process was the involvement of AGL-ACARE who formalized Advisory Groups for each of the 7 African Great Lakes

Currently the Lake Victoria Advisory Group has members from :

- Inter-governmental organisations (LVBC, LVFO),
- Governmental Fisheries Institutes (KMFRI, TAFIRI, NaFIRRI),
- Academic institutions (University of Eldoret, Nelson Mandela African Institution of Science and Technology, University of Nairobi, UFZ, IHE Delft) , and
- International organisations (IISD, WWF).

ke Victoria Advisory Group, Entebbe, 2019

Stakeholder Engagement

- Stakeholder engagement regarding the Africa Use Cases started in 2019 and continues to date
- The outcome of the stakeholder dialogues was the identification of a need for a tool to identify **Potential Water Quality Hotspots on Coastal Eutrophication.**
- The outcome was a Lake Victoria portal on GlobeWQ

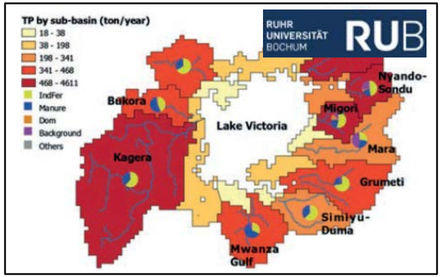
GlobeWQ
Global Water Quality & Analysis Platform

Piloting the triangulation approach for a snapshot view of Lake Victoria water quality

WWQA World Water Quality Alliance
THE UMVOTO FOUNDATION
SLR

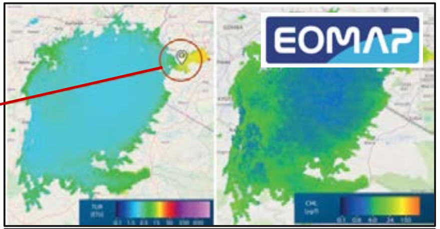
Hotspots based on loadings from modelling:

It's estimated that the sub-basins Kagera, Nzoia, Nyando-Sondu, and Migori, together with the Lakeshore; contribute more than 70 % of the riverine annual Total Phosphorous loadings into the lake.



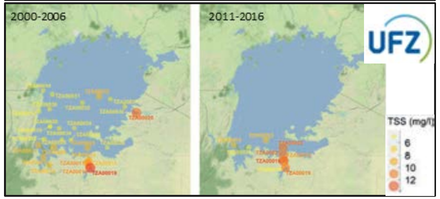
Hotspots based on concentrations from remote sensing:

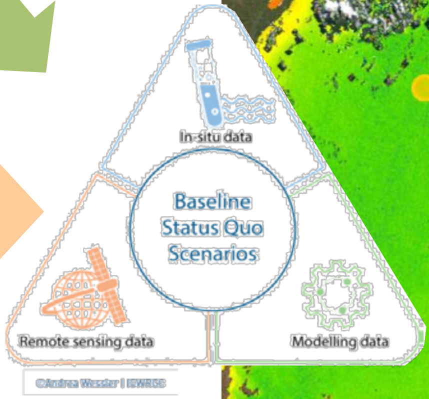
Areas of increased Turbidity (TUR) and Chlorophyll-a (CHL) concentrations in bays (e.g. Nyanza/Winam Gulf) and along the coastline.

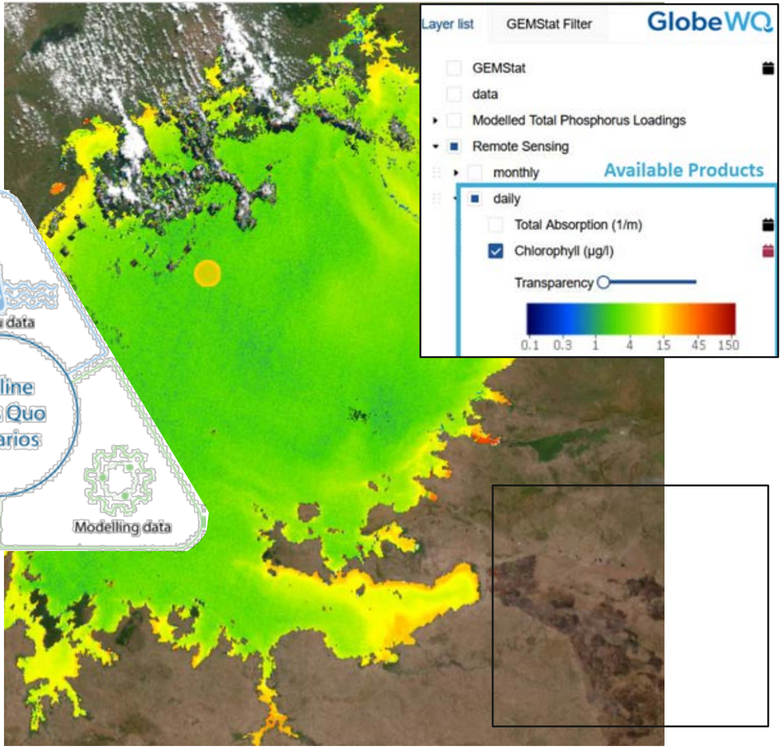


Hotspots based on concentrations from in-situ data:

Gauging stations with e.g. the highest measured Total suspended sediment (TSS) concentration (Mwanza Gulf).







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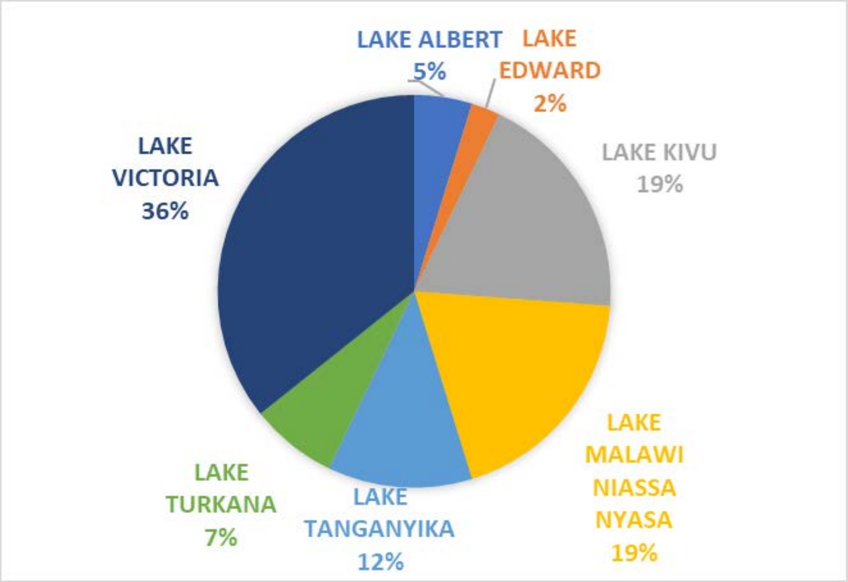
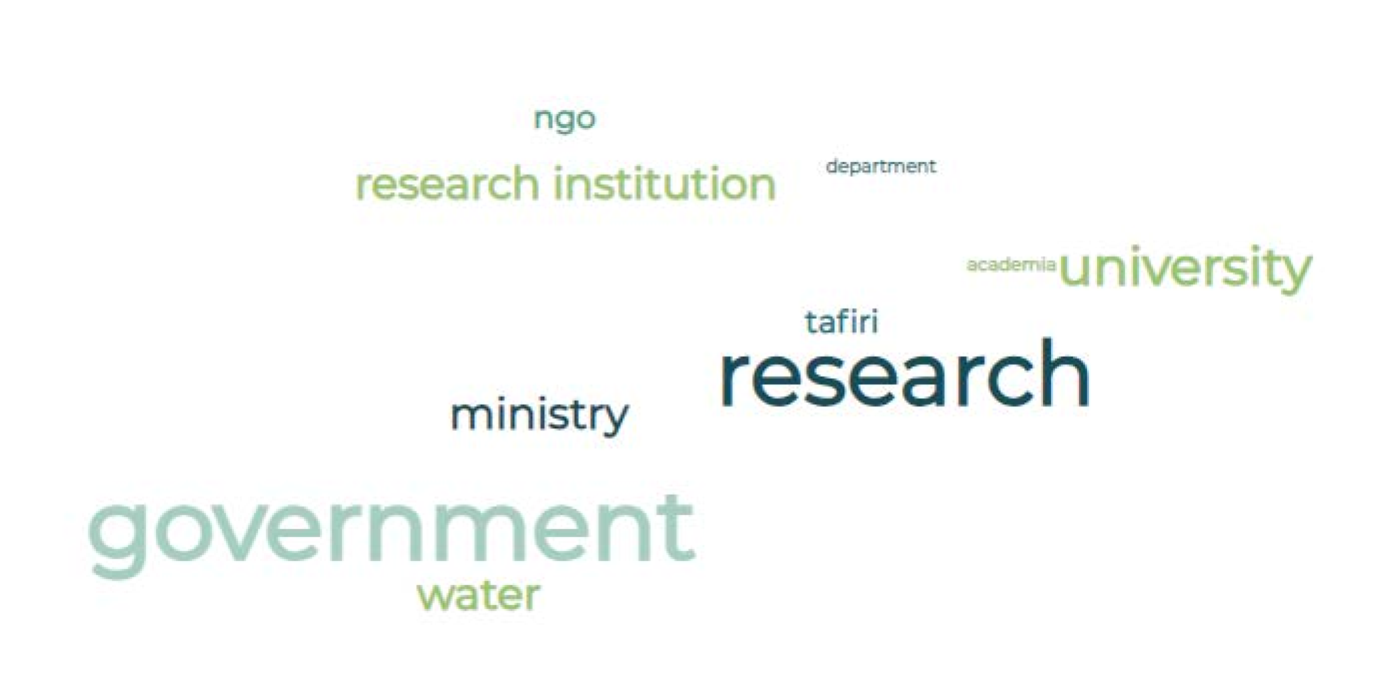
Water Quality Data Sharing – Survey Outcomes

42 responses from each of the AGL's.
Predominantly from universities and fisheries



Water Quality Data Sharing – Survey Outcomes

What are the primary organizations/institutions that collect and store water quality data for the Lake



Water Quality Data Sharing – Survey Outcomes

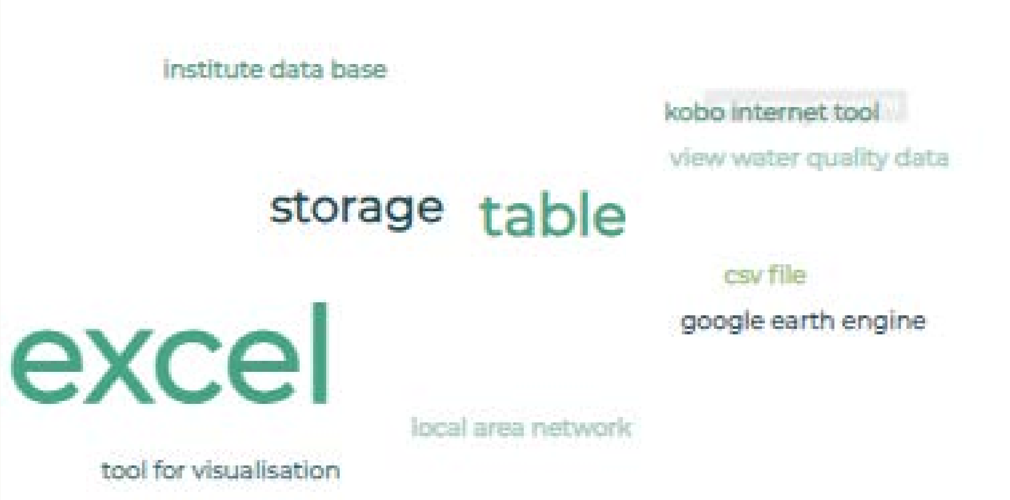
What water quality parameters are you most interested in at the Lake?

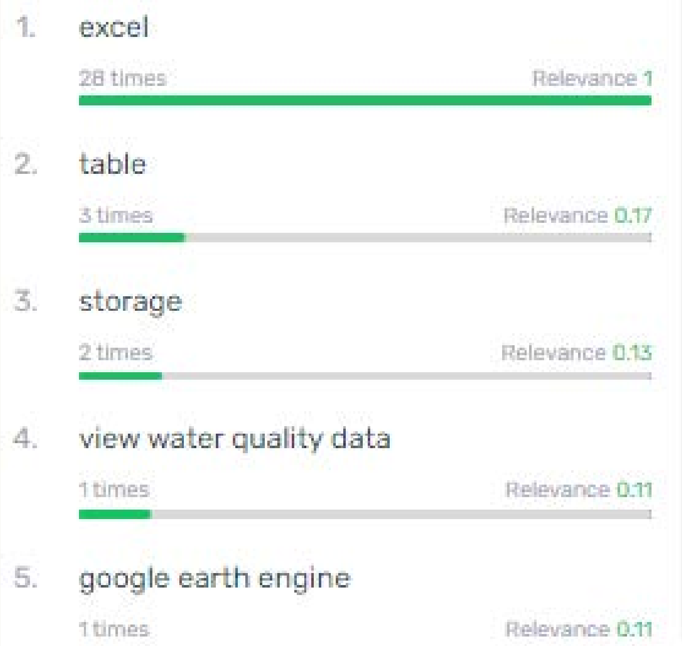
Water Quality Data Sharing – Survey Outcomes

Limitations to sharing of water quality data

Water Quality Data Sharing – Survey Outcomes

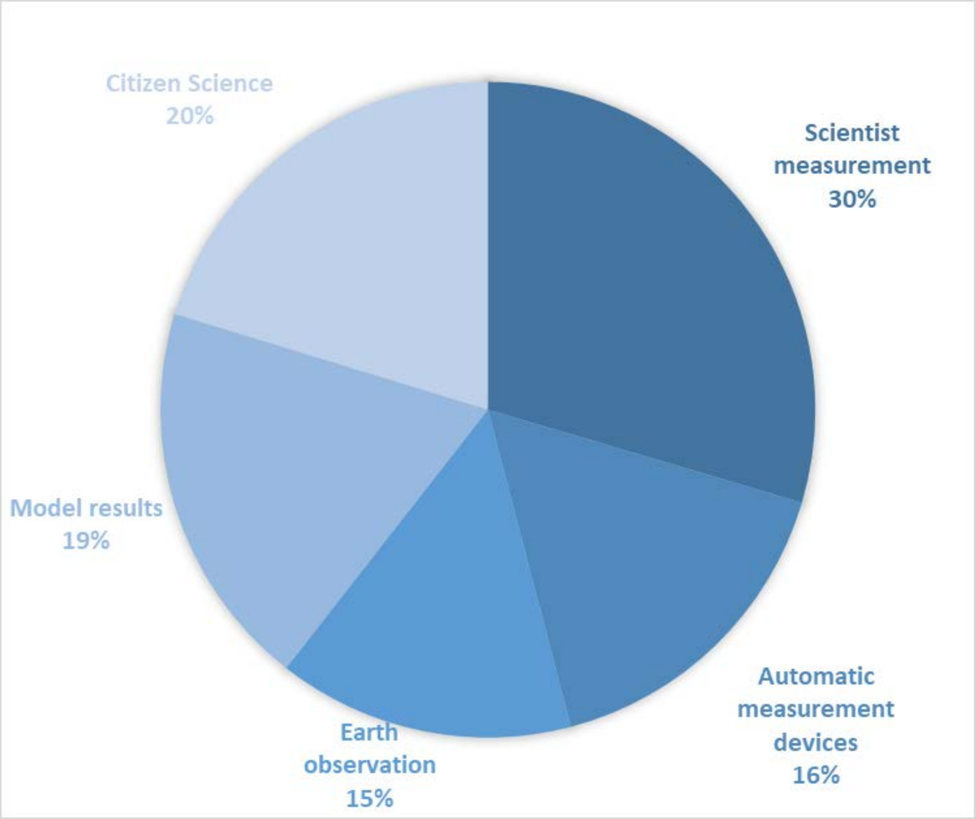
What tool/platform do you use (if any) to store/visualize water quality data?





Water Quality Data Sharing – Survey Outcomes

Reliant on which data types



Water Quality Data Sharing - Challenges

Challenge
Funding to those collecting water quality data, incl. data at cost (e.g., government data), data sharing limited by clauses in donor-funded projects
Lack of **shared database(s)** acceptable to all. Concerns incl.: • Data processing needs/ensuring data accuracy • Availability of hardware/software • No data archiving with ease of access
Lack of **protocols/policies** for data/metadata/information sharing across borders / institutions. **Data compatibility** problems (incl. data structuring and formatting)
Mutual Benefit/ Trust/ Recognition (e.g., collaborators using data and not citing data sources, north-south divide)
Training / Capacity Building

Water Quality Data Sharing - Opportunities

Challenge	Opportunity
Funding	• MOU's for sharing government data • Long-term sustainable investment. • Donor-funded projects to better allow data sharing. Avoid use of funder-specific databases
Shared database(s)	• Common (transboundary) data-management system. This could be owned/operated by data providers or use existing platforms (GEMStat/ GlobeWQ/ AGL-Inform). • Data sharing restrictions (as per **GEMStat – open/limited/restricted use**) • Automated data processing and validation
Protocols/ policies	• Standardised protocols/policies for data/ metadata/ information sharing across borders / institutions (e.g., **GEMStat / IGRAC protocols**) • Standardised data types and formats that allows for better collaboration between organisations/ institutions/ countries
Mutual Benefit	• Ensure data ownership/ recognition. Trust-building for data sharing. Benefit to data provider. • Tackle the "north-south" divide
Training	• In-country capacity building in the data collection, data analysis, & data management. • Provision of hardware/software and training

Way Forward

- Conclude which **water quality platform(s)** meet the Lake Victoria stakeholder needs and can be used as a shared repository. This may include **GlobeWQ.** Promote data sharing to such a repository.
- Develop a larger concept within WWQA framework to present to **funders**. This includes the use of the proven Lake Victoria methodology to **expand** the **stakeholder engagement process** and **product development** at Lake Victoria and to other Great Lakes.

THANK YOU

Andrew Gemmell
AGemmell@TheUmvotoFoundation.org

Q&A

Please post your questions in the chat

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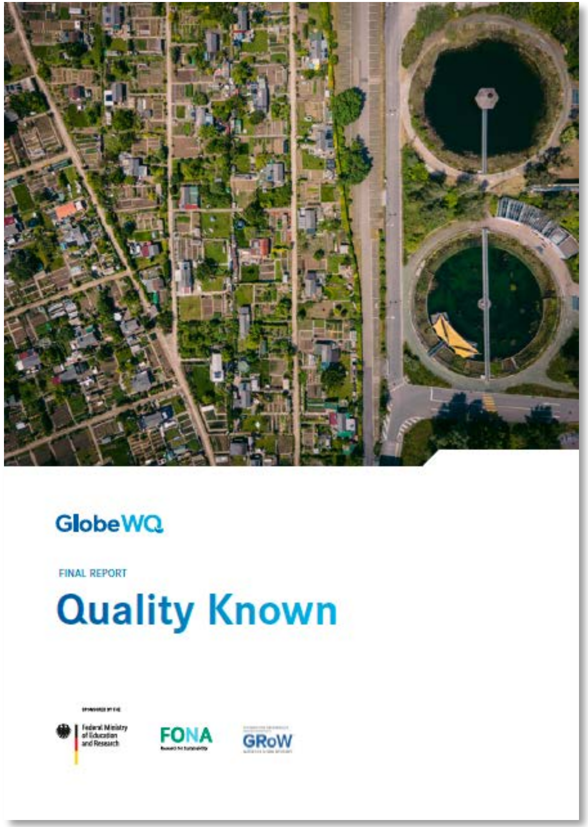

The final report, the slides and the recording is available at:
www.globewq.info

Thank you for joining

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