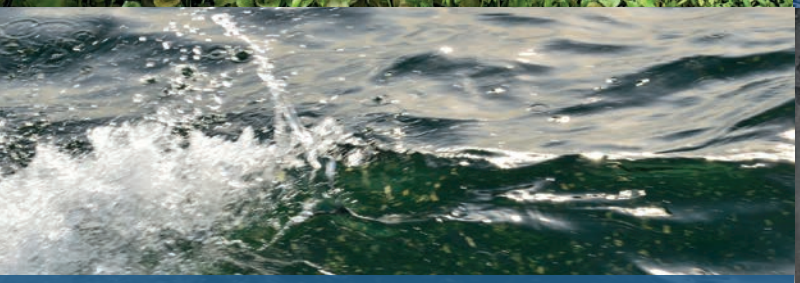


©Tallent Dadi | UFZ

Piloting the triangulation approach for the World Water Quality Assessment for a snapshot view of water quality – the Lake Victoria Case

The aim of this brochure

is to present first results of the data triangulation for the Lake Victoria case and to demonstrate how this approach can generally reduce the impact of missing in-situ information for further cases beyond Lake Victoria.

WWQA
World Water Quality Alliance

The World Water Quality Alliance piloted and demonstrated capabilities of current water quality information services through three case studies in Africa (referred to as Use Cases, WWQA-UC). These Use Cases provide an initial testbed for the integration of data from in-situ monitoring, remote sensing and water quality modelling to derive an improved view on current state of water quality (Baseline) for the World Water Quality Assessment.

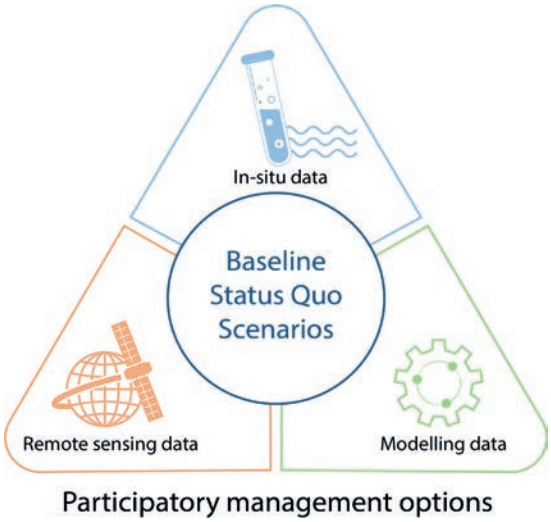
The objective of the Desktop Screening and Assessment work carried out as part of the overall Use Case compilation process was to

i. Identify water quality (WQ) hotspots in three African Use Cases: Lake Victoria, Volta Basin and Cape Town using the so-called triangulation approach.

ii. Develop strategies for complementary use of data from the different sources with the required spatial and temporal resolution in interaction with stakeholders.

iii. Derive lessons learned and recommendations.

The triangulation approach



The most common data source for water quality evaluation is in-situ data generated from measurements. Less common but increasingly popular are data derived from water quality modelling and remote sensing. The concept of the triangulation approach combines these three sources to overcome the limitations of each data source.

The triangulation approach for water quality is inspired by weather and air quality information where data from different methods are integrated to provide information with broad spatial and temporal coverage:

WMO Observation systems | Copernicus in-situ | WESR on air pollution

Our triangulation scheme

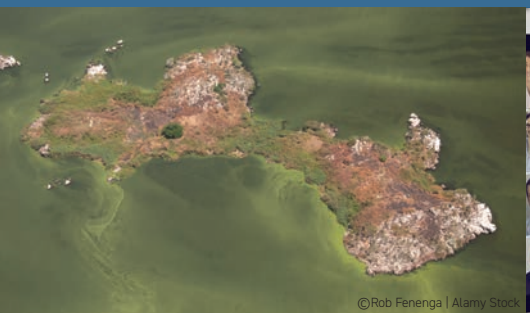
	In-situ	Remote Sensing	Modelling
What	Various water quality parameters from water samples and probes	Optical lake water quality parameters such as Chlorophyll, Turbidity, Secchi depth	Loadings and source attribution of Total phosphorus, Feacal coliform bacteria, Total suspended solids, Biological oxygen demand
Where	Lake Victoria water body	Lake Victoria surface water	Lake Victoria tributary catchment outlets
When	Unregular measurements over several decades, starting in the 1970s	Since 2018, regular updates after each satellite overflight	1990–2017 monthly resolution

Our toolbox

	Local WQ	Near real-time hydrology and WQ		Long-term WQ trends and projections		
Tool	GEMStat	mHM	eoWaterQuality	WorldQual	GLM lake	mQM
Description	Worldwide freshwater quality data-base	Fully-distributed hydrologic model	Satellite-based WQ products	Global scale water quantity and quality model DOI: 10.1002/hyp.9445	Lake model	Fully distributed WQ model
Host	ICWRGC	UFZ	EOMAP	RUB	UFZ	UFZ

Stakeholder identification and engagement e.g. through consultation workshops is vital for the Use Cases.

Potential Water Quality Hotspots on Coastal Eutrophication



Eutrophication is an issue

Stakeholder meetings with Lake Victoria Fisheries Organization (LVFO)

Deputy Executive Secretary's quote

Although there is a lot of data for the lake, there is no data sharing policy for the region.

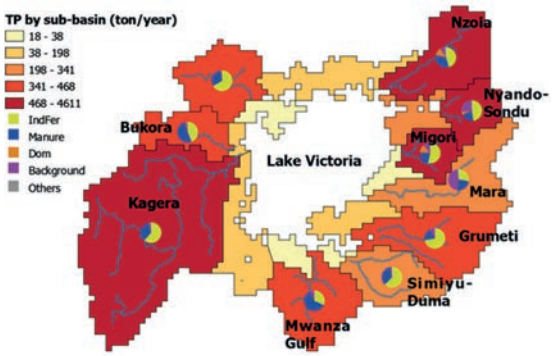
Data is compartmentalized at institute and national levels.

Lack of a platform / repository which is acceptable for all.

Potential WQ hotspots identified based on data from the different sources

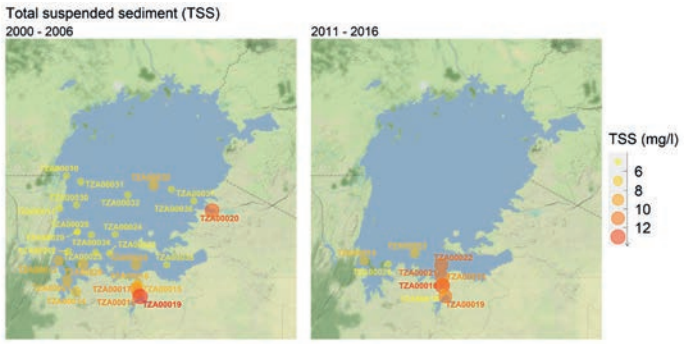
Hotspots based on loadings from modelling:

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.



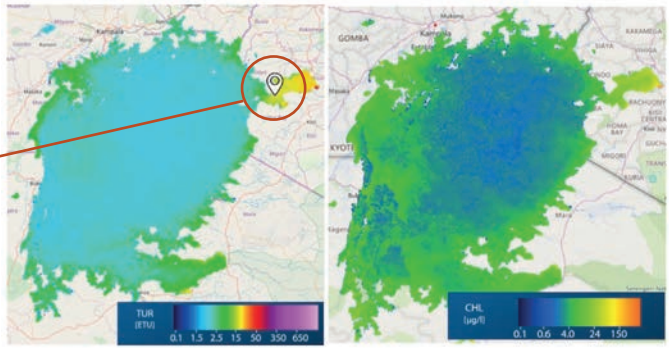
Hotspots based on concentrations from in-situ data:

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



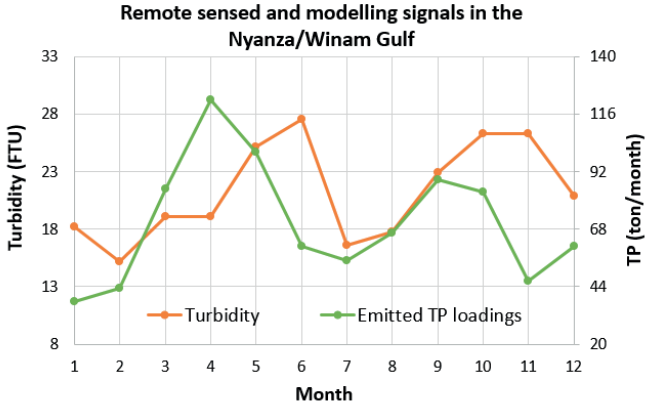
Hotspots based on concentrations from remote sensing:

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



Combining modelling and remote sensing

The time lag between the remote sensed turbidity (near the Rusinga Channel) and modeled riverine TP loadings from the Nyando-Sondu sub-basin, could indicate the role of nutrient transport processes influencing eutrophication dynamics.



Recommendations and outlook

This study raised main findings that affect future work on the triangulation approach:

- Lack of available in-situ data. Investing in data sharing and data science capability will leverage the value of data that is collected anyway.
- There is not necessarily a match in time and space between the data from different sources. This makes a complete merger challenging. The visual overlay always leaves space for speculation but it can be used to raise questions on cause-effect relationships and thus create new working hypotheses.
- The WQ hotspot may vary depending on the data source used for identification. This needs to be made explicit in order to foster a joint understanding.
- Early alignment of scientific questions with stakeholder needs in a knowledge co-production process is crucial for successful implementation of the triangulation approach. In a next step an analysis of links from the WQ hotspots identified here to impacts on fisheries is planned with LVFO.
- The digital geospatial platform being developed by the GlobeWQ project profits from the lessons learned to facilitate data integration from different sources and to support hosting and sharing of data.

For more information

WWQA World Water Quality Alliance

The World Water Quality Alliance represents a voluntary and flexible global multi-stakeholders network that advocates the central role of freshwater quality in achieving prosperity and sustainability.

The UN Environment Assembly Resolution 3/10 on 'Addressing water pollution to protect and restore water-related ecosystems' called for a World Water Quality Assessment. A first global display of the water quality (Baseline) was delivered as a pilot at UNEA-5 February 2021. Currently, 14 workstreams are in place that will contribute to a full World Water Quality Assessment for UNEA-6.

GlobeWQ Global Water Quality & Analysis Platform

SPONSORED BY THE Federal Ministry of Education and Research

In the GlobeWQ project (2019–2022), a web-based platform for hosting, visualizing and analysing data from in-situ monitoring, remote sensing-based Earth observation and water quality modelling in the triangulation approach is being developed.

Would you like to become a Use Case in WWQA?! Please contact us:

UN environment programme 1972-2022

Contact: Andrew Gemmell

RUHR UNIVERSITÄT BOCHUM RUB

Contact: Jaime Rivera Cardona

UNESCO United Nations Educational, Scientific and Cultural Organization · International Centre for Water Resources and Global Change under the auspices of UNESCO

Contact: Philipp Saile

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

UFZ HELMHOLTZ Centre for Environmental Research

Contact: Ilona Bärlund & Christian Schmidt

EOMAP detect more.

LAKE VICTORIA FISHERIES ORGANIZATION L.V.F.O. FOR A HEALTHY LAKE ECOSYSTEM