



British
Geological
Survey

Workshop on Dynamics of land to lake transfers in the Winam Gulf

BGS International Geoscience Research & Development
programme/ Environmental Change, Adaptations and Resilience
Internal Report OR/23/056



BRITISH GEOLOGICAL SURVEY

BGS INTERNATIONAL GEOSCIENCE RESEARCH & DEVELOPMENT
PROGRAMME / ENVIRONMENTAL CHANGE, ADAPTATIONS AND
RESILIENCE

Keywords

Report; Kenya, Land-to-Lake,
Management, Geochemistry,
Workshop, Source
Apportionment.

Front cover

Stakeholder Workshop
Participants at KMFRI,
Kisumu, Kenya.

Bibliographical reference

HUMPHREY, O.S., AURA, C.,
ONGORE, C., OSANO, O. AND
WATTS, M.J. 2023.

Workshop on Dynamics of
land to lake transfers in the
Winam Gulf. *British
Geological Survey Internal
Report*, OR/23/056. 25pp.

Copyright in materials derived
from the British Geological
Survey's work is owned by
UK Research and Innovation
(UKRI) and/or the authority
that commissioned the work.
You may not copy or adapt
this publication without first
obtaining permission. Contact
the BGS Intellectual Property
Rights Section, British
Geological Survey, Keyworth,
e-mail ipr@bgs.ac.uk. You
may quote extracts of a
reasonable length without
prior permission, provided a
full acknowledgement is given
of the source of the extract.

Workshop on Dynamics of land to lake transfers in the Winam Gulf

Humphrey, O.S., Aura, C., Ongore, C., Osano, O. and Watts, M.J.

BRITISH GEOLOGICAL SURVEY

The full range of our publications is available from BGS shops at Nottingham, Edinburgh, London and Cardiff (Welsh publications only) see contact details below or shop online at www.geologyshop.com

The London Information Office also maintains a reference collection of BGS publications, including maps, for consultation.

We publish an annual catalogue of our maps and other publications; this catalogue is available online or from any of the BGS shops.

The British Geological Survey carries out the geological survey of Great Britain and Northern Ireland (the latter as an agency service for the government of Northern Ireland), and of the surrounding continental shelf, as well as basic research projects. It also undertakes programmes of technical aid in geology in developing countries.

The British Geological Survey is a component body of UK Research and Innovation.

British Geological Survey offices

**Nicker Hill, Keyworth,
Nottingham NG12 5GG**

Tel 0115 936 3100

BGS Central Enquiries Desk

Tel 0115 936 3143

email enquiries@bgs.ac.uk

BGS Sales

Tel 0115 936 3241

email sales@bgs.ac.uk

**The Lyell Centre, Research Avenue South,
Edinburgh EH14 4AP**

Tel 0131 667 1000

email scotsales@bgs.ac.uk

**Natural History Museum, Cromwell Road,
London SW7 5BD**

Tel 020 7589 4090

Tel 020 7942 5344/45

email bgslondon@bgs.ac.uk

**Cardiff University, Main Building, Park Place,
Cardiff CF10 3AT**

Tel 029 2167 4280

**Maclean Building, Crowmarsh Gifford,
Wallingford OX10 8BB**

Tel 01491 838800

**Geological Survey of Northern Ireland, 7th Floor,
Adelaide House, 39-49 Adelaide Street, Belfast, BT2 8FD**

Tel 0289 038 8462

www2.bgs.ac.uk/gsni/

**Natural Environment Research Council, Polaris House,
North Star Avenue, Swindon SN2 1EU**

Tel 01793 411500

Fax 01793 411501

www.nerc.ac.uk

**UK Research and Innovation, Polaris House,
Swindon SN2 1FL**

Tel 01793 444000

www.ukri.org

Website www.bgs.ac.uk

Shop online at www.geologyshop.com

Foreword

This report summarises the findings of a stakeholder workshop carried out by the British Geological Survey (BGS) and research partners from the University of Eldoret (UoE) and Kenya Marine and Fisheries Research Institute (KMFRI) in December 2023. This workshop aimed to disseminate and share research findings on soil erosion and sediment source apportionment in the Winam Gulf, Kenya and discuss future opportunities and collaborations with stakeholders and use information collected from the workshop participants, obtained via a series of questions to inform future workshops and data distribution tools.

Acknowledgements

This work has been conducted with the financial support of the following funders: The Royal Society International Collaboration Awards 2019 grant ICA/R1/191077 entitled 'Dynamics of environmental geochemistry and health in a lake wide basin', BGS Centre for Environmental Geochemistry programmes, and the NERC National Capability International Geoscience programme entitled 'Geoscience to tackle global environmental challenges' (NE/X006255/1).

Contents

Foreword.....	1
Acknowledgements	1
Contents.....	2
Summary.....	3
1 Introduction.....	1
2 Stakeholder Workshop	1
2.1 Purpose of Workshop.....	1
2.2 Workshop Responses.....	3
3 Conclusions and Outlook.....	8
Appendix 1 Q&A Responses	9
Question 1 Responses	9
Question 2 Responses	12
Question 3 Responses	14
Question 4 Responses	15
Appendix 2 Participants.....	17
References.....	18

FIGURES

Figure 1 Workshop participants discussing questions during the workshop.....	3
Figure 2 Workshop participant feedback to question 1: ‘How can we use geochemical data to guide targeted soil erosion mitigation and lake management?’	3
Figure 3 Workshop participant feedback to question 2: ‘How would you like to see this research applied’	5
Figure 4 Workshop participant feedback to question 3: ‘To join land and lake management outcomes, what are the considerations for a future collaboration project using geochemical methods?’	6
Figure 5 Workshop participant feedback to question 4: ‘How can land and lake management researcher connect holistic research to influence decision makers?’	7

Summary

This report describes a stakeholder engagement workshop carried out by the British Geological Survey (BGS) and research partners from the University of Eldoret and the Kenya Marine and Fisheries Research Institute in December 2023. This workshop was co-funded by a Royal Society International Collaboration Grant (ICAR1\191077 entitled 'Dynamics of Environmental Geochemistry and Health in a Lake-wide Basin') and a NERC NC-International grant (NE/X006255/1, entitled 'Geoscience to tackle global environmental challenges'). The aim of this workshop was to disseminate our most recent research findings on soil erosion and sediment source apportionment in the Winam Gulf, Kenya. We also built upon previous stakeholder engagement meetings where discussions were held to identify the most effective methods of delivering outputs where they can be used to inform strategies to mitigate soil erosion and sediment transfers in the catchment resulting from poor land management. All the information collected from participants will be used to inform future workshops, planned for June 2024 and final data distribution tools.

Furthermore, it was recommended by the workshop participants that the need for greater capacity building could be achieved through the formation of a committee which oversees and plans the coordination of land-lake activities through the communication and sharing of the latest activities, interests and needs of the combined land/lake communities in the Lake Victoria basin. The formation of such a committee could be facilitated through this research project and would be the first step towards creating an impactful management framework. This could provide an exemplar for other land-lake systems.

1 Introduction

Lake Victoria is the largest of the African Great Lakes, with a surface area of ~68,800 km². It is the world's largest tropical lake with more than 30 million people in Kenya, Tanzania and Uganda relying on the lake for its natural resources. As such the lake's ecosystem has experienced accelerated change since the 1940s, as such the extent and impact of anthropogenic driven changes in a landscape critical for livelihoods and food security needs to be elucidated.

This project, co-funded by the Royal Society, brings researchers from the BGS, University of Plymouth, University of Eldoret (UoE) and Kenya Marine and Fisheries Research Institute (KMFRI) together to collaborate on a study assessing the dynamics of environmental geochemistry and health in the Winam Gulf catchment of Lake Victoria. This project aims to link environmental geochemistry and health in a lake wide basin using a multidisciplinary approach to assess land-to-lake pathways for micronutrients and PTEs, particularly where poor land management practices have led to soil erosion, acidification, and loss of organic matter. Various emerging and past activities ranging from land clearance, sediment deposition into Lake Victoria with implications for the fisheries industry, growth from which is rapidly addressing issues around food security and generating sustainable livelihoods (UN SDGs 2, 8). Overstocking of cattle/fish, excessive fertiliser usage, unregulated construction, small scale artisanal mining, and poor landscape management have resulted in losses of micronutrients and mobilisation of metals from soil with implications for life on land and below water (UN SDGs 14, 15). The objectives of our study were to:

- Evaluate the mobilisation and loss of micronutrients/PTEs from soils resulting from changes in land-use/soil erosion,
- Model the potential risk of soil erosion in the Winam Gulf catchment and use novel plutonium isotope tracers to better define soil loss/gains using specific experimental plots which experienced differing periods of cultivation,
- Evaluate the transport of micronutrients/PTEs into the Winam Gulf catchment, using source apportionment to characterise sediment inflows to the lake and their potential for ecological/human health impact,
- Connect land and lake management authorities with communities to explore the implication for these land-to-lake transfers into the food-chain using fish as a proxy for ecological and human health and promote sustainable practices.

In this report, we highlight the thoughts and opinions of stakeholders captured at a workshop hosted by KMFRI in December 2023. We will use this data to plan future stakeholder engagement activities and collaborative projects building on the success of our current research grant.

2 Stakeholder Workshop

2.1 PURPOSE OF WORKSHOP

The purpose of this workshop was to (i) share our research findings on how soil erosion and land management are influencing soil and sediment inputs into the Winam Gulf and the novel methods of investigate these phenomena, (ii) provide a forum for stakeholders to share their current research and interests and (iii) connect land and lake management authorities with communities to explore the implication for these land-to-lake transfers.

The research undertaken by UoE-KMFRI-BGS using novel chemistry and machine learning modelling, aims to inform the targeting of scarce resources for mitigation practices to the benefit of land and lake management of key resources for food security and livelihoods. The workshop connected practitioners in the management of land (agriculture) and lake (fisheries) in the

Winam Gulf catchment to design future activities to monitor and test the effectiveness of soil management practices to reduce soil loss and its impact on downstream water bodies. We invited workshop participants who can facilitate this process and who will be willing to participate in future funding proposals to broaden the collaborative team and scale of research from this project funded by the Royal Society and UK Natural Environment Research Council.

Project outputs to date

- Dowell et al. 2023. Suitability of ^{210}Pb , ^{137}Cs and $^{239+240}\text{Pu}$ as soil erosion tracers in western Kenya. *Journal of Environmental Radioactivity* (awaiting final URL from publisher)
- Humphrey et al. 2022. Evaluating spatio-temporal soil erosion dynamics in the Winam Gulf catchment, Kenya for enhanced decision making in the land-lake interface. *STOTEN*. <https://doi.org/10.1016/j.scitotenv.2021.151975>
- Humphrey et al. 2023. Predictive geochemical mapping using machine learning in western Kenya. *Geoderma Regional*. <https://doi.org/10.1016/j.geodrs.2023.e00731>
- Marriott et al. 2023. Considerations for environmental biogeochemistry and food security for aquaculture around Lake Victoria, Kenya. *Environmental Geochemistry and Health*. <https://doi.org/10.1007/s10653-023-01585-w>
- Aura C.M., Humphrey O.S., Marriott, A.L., Watts, M.J., Ongore, C., Mwamburi, J., Osano, O., and Coffey, T.J. (In Press) Assessing the spatial distribution of elemental concentrations in surface sediments of Lake Victoria, Kenya: implications for ecological health and management.

2.1.1 Workshop Agenda

2.1.1.1 OPENING REMARKS AND INTRODUCTIONS

Dr Chris Aura (KMFRI), Prof Odipo Osano (UoE) and Dr Michael Watts (BGS) opened the workshop and provided the research context of the study prior to all participants introducing themselves and their research backgrounds and land/lake management roles. A handful of participants shared their relevant research background and expertise in more detail.

Dr Ismael Oduor (Koitalel Samoei University College) provided an interesting historical perspective of soil erosion in Kenya from the 1930's to the present-day highlighting conservation agricultural practices, key legislation, and sustainable practices for future farming. Everline Achieng (Ministry of Agriculture, Livestock, Fisheries and Co-Operatives, Migori) then highlighted how extension services approach land/lake management using a watershed catchment method using soil conservation management techniques including regenerative and smart agricultural practices.

Elvis Weullow (Center for International Forestry Research - International Council for Research in Agroforestry) described the large-scale approach taken by CIFOR– ICRAF to analysis and map soil function properties using MIR/NIR analysis.

Finally, Dr Abigael Otinga discussed her research on poor responsive soils in western Kenya, highlighting how even good soil management can be ineffective in the region due to a number of complex overlapping issues.

Following introductions, a series of questions were put to the workshop participants who were split into 'land' and 'lake' management teams (Figure 1).



Figure 1 Workshop participants discussing questions during the workshop.

2.2 WORKSHOP RESPONSES

2.1.2 Q1: How can we use geochemical data to guide targeted soil erosion mitigation and lake management?

Both the land and lake management groups carefully considered the question and grouped their findings into three themes: (i) identification, (ii) intervention, and (iii) information, whilst still highlighting points specifically addressing their individual management requirements (Figure 2).

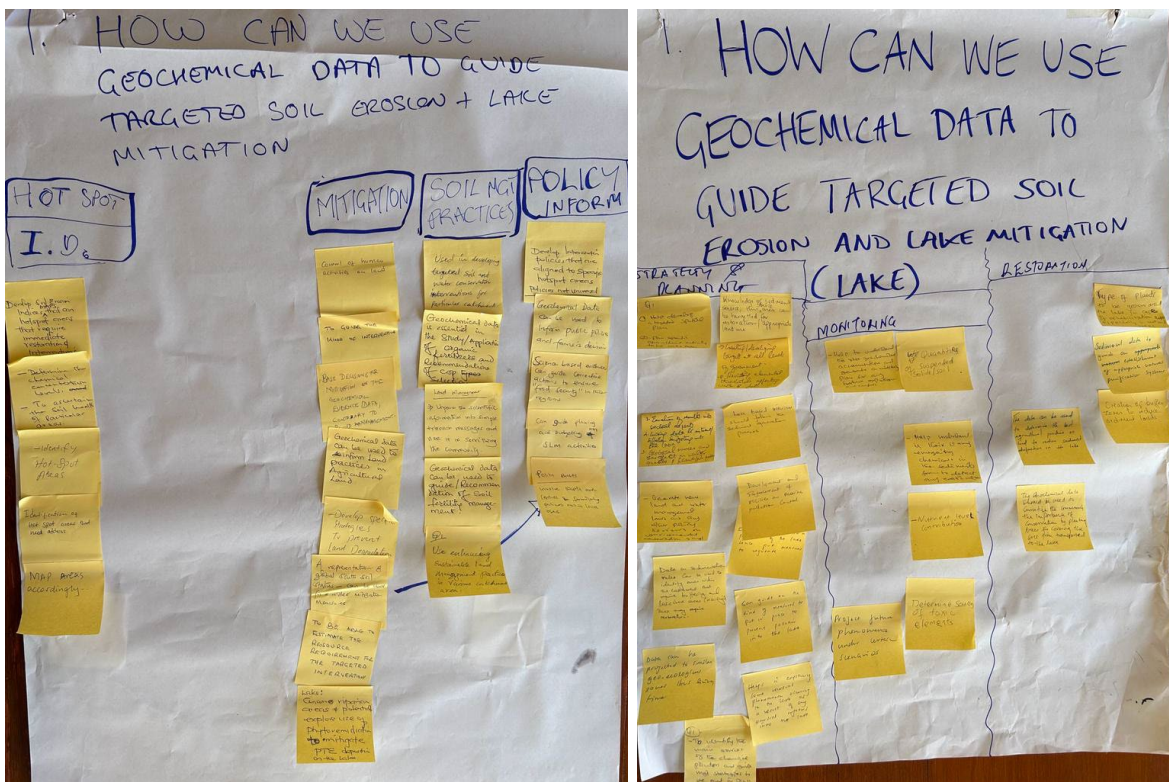


Figure 2 Workshop participant feedback to question 1: 'How can we use geochemical data to guide targeted soil erosion mitigation and lake management?'

Theme 1: Identification- hotspot mapping and monitoring

Land Management key findings

- 'Develop soil erosion maps that can identify hotspots that require immediate restoration intervention'.
- 'Use hotspot mapping to ascertain soil health'.

Lake Management key findings

- 'Help to understand geochemical accumulation and generate a monitoring plan for future work'.
- 'Determine chemical concentrations in Lake Victoria'.

Whilst both groups identified that geochemical data provides critical insight into the management needs of the land-lake interface the approach of both groups differed. Within the lake community there appears to be a more dynamic approach to management through continual monitoring whereas the land management group identified the need for hotspot analysis, which is typically a one dimensional, less dynamic approach.

Theme 2: Intervention - Restoration/Mitigation/Soil management practices

Land Management key findings

- 'Base decision for mitigation on geochemical evidence/data'.
- 'Geochemical data is essential in the study/application of fertiliser, crop selection and recommendation'.

Lake Management key findings

- 'Data can be used to determine the best agricultural practices to reduce sediment deposition in the lake'.
- 'Geochemical data should be used to sensitize the community of the importance of land-lake management'.

The need for resource management and catchment scale management approaches to make a meaningful difference in this complex environment was identified by both groups. The concept of 'targeted mitigation' was highlighted as a key means of effectively managing a large area, such as the Winam Gulf basin, and that at the heart of decision-making geochemical data is critical for making informed decisions. Interestingly, the concept of community engagement was mentioned very early on during the workshop.

Theme 3: Information - Strategy and Planning/ Policy

Land Management key findings

- 'Geochemical data can be used to inform public policies and farmers decision'.
- 'Science based evidence can guide corrective action'.
- 'Develop intervention policies that incorporate specific hotspots'.
- 'Policy briefs; involve county and central government in formulating land use policy'.

Lake Management key findings

- 'Develop targets at all levels of government'.
- 'Development and enforcement of policies on marine pollution'.
- 'Use geochemical data to generate land and lake management laws/policy'.

Both groups identified the ability of geochemical data and scientific evidence to inform governance through planning and policy. A significant challenge in using geochemical data to inform policy is the need to make it easily accessible for central and county government and then using the appropriate language and media to encourage the local community to adhere to policy change.

2.1.3 Q2: How would you like to see this research applied?

The answers to the second question can be broadly categorised into three main themes (i) where, (ii) how and (iii) whom. A common thread between both the land and lake management groups was the scalability of each theme both spatially (small to large) and temporally (short to long term) (Figure 3).

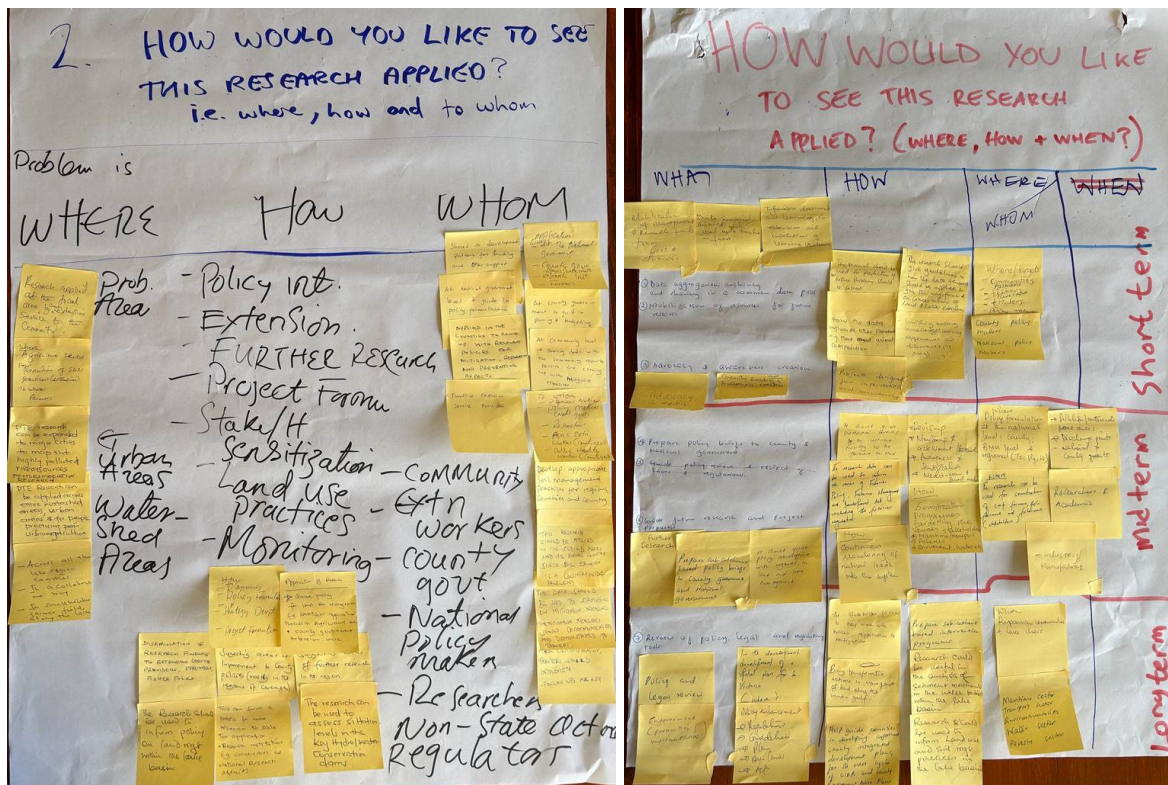


Figure 3 Workshop participant feedback to question 2: 'How would you like to see this research applied'.

Where

The concept of further applying this work at different scales resonated within both groups. Applying this research at a catchment scale (large size) was seen as the best approach, however, it was noted that without community buy-in and engagement (small size) it would be difficult to do. It was also noted that urban areas exist within catchments and future research should include the influence of urban areas in catchment sediment/soil movement studies.

How

The concept of how this research could be applied raised some very interesting discussion points. It was noted that evidence-based changes to land use practices should be introduced to encourage more sustainable agricultural systems which have fewer negative impacts 'downstream'. The actual process of how to change land use practice was then discussed. With the following process identified: policy change → extension services → community change. Furthermore, monitoring the impacts through future research was also identified as a critical component of 'how' the workshop participants wanted to see this research applied. Thus, successful intervention policy can be implemented at multiple scales.

Whom

There was an interesting contrast in the approach to this question between the land and lake management groups. Whilst the land management group assessed this question on a 'front-line' basis and included farming communities, fisherman, livestock traders and policy makers the lake management group focused on a top-down approach starting with National Policy → County Government → Extension Services → Community. What was clear from both groups was the need for more collaborative research involving all necessary stakeholders.

2.1.4 Q3: To join land and lake management outcomes, what are the considerations for a future collaboration project using geochemical methods?

The groups assess this question carefully and identified key subjects in which future research could take place, but also assessed who should be involved (Figure 4).

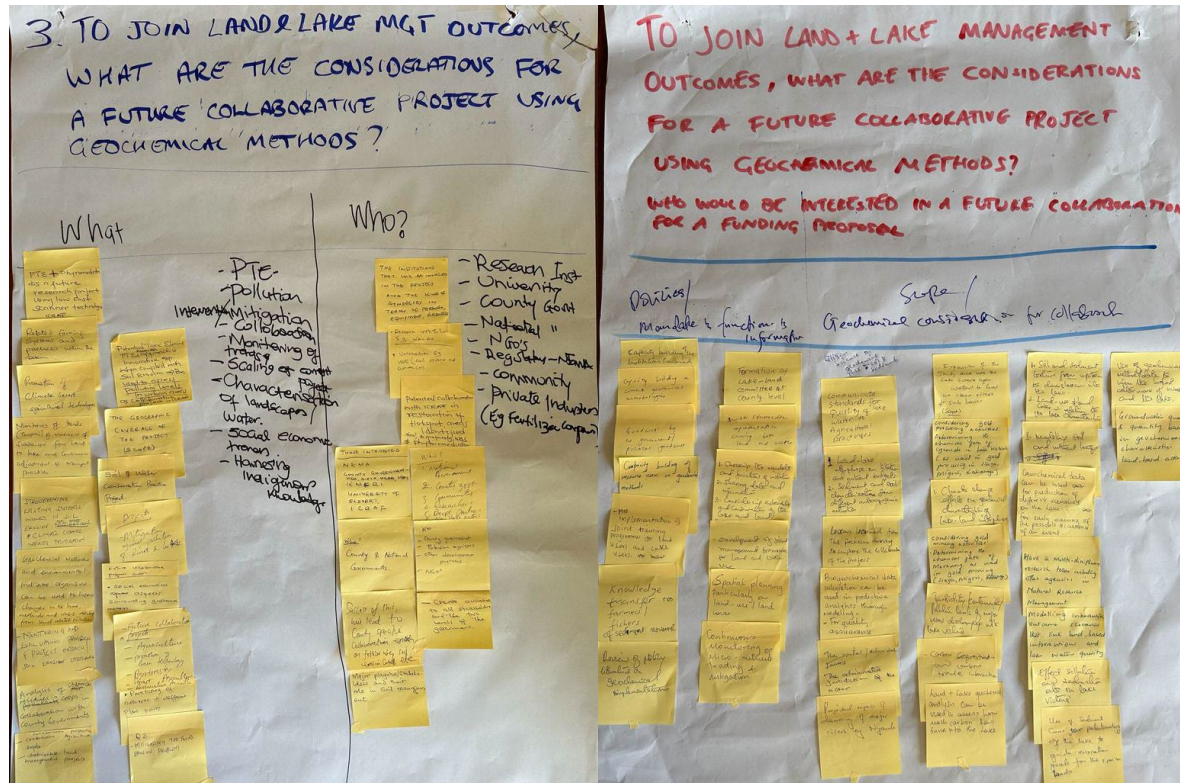


Figure 4 Workshop participant feedback to question 3: 'To join land and lake management outcomes, what are the considerations for a future collaboration project using geochemical methods?'

Land Management key findings

- 'Monitoring the movement of soils/sediments from land to lake with continuous adjustment of management practices'.
- 'Geochemical methods and environmental indicator organisms can be used to inform changes in the lake, wetlands and rivers from land related activities.'

Lake Management key findings

- 'Have a multidisciplinary research team'
- 'Investigate the role of climate change on geochemical cycling in land-lake interface'

There was a wide range of ideas for future collaboration projects within the Winam Gulf catchment basin. Some ideas included looking at potentially toxic elements, pollution pathways, and remediation activities, however the most popular research topic was on resilient agriculture (climate change, adaptation, and resilience) and soil health. This included evidence-based mitigation and regenerative agriculture, smart farming, and sustainable land management, building on the work presented to the workshop participants. The participants also reiterated one of the projects original tasks of providing geochemical data in easily digestible format for all stakeholders to engage with, leading to impact within the community.

The specific need to form a multidisciplinary research team with a wide range of partners was key to future work. This included: research institutions, universities, county government, NGOs, local communities, and the private sector (fertiliser companies etc). Furthermore, it was recommended by the workshop participants that the need for greater capacity building could be achieved through the formation of a committee which oversees and plans the coordination of

land-lake activities through the communication and sharing of the latest activities, interests and needs of the combined land/lake communities in the Lake Victoria basin. This could provide an exemplar for other land-lake systems. The formation of such a committee could be facilitated through this research project and would be the first step towards creating an impactful management framework.

2.1.5 Q4: How can land and lake management researchers connect holistic research to influence decision makers?

The concept of influencing decision makers based on scientific evidence is often neglected by researchers and remains a significant challenge when working between multiple environmental sectors. Here both groups identified two pathways in which environmental research such as our can influence decision makers: (i) dissemination and (ii) engagement (Figure 5).

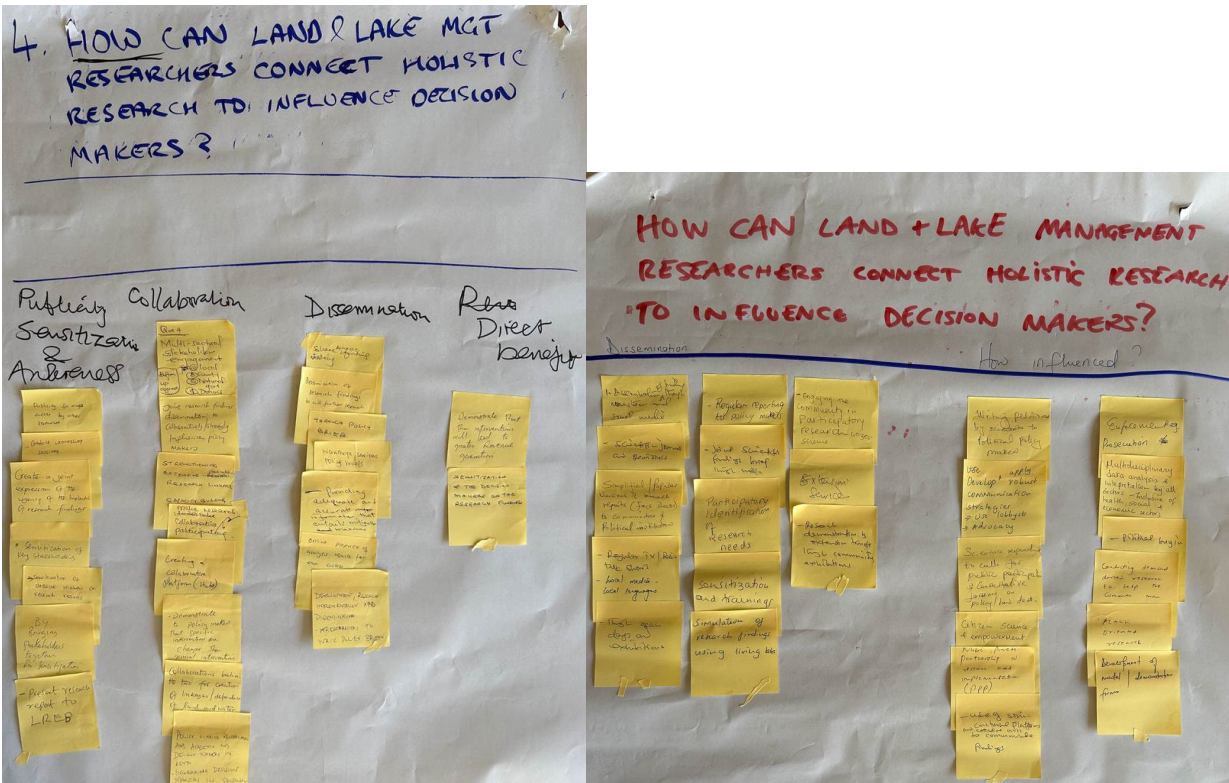


Figure 5 Workshop participant feedback to question 4: 'How can land and lake management researcher connect holistic research to influence decision makers?'

Dissemination

The key point made by both groups in the workshop was the need to actively share results from studies with decision makers. The process in which results are shared is multifaceted. Writing scientific journal articles and policy briefs can be the first step, however, this often fails to raise awareness with people that the policy would directly impact and as such, scientific research findings often need to be simplified for mass consumption. Once simplified the results also need to be shared in an accessible manner, often through community engagement and training activities.

Stakeholder engagement

Engagement and collaboration were identified by the workshop participants as vitally important when influencing decision makers. Taking a multi-sectoral and multidisciplinary approach that was applicable at different scales was a popular approach. Additionally, the concept of getting

the public connected with the research through citizen science/observations was key and the physical/emotional connection researchers can achieve through this buy-in can strengthen stakeholder/community engagement.

3 Conclusions and Outlook

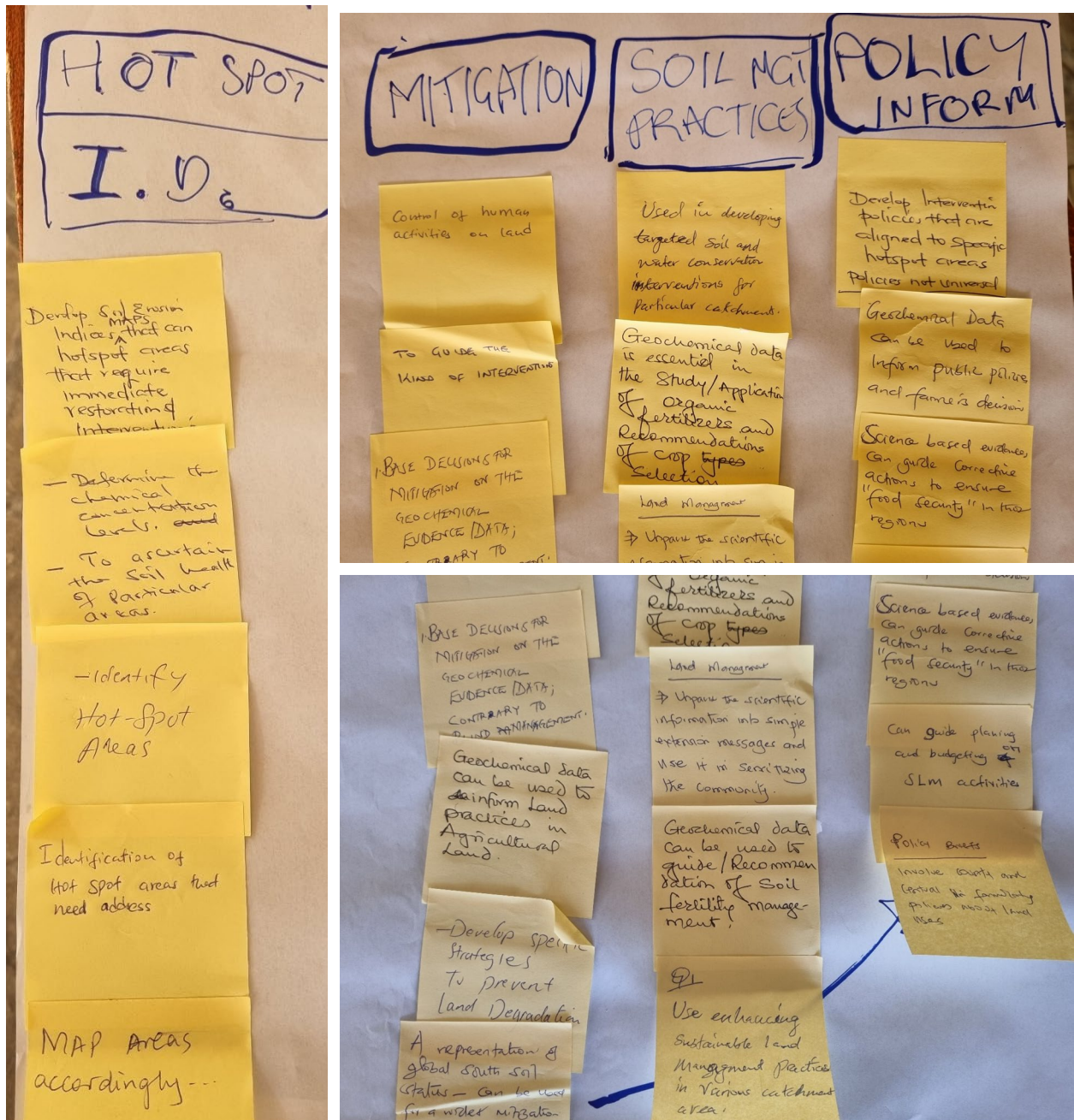
During this workshop we were able to successfully share our research findings with key stakeholders responsible for managing and working within the land-to-lake interface in the Lake Victoria basin. Our research findings showing how soil erosion and land management are influencing inputs into the Winam Gulf were well received.

Through the fact-finding portion of the workshop, we were able to identify several essential requirements to ensure that this work has long-lasting impact. The workshop participants highlighted how the geochemical data produced provides critical insight into the effect of land-lake management within the Winam Gulf and that future policies should be guided by scientific evidence. However, using geochemical data to inform policy presents a significant challenge. Our research highlights regions within the Winam Gulf catchment where targeted mitigation could be an effective means of management where resources are limited. The most immediate challenge revolves around making the data accessible for central and county government, which in turn will transition from National Policy → County Government → Extension Services → Community. As such additional stakeholders were identified and will be invited to future workshops: Kenya Agricultural and Livestock Research Organization (KALRO), Public Health, Private sector (sugar and tea industries), Crop Nutrition Institution, Kenya Forestry Research Institute (KFRI), Horticultural Authority and the National Irrigation Authority.

Furthermore, it was recommended by the workshop participants that the need for greater capacity building could be achieved through the formation of a committee which oversees and plans the coordination of land-lake activities through the communication and sharing of the latest activities, interests and needs of the combined land/lake communities in the Lake Victoria basin. The formation of such a committee could be facilitated through this research project and would be the first step towards creating an impactful management framework. This could provide an exemplar for other land-lake systems.

Appendix 1 Q&A Responses

QUESTION 1 RESPONSES



STRATEGY & PLANNING

Q1

1. Help develop a targeted SPMSD Plan
2. Plan specific management activity to be undertaken

Knowledge of sediment source; this area can be targeted for restoration / appropriate land use

- Create / develop target at all levels of government
- Identify elemental constituents affecting water & fish

Data on sedimentation rates can be used to identify areas within the catchment that require buffering and lake/shore areas (re-vegetation) that may require restoration.

Determine the source of the pollutant to lake to regulate measures

Can guide on the kind of measures to put in place to prevent pollution in to the lake

Data can be projected to similar geo-ecological zones this during time

Helps in explaining some unusual phenomenon occurring in the lake or of any

1. Evaluation of results into societal aspects
2. Linking data to nutrient/sediment budgeting into the lake
3. Ecological sources and their effect on water quality & fish and fish quality

Lake based activities should follow the sediment operation process.

- Generate new land and water management laws and any other policy behaviors on environmental conservation & mgmt

Development and Enforcement of policies on marine pollution control.

Q1-

- To identify the main sources of the chemical pollutants and guide mgmt strategies to be put in place

MONITORING

- Help to understand the rate geochemical accumulation and generate a monitoring plan for any future depletion and control.

the Quantities of Suspended Solids/soil

- Help maintain if there is any emerging chemicals in the sediments

- Help maintain if there is any emerging chemicals in the sediments for to detect any contaminants

- Nutrient level contribution

Project future phenomena under certain

Determine source of toxic elements

Type of plants
to be grown about
the lake, in case
of rehabilitation especially
in wetland areas

Sediment data to
guide on appropriate
~~natural~~ establishment
of appropriate natural
purification systems

The data can be used
to determine the best
agricultural practices on
land to reduce sediment
deposition in the lake

Creation of buffer
zones to reduce
sediment loads

The geochemical data
should be used to
sensitize the community
the importance of
conservation by planting
trees for covering the
soil from transported
to the lake.

QUESTION 2 RESPONSES

WHA

Mobilization of management & research funds from Govt & donors

Data generated, Archived and used as a baseline in future

Information destination and learning, in extension and institutions of learning (academia)

- 1) Data aggregation, archiving and sharing in a common data pool
- 2) Mobilization of resources for future research
- 3) Advocacy & awareness creation

Capacity building & Awareness creation

- Advocacy in media

- 4) Prepare policy briefs to county & national government
- 5) Guide policy review & review of laws & regulations.
- 6) Guide future research and project proposals

Further Research

Prepare sub-catchment based policy briefs to County governments and National government

It should guide policy development with regards to land and lake management

- 7) Review of policy, legal and regulatory tools.

Policy and legal review

Enforcement (protocol / implementation)

In the development of a spatial plan for Lake Victoria (where)

Policy enhancement

- Regulations
- Guidelines
- Plan
- By-Laws
- Act

The research should be used for prediction of future problems should be solved.

The research should give guidelines on how the data generated should be applied to give the way forward on conservation of land & lake ecosystem

How the data influences other parameters e.g. plant and animal competition

- Enriching existing knowledge, learning experience and discoveries (if any)

Projects designed for intervention and monitoring

It should guide extension services by the relevant ministry to the farmers on land.

Reviewing & Monitoring & assessment / Research

Awareness & Sensitization & Media - radio & Social media

How

Sensitization programmes targeting the various stakeholders

- Maritime transport
- Fisheries
- Environment, Water etc

How

Continuous Monitoring of nutrient loads into the system

-At stakeholder forums to help come with holistic approaches to mitigation

Prepare sub-catchment based intervention programs

Research could be useful in the analysis of sediment movement in the water bodies within the lake basin

Research could be used to inform land use and soil mgmt practices in the lake basin

Bring transformative actions in management of land along the inner gulf.

Help guide countries in developing informed county integrated development plans, for the next cycle of CIDPs and County Environment Action Plans

ld
on
water
to
d
m

Where/targets
- Communities
- farmers
- fishers
- livestock
- traders
- Policy makers

County policy
makers
National policy
makers

Where
Policy formulation
at the national
level, county,
B.M.U. level &
regional (Tz, Ug, Ke)

→ Pollution/outcomes
issue areas
→ Discharge points
- National &
County govt

Where
The research can be
used for sensitization
of crop farmers, fish
farmers and fishermen
(stakeholders)

Researchers &
Academia

- Industry/
Manufactures

When
Riparian communities
& lake users

Maritime sector
Transport sector
Environmentalists
Water sector
Forestry sector

QUESTION 3 RESPONSES

PTE + Phytoremediation is a future research project using low cost scanner technology ICRAP

Related farming systems and practices within the basin

Promotion of Climate Smart agricultural technologies

Potential Toxic Element Research PTE approach is innovative esp. when coupled with Soil erosion \Rightarrow Be used to assess pollution level in urban areas as collaborative project - ICRAP

THE INSTITUTIONS THAT WILL BE INVOLVED IN THE PROJECT AND THE KIND OF SYNERGIES IN TERMS OF PERSONNEL, EQUIPMENT, RESOURCES

- Research Inst
- University
- County Govt
- National "
- NGOs
- Reg. Staty - NEMA
- Community
- Private Industries (Eg Fertilizer company)

Potential collaborative with ICRAP in restoration of hotspot areas

Identified: Air quality, NBS & Phytoremediation

Monitoring of trends (Temporal) of movement of substances from land to lake and continuous adjustment of management practices

THE GEOGRAPHIC COVERAGE OF THE PROJECT (SCOPE)

Soil & Water Conservation Practice Project

Projects

Mitigation against pollution of Rivers & Lake

Future collaborative project areas

- Social economic aspects surrounding geochemical methods
- Future collaborative a project
- Aquaculture
- promotion of green technology
- Agroforestry
- Smart Agriculture

Strengthening existing systems involves in soil erosion and other ~~mitigation~~ & CLIMATE CHANGE IMPACTS MITIGATION

Geochemical methods and environmental Indicator organisms can be used to inform changes in the lake, wetlands and rivers resulting from land related pollution

MONITORING AND EVALUATING PROGRESS & PROJECT IMPACTS SOIL EROSION EFFECTIVENESS

Analysis of chemical residues in soil & crops

THOSE INTERESTED

NEMA

COUNTY GOVERNMENT - KEM, SIMA, MORA, HMA, KMA, R1

UNIVERSITY OF RDORAT, ICRAP

Who?

1. National Government
2. County govt
3. Community
4. Researchers
5. Deprt. partners
6. Non-State actors

Who?

- County government
- Embassies offices
- other development partners
- NGOs

Success of this, will lead to County specific Collaboration especially on future use, soil erosion control etc

Major players/stakeholders and their role in Soil management

- Create awareness to all stakeholders and the two levels of the government

QUESTION 4 RESPONSES

Publicity Collaboration Sensitization & Awareness

Publicity for easy access by other researchers

- Conduct workshop sessions

Create a joint expression of the urgency of the importance of research findings

→ Sensitization of decision makers on research results

By bringing stakeholders together for sensitization

- Present research report to LREB

Multi-sectoral stakeholder engagement

Diffusion approach

Local
County
National
Govt
Depts

Joint research findings dissemination to Collaboratively/strongly influence policy makers

STRUCTURING EXTENSIVE RESEARCH LINKAGE

CAPACITY BUILDING

Make research understandable Collaborative/participatory

Creating a collaborative platform (Hub)

- Demonstrate to policy makers that specific interventions are cheaper than general interventions

Collaborations between the two for creation of linkages/dependence of land and water

POLICY LINKING RESEARCHERS AND ACADEMIA AND DECISION MAKERS IN KENYA

- INCORPORATING DECISION MAKERS IN PROPOSALS

Dissemination Research Direct benefit

Share research findings widely

Dissemination of research findings to aid further research

THROUGH POLICY BRIEFS

Workshops, Seminars, Policy briefs

Providing adequate and accurate information that entails mitigation and measures

Online presence of analysis reports for easy access

Demonstrate that the interventions will lead to greater revenue generation

SENSITIZATION OF THE DECISION MAKERS ON THE RESEARCH FINDINGS

Dissemination

1. Dissemination of policy messages through social media

- Scientists - Journals and Periodicals

Simplified / Popular Versions of research reports (Focus Groups) to Communities & Political Institutions

- Regular TV / Radio Talk Shows
- local media - local languages

- Through open days and exhibitions

- Regular reporting to policy makers

- Joint Scientists findings brief through media

Participatory Identification of Research needs

Sensitization and Trainings

Simulation of research findings using living labs

- Engaging the community in Participatory research - citizen science

Extension service

- Research demonstration to extension transfer through community exhibitions

How influenced?

Writing Petitions by scientists to Political Policy makers

Use Develop² apply robust communication strategies
→ Use lobbyists
→ Advocacy

Scientists responding to calls for public participation & Consultative forums on policy / law draft.

Citizen Science & empowerment

Public, private Partnership in research and implementation (PPP)

- use of social and cultural platforms and creative arts to communicate findings

Enforcement Prosecution ≠

Multidisciplinary data analysis & Interpretation by all sectors - Inclusive of health, social & economic sectors

- Political buy in

Conducting demand driven research to help the common man

Action oriented research.

Development of model / demonstrator farms

Appendix 2 Participants

Name	Institution
Michael Watts	BGS
Olivier Humphrey	BGS
Susan Clare Adhiambo	CGK
Michael Omollo	HBCG
Elvis R.A Weallow	ICRAF
Flora Musanga	Kakamega County
Christine Etiegni	KEFS
Wilson Otieno Odhiambo	Kisumu
George Morara	KMFRI
Priscilla Boera	KMFRI
Venny Mziri	KMFRI
Jared Miruka	KMFRI
Collins Ongore	KMFRI
Christopher Aura	KMFRI
Ismael Oduor	Koitaleel Samoi University
Ndaga Ogola	Migori County
Everline Achieng	MOALF-Migori
Simion Mutai	Nandi County
Stella Kamwesir	NEMA
Samson Kidera	SDBER
Vincent Okoth	Siaya County
Odipo Osano	UoE
Maureene Ondayo	UoE
Agan Leonard	UoE
Abigael Otinga	UoE
Isabokey Job	UoE

References

Aura C.M., Humphrey O.S., Marriott, A.L., Watts, M.J., Ongore, C., Mwamburi, J., Osano, O., and Coffey, T.J. (In Press) Assessing the spatial distribution of elemental concentrations in surface sediments of Lake Victoria, Kenya: implications for ecological health and management.

Dowell et al. 2023. Suitability of ^{210}Pb , ^{137}Cs and $^{239+240}\text{Pu}$ as soil erosion tracers in western Kenya. *Journal of Environmental Radioactivity* (awaiting final URL from publisher)

Humphrey et al. 2022. Evaluating spatio-temporal soil erosion dynamics in the Winam Gulf catchment, Kenya for enhanced decision making in the land-lake interface. *STOTEN*. <https://doi.org/10.1016/j.scitotenv.2021.151975>

Humphrey et al. 2023. Predictive geochemical mapping using machine learning in western Kenya. *Geoderma Regional*. <https://doi.org/10.1016/j.geodrs.2023.e00731>

Marriott et al. 2023. Considerations for environmental biogeochemistry and food security for aquaculture around Lake Victoria, Kenya. *Environmental Geochemistry and Health*. <https://doi.org/10.1007/s10653-023-01585-w>