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Dynamics of Environmental Geochemistry and Health in a Lake-wide Basin: Stakeholder engagement meeting

Environmental change, adaptations and resilience/ BGS
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Stakeholder engagement meeting participants at KMFRI, Kenya

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Dynamics of Environmental Geochemistry and Health in a Lake-wide Basin: Stakeholder engagement meeting

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BRITISH GEOLOGICAL SURVEY

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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 February 2023. This workshop aimed to share sediment geochemical data produced over the previous two years with relevant stakeholders and use information collected from the workshop participants, obtained via a series of questions to inform future workshops and data distribution tools.

Acknowledgements

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Summary

This report describes a stakeholder engagement workshop carried out by the British Geological Survey (BGS) 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') with research partners from the University of Eldoret and Kenya Marine and Fisheries Research Institute in February 2023. This workshop aimed to share progress of the project from 2019 to date and follows from stakeholder engagement in the design of data outputs to inform strategies to mitigate for land-to-lake transfers resulting from soil erosion. An update of data outputs was initially reported to gauge the delivery of research data as an information tool to expand the cohort of stakeholders in lake-land management, the connections between the stakeholders, current information and its accessibility, and whether the data we are producing is useful and try to assess additional unforeseen uses of our outputs. All of the information collected from participants will be used to inform future workshops, planned for late 2023, May 2024 and final data distribution tools.

1 Introduction

Lake Victoria's ecosystem has experienced accelerating change since the 1940s and the extent and impact of anthropogenic driven changes in a critical landscape for food security needs to be elucidated. This project, funded by the Royal Society, brings researchers from the BGS, University of Plymouth, University of Eldoret and the 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. Knowledge gaps in local processes and technical capacity were identified, requiring novel research to better understand the influence of soil degradation on soil-to-crop dynamics for micronutrients essential for a healthy diet and potentially toxic elements (PTEs); transfers from land-to-lake via sediment flows and dust transfer and the subsequent impact on the lake ecosystem health and human health. Emerging and past activities ranging from land clearance, overstocking (livestock/fish), use of fertilisers, road construction, mining and poor landscape management have resulted in the land-to-lake transfer of sediments with consequences for land and aquatic productivity. Given that half of all run-off into Lake Victoria originates in Kenya, the Winam Gulf is suited to a targeted study of land-to-lake transfers of soil and anthropogenic pollution.

This project aims to link environmental geochemistry and health using a multidisciplinary approach. One of the key objectives of this study is to evaluate the transport of micronutrients/PTEs into the Winam Gulf catchment, using source apportionment for sediment inflows to identify the origin of sediments transfers from land-to-lake with the potential for ecological-human health impacts. A major consideration for this project is to share the results with relevant stakeholders to influence change and ensure outputs are used by the appropriate land-lake management stakeholders to have a long-lasting impact. Therefore, the aim of this meeting was to find out who else do we need in future stakeholder groups to ensure our pathway to impact? In this report, we showcase some of the opinions of stakeholders captured at a workshop hosted by KMFRI in February 2023. We will use this data to plan future stakeholder engagement activities.



Figure 1 Sample landscape within the Winam Gulf, Kenya (top). River sediment sampling site (bottom left). Partners from the University of Eldoret collecting a sediment sample from the Nyando river (bottom right).

2 Stakeholder Workshops

2.1 WORKSHOP AGENDA

The workshop was held on the 7th February 2023 between 10:00 am and 1:00 pm in the KMFRI Conference Hall, Kisumu Centre. P.O. Box 1881, Kisumu. A total of 17 stakeholders attended the workshop. Both Dr Humphrey and Ms Dowell delivered a presentation explaining the origin of the research project and current data outputs before the participants were split into two groups to answer a series of questions. In these interactive sessions stakeholders were asked to consider the following questions: (i) Who are the stakeholders in lake/land management?; (ii) Who connects the two groups? / Are they already collaborating?; (iii) What data do you currently use for land/lake management?; (iv) Is the data we are producing useful? /How will you use it?; and (v) How should the data be presented for use? These questions led to dynamic, collaborative conversations and stakeholders were asked to summarise their thoughts, opinions and observations on post-it notes and attach them to each question which was presented on a poster. Finally, each group presented their findings to all stakeholders with a general discussion and closeout.



Figure 2 Stakeholders deliberating and sharing their answers to a series of questions

2.2 WORKSHOP RESPONSE

2.2.1 Stakeholder Identification

2.2.1.1 WHO ARE THE STAKEHOLDERS IN LAKE/LAND MANAGEMENT?

This question was designed to make the workshop participants consider all the major stakeholders relevant to the project and produce a list of additional stakeholders required at future meetings. The participant's comments for (i) land and (ii) lake stakeholders are shown in Figures 3 and 4 (see appendix), respectively.

A wide range of additional stakeholders were identified for both land and lake management sectors from the grassroots level up to governing bodies. The list produced from this question is extensive and enables potential communication routes with key stakeholders that can be explored in later workshops.

Land management stakeholders included a range of sectors including:

Community Based Organisations (CBOs): farmers, beekeepers, bio-enterprises, and artisanal miners.

Community leaders: the Ministry of Mines, Community Forest Associations, County Governments and their officers involved in land management were identified and soil management experts and researchers from academic institutes were also recognised.

Governing bodies: Kenya Agricultural and Livestock Research Organization (KALRO), Ministry of Agriculture, Ministry of Environment & Fisheries, Kenya Forest Research Institute (KFRI), National Land Commission (NLC) and Kenya rural roads management authority were listed. In addition,

Lake management stakeholder included a range of sectors including:

Community Based Organisations (CBOs): Aquaculture farmers and their associated management.

Non-government organisations (NGOs) and their private partners: Civil Society, Kenyan Water Tower agency (KWT), Water resource authority (WRA), Lake Basin Development Authority (LBDA), Lake Victoria Basin Commission (LVBC),

National Agencies: Water and Sewage Management, Water Resource Users Association (WRUAS), Kisumu Lake Development Companies,

Joint management stakeholders

One organisation the National Environmental Management Authority of Kenya (NEMA) was identified as an organisation relevant to both sides of management, and an organisation that should attend future workshops.

2.2.2 Who connects the two groups? / Are they already collaborating?

This question aimed to assess the extent of current collaboration and the connectivity between land and lake management stakeholders. Given the integrated approach of the current research programme, we need to assess whether a research network already exists which could be utilised to maximise research output uptake. The participant's observations and comments to the questions are shown in Figures 5 and 6 (see appendix), respectively.

The workshop participants identified that the two groups (land and lake management stakeholders) are usually connected when a research project allows funding or if a

natural/anthropogenic event occurs meaning the solution must be found by working together. However, it was highlighted that the two groups do not have a streamlined way of working together and that collaborations were short-lived and dependent on project funding available at that time. The consensus was that that collaboration could be better and that there was a need for improved synergy between the two groups.

The participants were initially challenged by the question, as they felt this had already been covered in the first set of questions; when asked about the already existing collaborations, a common answer was "the names from the previous question". The participants briefly discussed who the policymakers are and directed us to the relevant government authorities who are supposed to issue the guidelines and management plans/documentation. They provided a list of NGOs and other institutes which were all tailored around the Government connecting organisations/institutes and the private sector through management administration interior Government direction (CBOs, WRUAS, CFAs, SAGAs, KFRI, KFS, LVEMP). The group needed further explanation that we (BGS) did not understand which projects/departments/ministries were involved in the aforementioned collaborations, so names needed to be provided. The overall feeling given was that there is currently very little in the way of collaboration between the two land and lake management sides, with the work done by BGS being the most predominant connection between the two sides. Data and information from project-based research: e.g. KMFRI, KFRI, BGS, UoE, Moi U were also indicated as a connection. However, it was explained that this has a finite shelf-life, unless this information can be utilised at a senior level in other management institutes/organisations. The overall consensus was that there is currently very few if any collaborations working together (other than through the indicated projects between organisation/institutes i.e. RS with BGS-KMFRI-UoE etc.).

2.2.3 What data do you currently use for land/lake management?

This question was designed to assess (i) what data is currently used and (ii) whether there are currently any data platforms that research outputs from this grant could be published on. The participant's observations and comments are shown in Figure 7 (see appendix).

The team separated the question into (i) land and (ii) lake management datasets. Listing the different organisations and institutes and the data used therein for management purposes. The overall consensus was that data (if available) was not being used constructively, actively, or to its full potential.

Land Data: Soil, Land (information), Crop (suitability and use), Livestock (sustainability), Forest (cover and use), Population (economy and growth), Climate management purposes. Tourism (management). Diseases (management of).

Lake Data: Water, Fisheries (trends in population management), Aquaculture (fish farming management), Hydrology (mapping water resources), Societal (trends and changes including planning)

The group discussed how the data used for management purposes either relied on survey data for the trends within the local population or historic management data including land use, rainfall, soil type/properties, and location of aquaculture. This data can be found in historic reports and from local governing bodies.

2.2.4 Is the data we are producing useful?/ How will you use it?

These questions were designed to assess (i) whether or not the data we are producing meets a currently unmet need and (ii) try and understand how the data would be used and whether or not we had predicted proposed uses. The participant's observations and comments are shown in Figures 8 and 9 (see appendix), respectively.

The participants agreed that the data is useful. The data was presented well and met with understanding from the participants regarding the scientific impact. Some further discussions were had involving soil erosion tracers, and how these data could benefit other land users further down the catchment.

The participants discussed how the data would be used. This highlighted the need for transparency and the requirement to use the data to inform policy and inter-county collaborations to enable better management of the land and lake environments. Further to this and using the list of ideas suggested on the charts, the group pointed out the data could be used to inform spatial distribution decisions for agriculture (erosion index, mapping vulnerability and susceptibility, inform mitigation measures), siltation and sedimentation through erosion and its mitigation. Identification of nutrient loading (land leaching, fertilisers), pathways for eutrophication and increased sedimentation effects and pollution and contamination pathways from land to lake (sand and gold mining) impacting fisheries and aquaculture management. The identification of source locations and potential "hot spots" are critical for informing policymakers and stakeholders for managing pollution pathways and their impacts. A misunderstanding arose in some participants regarding radionuclide soil erosion tracers, but this was partially expected due to their lack of understanding of radiation and radiochemistry used in this format.

It was generally agreed that the data presented was very useful, and in its current format appropriate for the scientific community to utilise for future journal paper publications. However, it was highlighted that to be able to target a broader non-scientific audience, these data needed to be presented in an alternative format. The group identified that if at all possible, it would be useful to be able to repeat the sampling in order to prove the results. Furthermore, it would be useful to be able to see how sediment load/micronutrient loss changed over time. Additional sediment core data, not previously mentioned to the stakeholders could be utilised to assess historical changes from sediment transfers and used to provide temporal changes within the lake basin.

Participants agreed that data will be used to inform policy and inter-county collaborations concerning the management of the land and lake. The group also suggested using the data to inform spatial distribution decisions for agricultural, mining, fisheries sector activities and others, and hosting workshops with local farmers/miners/fishermen to inform management decisions on a local level.

2.2.5 How should the data be presented for use?

This question was designed to assess how we should present the data and to whom. The participant's observations and comments are shown in Figure 10 (see appendix).

The initial response was a positive one with regards to how BGS had set up and presented the data from the collaborative research work. It was agreed by the workshop participants that the current format of the data is suitable for researchers to interpolate, and additional ideas were proposed as to how to present the data to less informed individuals (i.e. farmers and politicians, non-scientists). For the landowners, it was suggested that the use of a pamphlet style specific to the local community and their area would be appropriate. To do this, local languages and

dialects should be used and results presented to illustrate the key information. Additionally, information shared would be to suggest possible improvements and mitigations against further loss of micronutrients and land degradation. Suggestions included factsheets, clearly communicating ideas (e.g. "farm this type of crop here, and a different type of crop there"), and trying to use these data to promote inter-county land and lake management exercises. Local seminars and workshops in the local communities were also suggested and the use of field day workshops to engage with local counterparts. The ideas also included the possible difficulty in the county boundaries and community structure e.g., crops could be planted in specific locations to reduce/remove problems further down in the catchment. There would need to be a clear explanation as to the reasoning, in order to gain the buy-in of the communities in the upper catchments where the crops are being planted and who would not see the immediate benefit, as this would be gained by those communities in the lower catchment area. For governing bodies, it was highlighted that short (one paragraph) impact statements are the best way to present these data. These impact statements should highlight the key result, what that means and what can be done about it. For academics, the data should be published through traditional peer-reviewed avenues (open-access). The use of these data to promote positive inter-county work ethics i.e. to your fellow farmer and then further growth of inter-county land to lake management promoting cross-information for helpful working relationships across the catchment.

3 Conclusions and Outlook

Overall, the workshop participants provided a substantial number of names and organisations, from grassroots organisations to government officials for future collaboration/invitation to workshops. However, there is currently a distinct lack of current collaborative effort and the connection only exists when a research project provides funding. Stakeholders were able to list different organisations and institutes and the data used for management purposes, however, many of them sense that current data is not being used constructively or to its full potential. A substantial reason for this is the division at the county level, requiring more engagement from these higher positions to encourage the management of the land and lake simultaneously. The stakeholders agreed that having scientific data to back up the management strategies and potential benefits may help to improve inter-county relations and thus improve the overall management of natural resources. The group mentioned using the data to inform local people of management needs and methods, to try to combat the problem on a local level in addition to the county level. The stakeholders unanimously agreed that the data presented was useful and understood how the data could be used to advise spatial distribution decisions for agricultural, mining, and fisheries sector activities to inform management decisions on a regional level. The main outcome from this meeting was the list of additional stakeholders including the National Environmental Management Authority of Kenya (NEMA) which was frequently mentioned as an organisation relevant to both sides of management, and an organisation that should attend future workshops. Future engagement activities are planned for late 2023 where we will present final data outputs to the stakeholders enabling significant changes to land-lake management systems.

4 Appendix

Stakeholder responses were captured using post-it notes.



Figure 3 Workshop participant feedback to the question 'Who are the stakeholders in land management?'

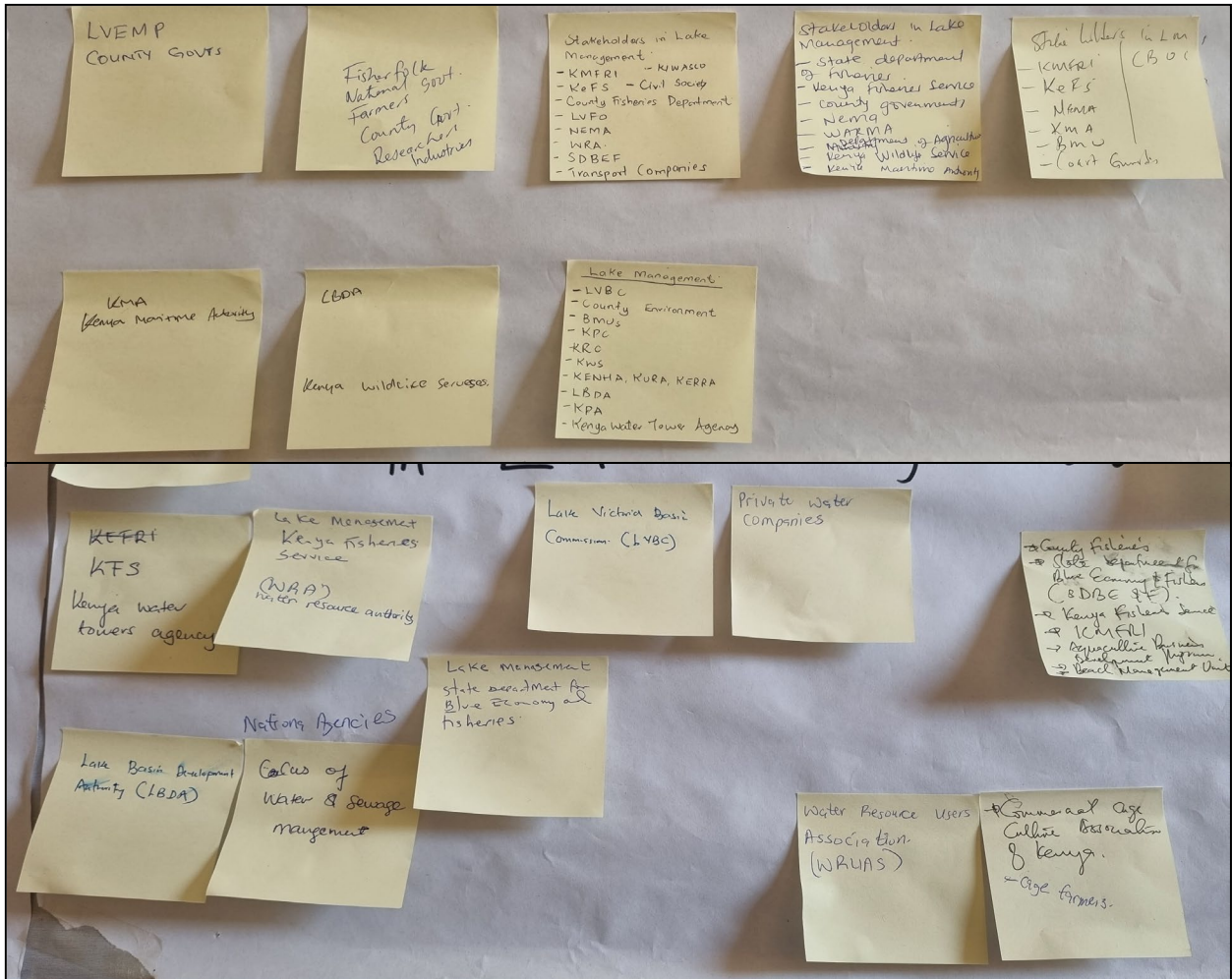


Figure 4 Workshop participant feedback to the question 'Who are the stakeholders in lake management?'

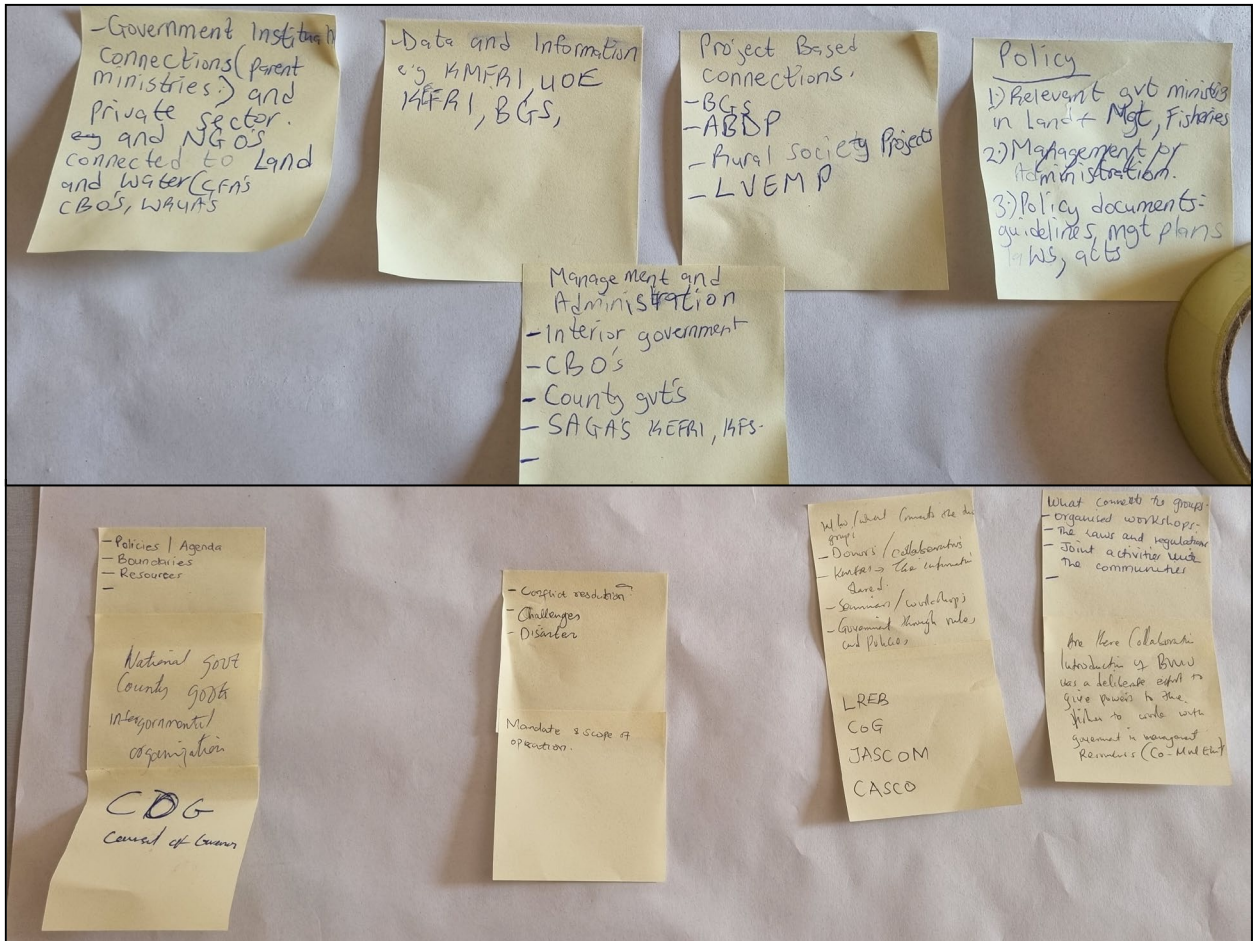


Figure 5 Workshop participant feedback to the question 'Who connects the two groups?'

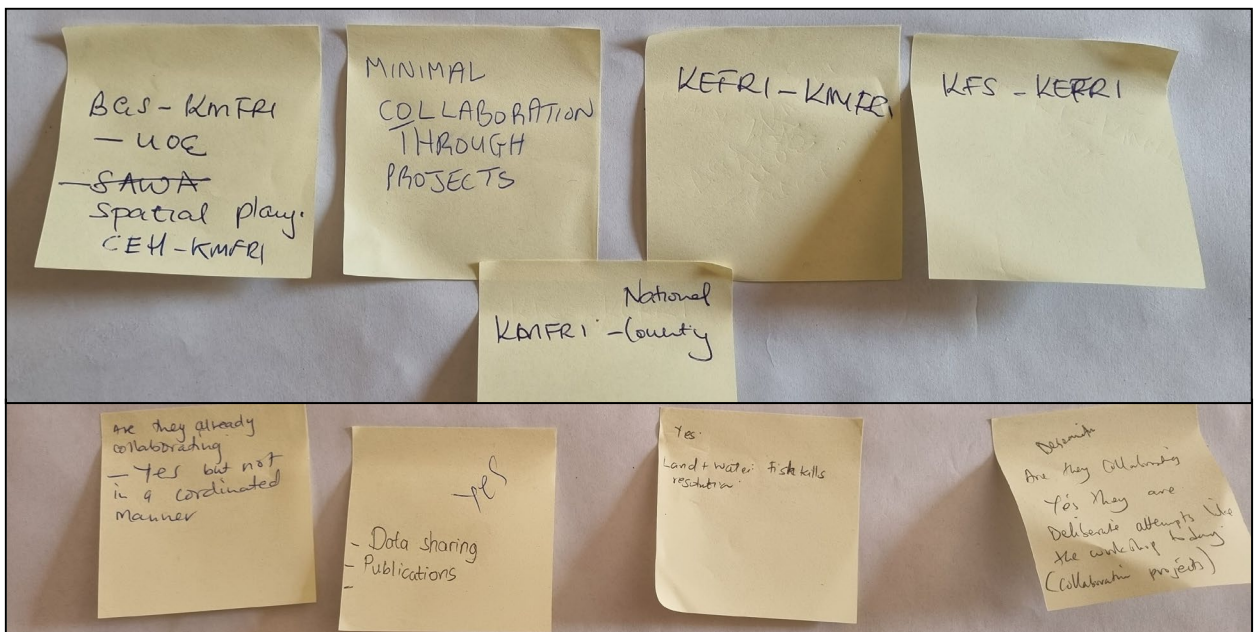


Figure 6 Workshop participant feedback to the question 'Are they already collaborating?'

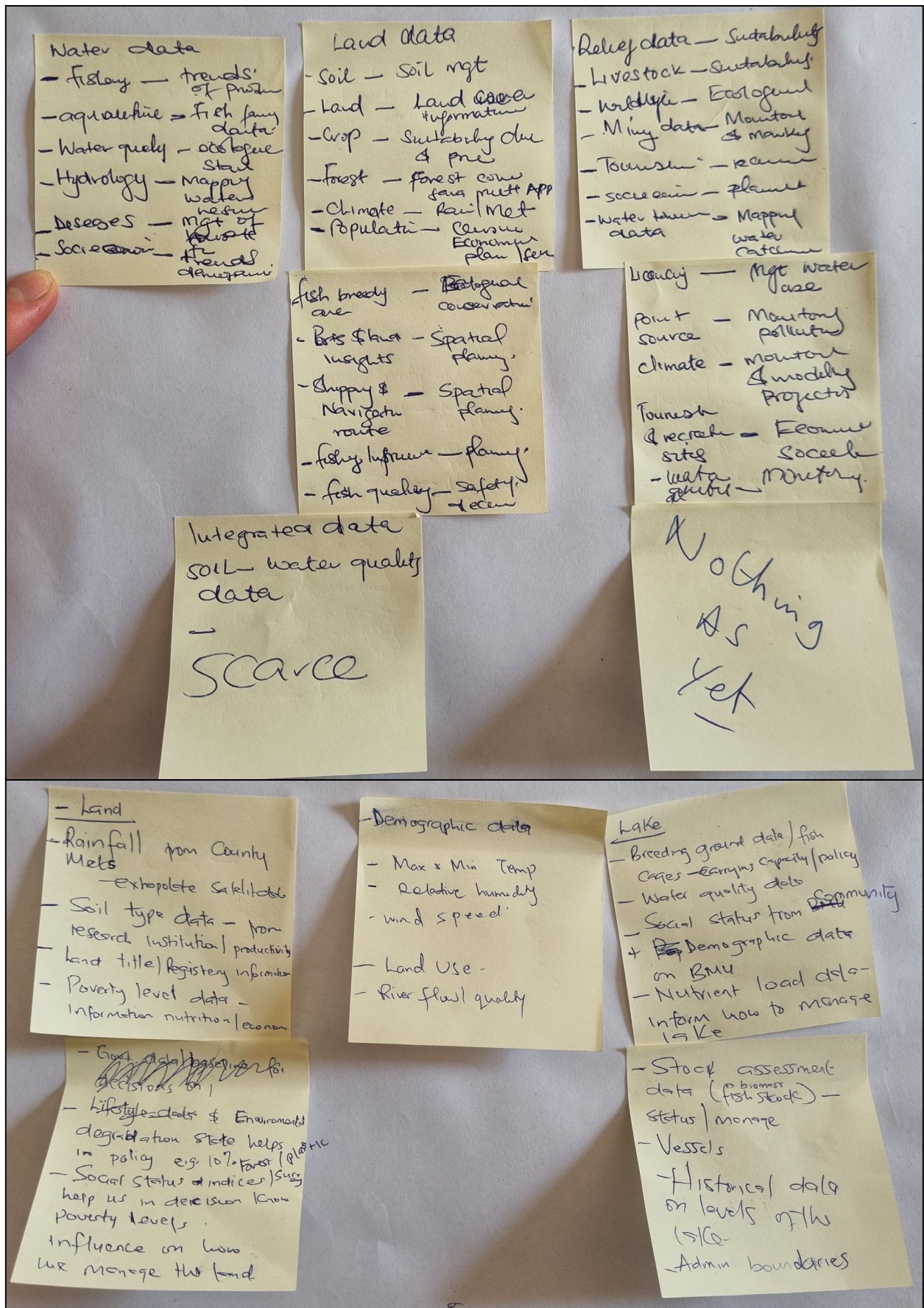


Figure 7 Workshop participant feedback to the question 'What data do you currently use for land/lake management?'

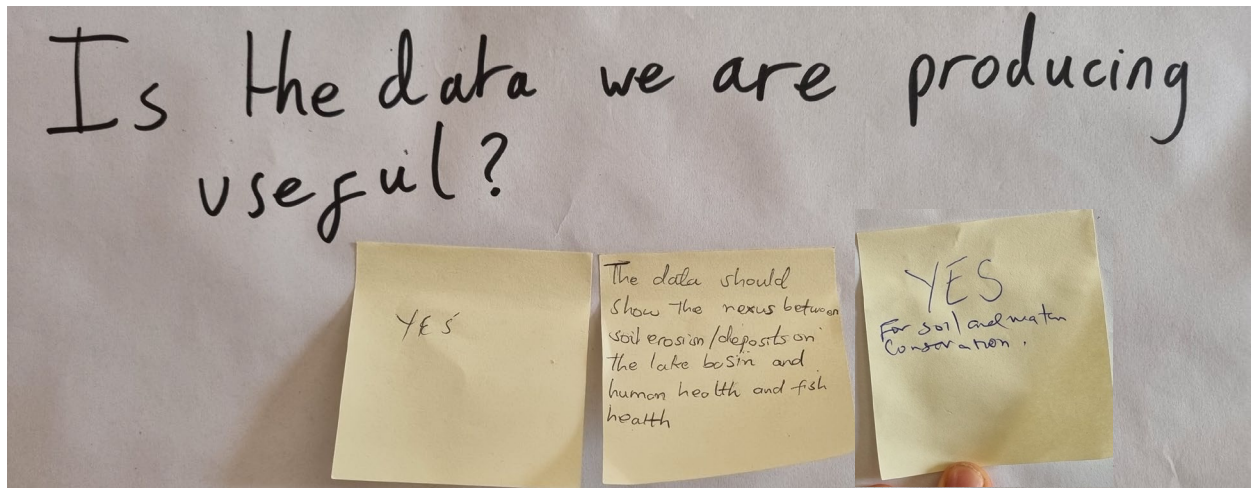


Figure 8 Workshop participant feedback to the question 'Is the data we are producing useful?'

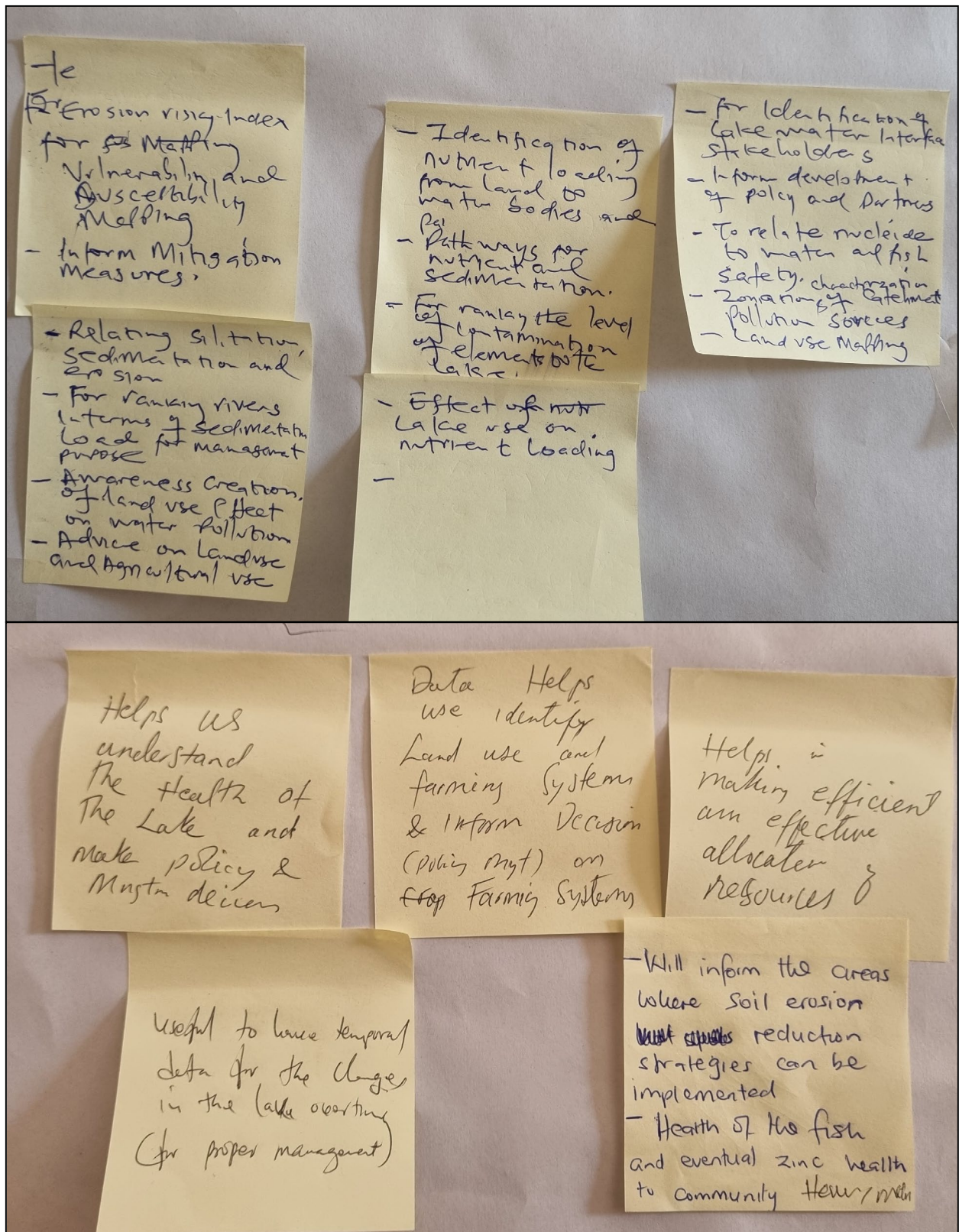


Figure 9 Workshop participant feedback to the question 'How will you use it?'

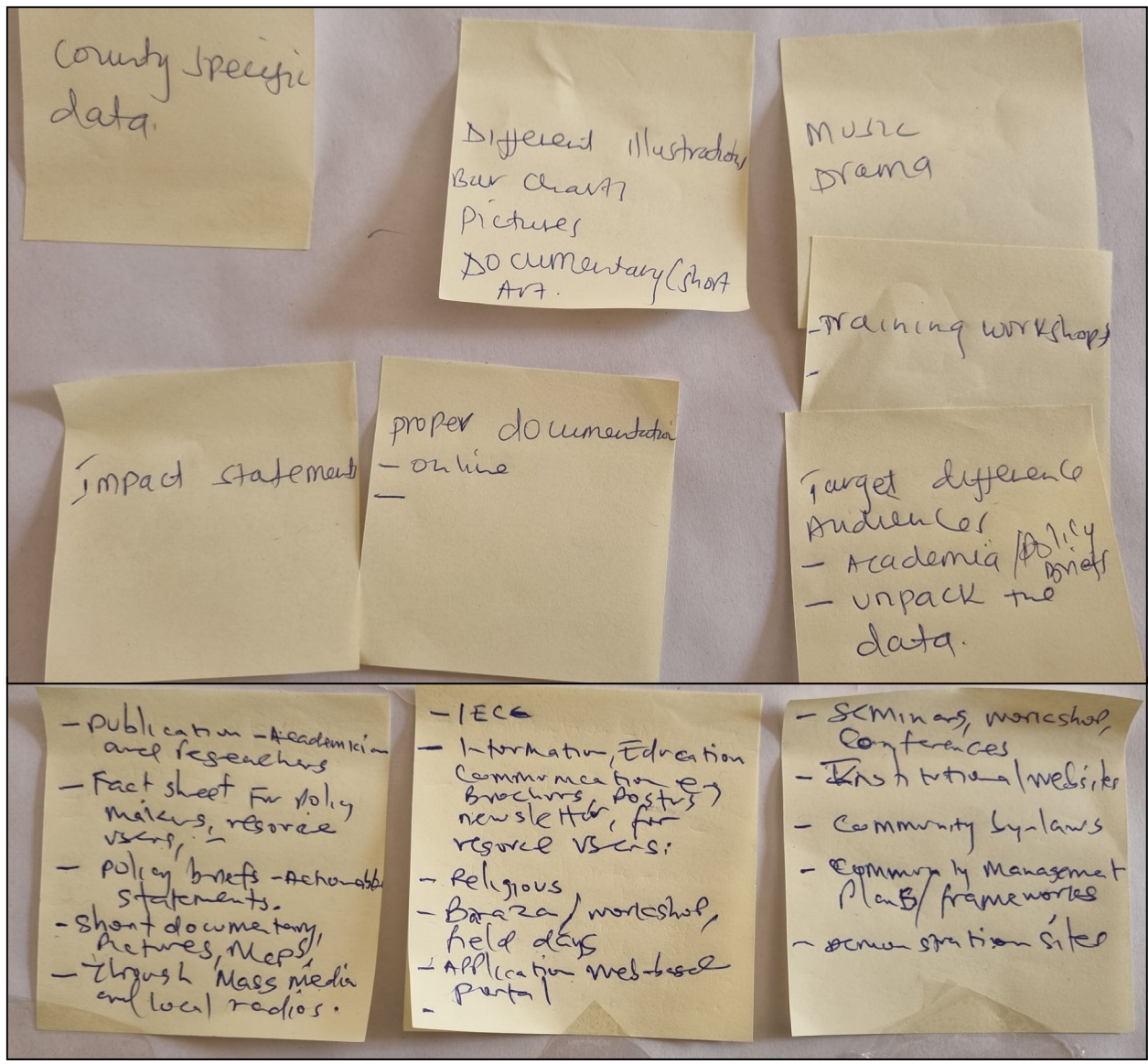


Figure 10 Workshop participant feedback to the question 'How should the data be presented for use?'