



Data
Integration

Database
Development

Capacity
Development

Workshop



Citizen
Science
data integration

SDG 6.3.2

SDG indicator 6.3.2: Proportion of bodies of water with good ambient water quality

The World Water Quality Alliance (WWQA) Workstream on Citizen Science presents the *Citizen Science Data Integration for SDG 6.3.2 project*.

This will help to normalise the use of citizen science data for SDG indicator 6.3.2 reporting by national authorities, focusing on identifying barriers and developing solutions to known data mobilization and integration issues.

PROJECT OVERVIEW

This project has built on the strong foundation of the existing work from the *Citizen Science for SDG Indicator 6.3.2 Workstream* of the World Water Quality Alliance (WWQA). This workstream which has the ambition of normalising the use of citizen scientist-generated data for national, regional and global reporting frameworks includes seven active country projects. Two of which have resulted in 'official' SDG Indicator 6.3.2 contributions (Sierra Leone and Zambia). This workstream also convenes a broad working group of experts and practitioners through regular meetings, and has produced a number of specific outputs including both a policy and technical brief outlining best practice recommendations for citizen science contributions to national databases and SDG reporting, and convened a *Knowledge Exchange Workshop* in Nairobi in 2023. These efforts have promoted uptake and development of a 'citizen plus authority data for SDG reporting' approach, and will help inform the future direction and workplan of the workstream.

This 'Data Integration' project tested bringing citizen-derived data from different approaches together to provide a more comprehensive assessment than each on their own. The project tested several technical barriers related to collating these data for a single assessment with a goal to create 'SDG-ready information' to be made available to national authorities. The project ensured that the information generated conformed to the FAIR data principles (Findable, Accessible, Interoperable and Reusable) for uptake for national reporting and public access. The project focused on two national pilot studies: Kenya and South Africa. In both countries there are a variety of citizen science-water quality monitoring activities, as well as strong connections between project partners and the national organizations responsible for water quality monitoring and assessment and SDG Indicator 6.3.2 reporting.

The work done in these pilot countries was showcased through an online workshop that convened international stakeholders and focused on the opportunities and constraints of citizen science data integration. Further, the work was contextualized in various national settings with respect to the feasibility for application in different countries. The key goal was to workshop and map an approach for combining water quality data from numerous initiatives for SDG Indicator 6.3.2 reporting.

Alignment with the vision and pillars of the WWQA: The project helped progress three main thematic priority pillars of the WWQA. These were:

- **Citizen Engagement** – SDG 6 reporting is used as a ‘vehicle’ that brings disparate citizen science activities together for a common goal, and by doing so, brings multiple additional benefits that go far beyond the ‘provision of data’. These include raising awareness of the importance of good water quality, mobilizing enthusiastic citizens to protect and restore local water bodies, and providing education on causes and impacts of pollution at the catchment level.
- **Data to Action** – In many organisations, there are data that are lost, unused or underused. This project created and tested a system for such water quality data to enter into the reporting-management pathway. Specifically in Kenya (Activity 1), the project focused on bringing paper-based water quality data into a digital platform. Going further, this project also explored the integration of different citizen and national authority data for use in SDG 6 reporting and, ultimately, action aimed at protecting and restoring freshwater bodies.
- **Development Programme of long-term citizen science** – The long-term objective of this workstream is to ‘normalise’ the incorporation of citizen science-derived data into SDG Indicator 6.3.2 reporting processes. The rise of citizen and community-based monitoring initiatives offers a tangible and practical mechanism to help fill data gaps and to track SDG progress. However, the data collected by citizen science programmes often go unused or fail to match their potential usefulness. Maximising the value of these data, which are often collected on a volunteer basis, is essential to sustain these efforts - citizen scientists need to see that their efforts are not wasted!

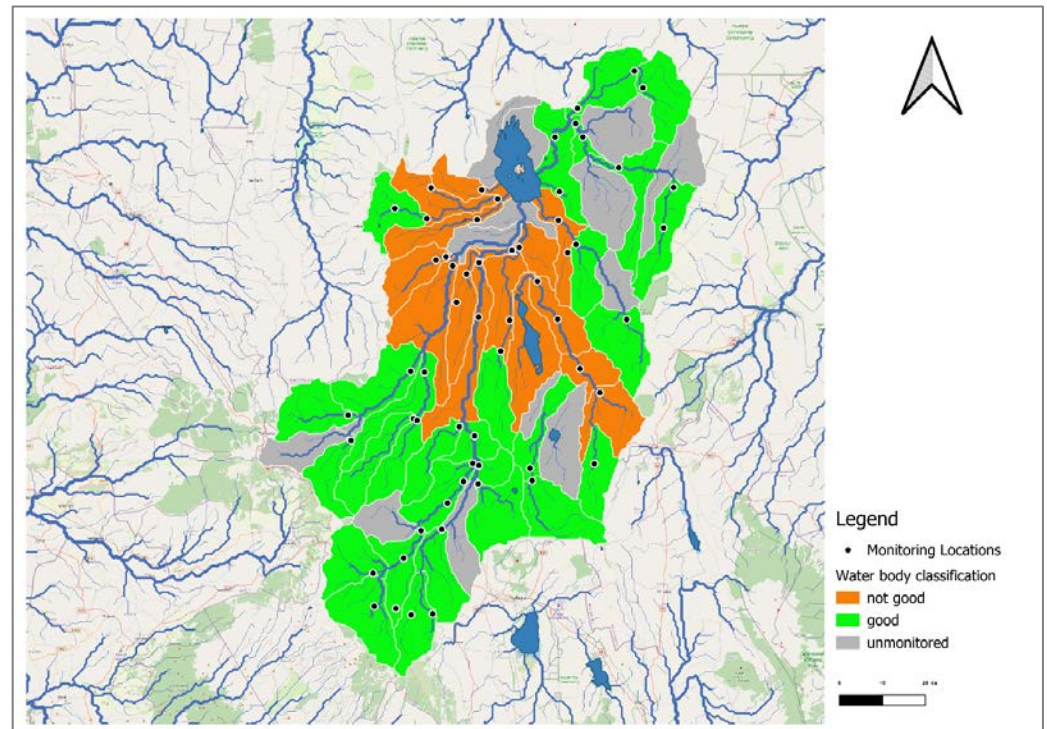


Figure 1. Example map (not based on real data) modelling what could be possible for SDG6.3.2 assessment if data could be integrated.

CASE STUDY: KENYA

The Kenya [Water Resource User Associations \(WRUAs\)](#) (coordinated by KeNAWRUA) are key stakeholders that link the national authority to water bodies and communities that depend on those waterbodies. For more than 10 years, several WRUAs have been conducting water quality monitoring using kits funded through a German GIZ grant. These 40 WRUAs began monitoring important rivers and lakes in various areas of Kenya in 2012. Unfortunately, the data were stored on individual computers, resulting in data loss. Within this project, we developed an online database and data acquisition app for the WRUAs already engaged in monitoring, and we expanded monitoring to 20 additional WRUAs. Data from 2019 until the present day have been transferred to this database, which will be linked to the monitoring initiated using the [Freshwater Watch](#) approach. The key challenge that remains is to expand monitoring from these WRUAs to a larger number of the 400 WRUAs in Kenya, initially focusing on those most critical.

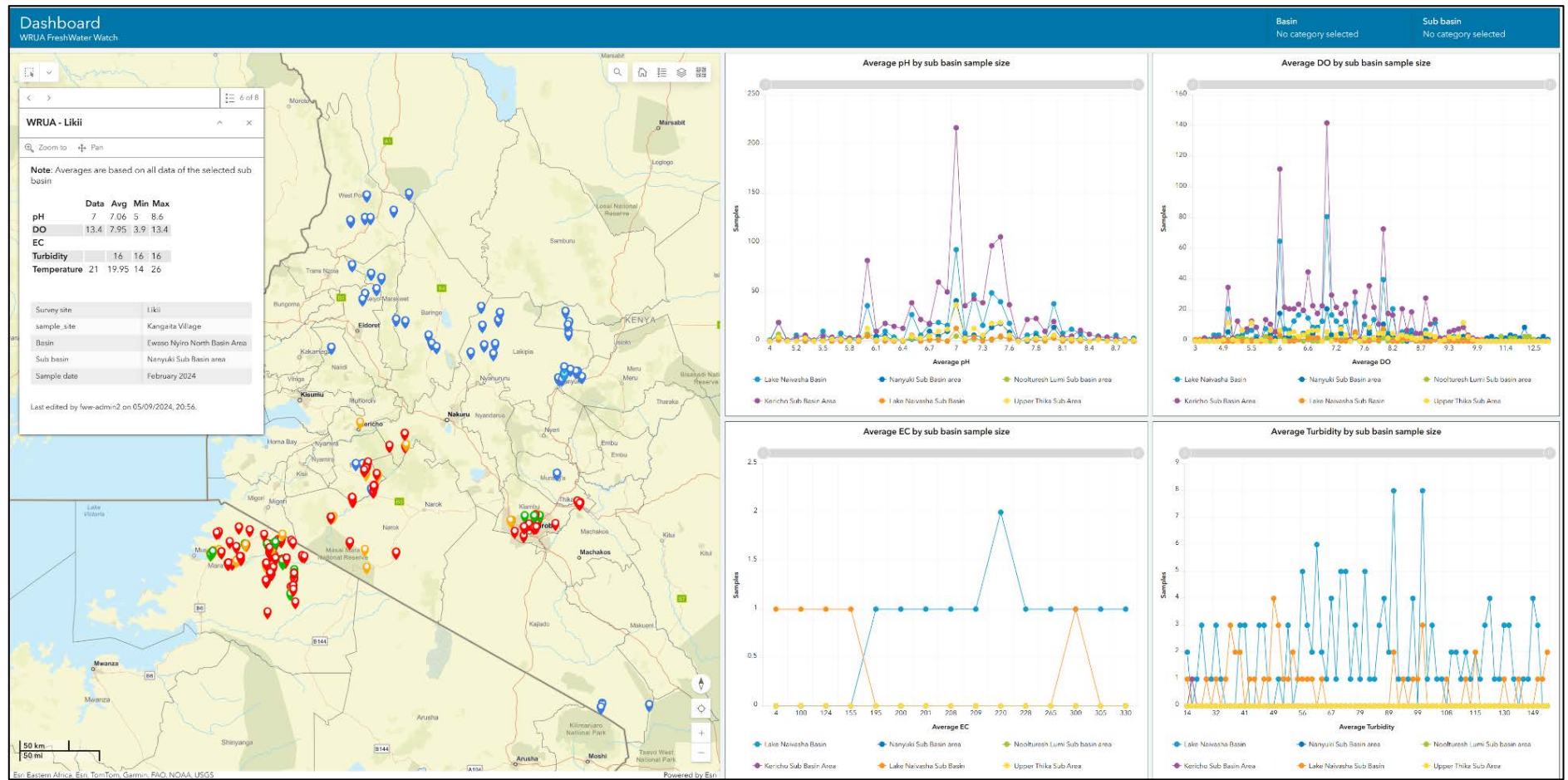


Figure 2. A map showing the data and analysis for Kenya on the FreshWater Watch Platform. The red/yellow/green pins are FreshWater Watch data, collected in the Mara and the River Nairobi. The blue pins are the historical WRUA data uploaded through this project.

CASE STUDY: SOUTH AFRICA

South Africa faces severe freshwater quality issues, tied primarily to poor wastewater management and large areas of agriculture. National government monitoring is infrequent and at a low temporal resolution, creating insufficient data to inform effective water resource management strategies. In response, a research project, termed the citizen science State of Rivers, is underway to use citizen science for monitoring and reporting on water quality in rivers across the country. Within the WWQA citizen science data integration for SDG Indicator 6.3.2 reporting project, >30 individuals and organisations from the citizen science State of Rivers network in South Africa were sent [Freshwater Watch](#) water quality monitoring kits and trained in their use. The network then gathered data between July and September 2024, ultimately collecting >120 comprehensive Freshwater Watch surveys on a variety of waterbodies across the country. These Freshwater Watch data were uploaded to the Freshwater Watch platform, contributing directly to a globalFAIR database useful in SDG Indicator 6.3.2 reporting. However, data collected by other means, including using the [mini stream assessment scoring system \(miniSASS\)](#) led by [GroundTruth](#) were captured using other mechanisms, leading to some data not entering the SDG Indicator 6.3.2 reporting stream. There is a strong citizen science community of practice in South Africa focusing on water quality issues, creating excellent opportunity for citizen science data to augment national and international monitoring schemes.

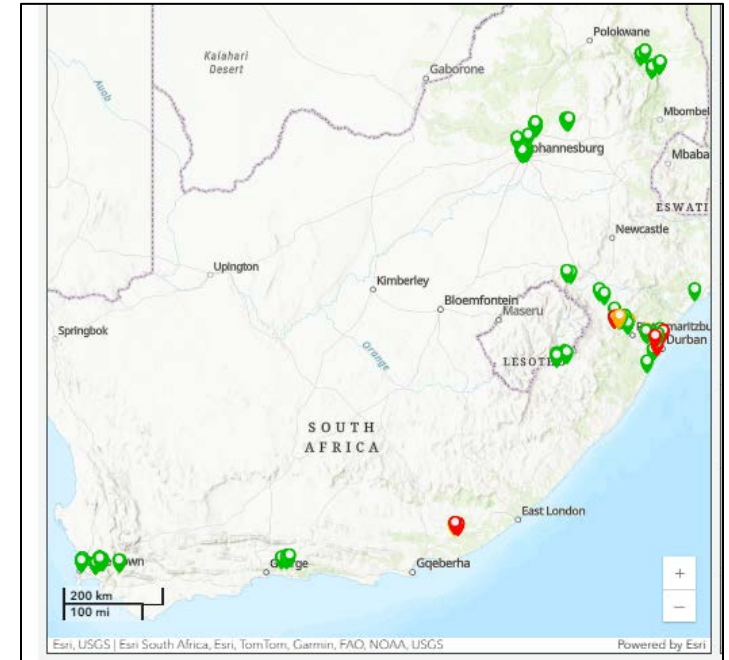


Figure 3. Map of South Africa on the Freshwater Watch online platform showing the Freshwater Watch kit survey data submissions (n = 124) across the country. Data were submitted via the ArcGIS Survey 123 application.

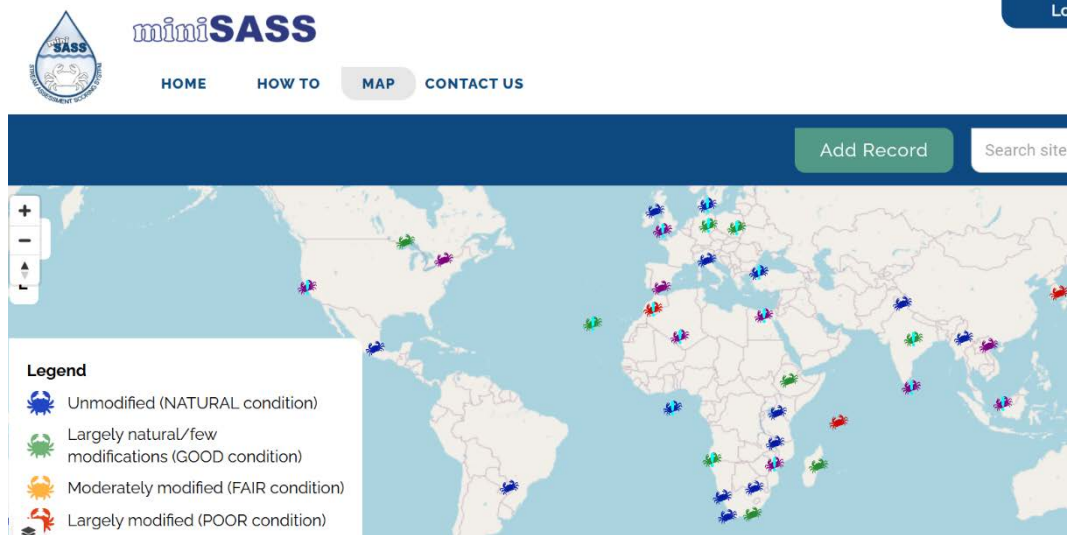


Figure 4. Screenshot of the mini stream assessment scoring system (miniSASS) website, showing the map of survey submission clusters. To date, there have been >2500 submissions, with 69 collected during the project period (i.e., 16 July – 1 September 2024).

WORKSHOP

The webinar workshop was held on September 3rd 2024. It attracted a large and diverse group of attendees from various backgrounds and levels of expertise. The workshop highlighted the two pilot case studies, where the case study partners discussed the challenges and benefits of their efforts to integrate and manage data from multiple citizen science initiatives in South Africa and Kenya.

The workshop focused on key themes that present challenges in integrating citizen science activities into improved river basin management and SDG Indicator 6.3.2 reporting. The main themes included:

- Goals and Value of Integrating Data
- Building Trust in Data Sharing
- Governance and Upscaling
- Technical Requirements for Data Integration

The first subgroup worked on better defining why the integration of data from different sources is valuable and how various stakeholders can contribute. This discussion and collaborative work took place over two sessions, resulting in several new insights.

The second subgroup focused on the challenges of creating trusted data-sharing ecosystems that ensure reliable and trustworthy data exchange, which is essential for making data actionable. Over two sessions, this subgroup outlined recommendations to guide projects toward shared, actionable knowledge.

The third subgroup explored the roles and responsibilities of key stakeholders, particularly in terms of access and governance frameworks. Over two sessions, important observations and considerations emerged regarding how citizen science activities can be designed for broader adoption.

Finally, the fourth subgroup examined the technical requirements for integrating citizen science water quality data.

The workshop concluded with the development of a Shared Statement for Collective Data Sharing for Good Ambient Water Quality.

The data integration activities demonstrated the challenges and opportunities for bringing data from different programmes together. These were discussed in the webinar and are being further explored in the WWQA Citizen Science for SDG Indicator 6.3.2 working group. Both Kenya and South Africa partners identified a number of challenges and how they were overcome. The benefits of these shared efforts were clear, a more robust approach that reinforces the role of citizen science for improved and shared water quality management and monitoring.

THE WAY FORWARD

Through collaboration between the partners of the project and the participants of the webinar, a common understanding was achieved that there is a global, urgent need to ensure good water quality in rivers, lakes, and aquifers for sustainable development. It is also essential for achieving key goals, such as reducing global health costs and the disease burdens linked to poor water, sanitation, and hygiene, as well as restoring and conserving healthy ecosystems. It is clear, however, that water quality is under significant threat from various sources. National monitoring programs, as highlighted through UNEP's implementation of SDG Indicator 6.3.2 (good ambient water quality), are often inadequate. They fail to fully capture the extent and severity of these threats or answer essential questions about spatial and temporal water quality trends. Even when water quality data exist, they are frequently inaccessible or not presented in a way that is easily understandable. This lack of actionable information places millions of people at risk because the health of the freshwater ecosystems they depend on—both now and in the future—remains largely unknown.



Freshwater Watch Phosphate testing

Citizen science data collection presents a valuable opportunity to upscale water quality monitoring when integrated with national and international water quality datasets. Overall, this project has assisted to a) strengthen communities by providing tools for citizen science, as well as integrated datasets, data analysis, and data visualization, b) provide valuable insights into local priorities for improving water bodies, c) map water quality in streams and rivers, aiding transparent water quality reporting for SDG Indicator 6.3.2, and d) ultimately achieve SDG Target 6.3 by identifying priorities for action and opportunities for collaboration that will improve water health and enhance community engagement by fostering appreciation for, and placing a value on, freshwater ecosystems.

Thank you to all of the citizen scientists and supporting organisations involved.

