KEY STRATEGIC AREA	Water Resources and Ecosystems
THRUST: 2	Hydrological and ecosystem processes
PROGRAMME: 2	Data and hydroinformatics
TITLE	The state of citizen science (CS) for water resource quality monitoring

Overall Aim: To improve the quality of water resource management in South Africa through the consolidation of citizen scientist generated data to influence policy change at the national level.

Overall Research Objective: Highlight the value of CS as a scientifically credible method of collecting data and reporting on the quality of water resources in SA, determine the manner in which the CS sector can consolidate CS efforts and fill critical gaps.

Specific Objectives:

1. Conduct a situation analysis /landscaping on the use of citizen science and scientists in South Africa to collect data on water resource quality monitoring and establish the extent to which this has generated credible data and information and how it has been used (or not used), and assess the degree to which this intervention is cost effective.

2. Determine crucial water quality data required to be collected by youth citizen scientists to ensure credible and scientific water resource quality to support SDG 6 reporting.

3. Determine barriers to applicability and use of CS in national level reports/SDG monitoring.

4. Determine how using youth monitors as part of a CS and water quality monitoring can contribute to the 'learning to earning' pathway for young people, including incentivisation of citizen scientists more broadly.

5. Advise on the adequacy of the available water resource CS monitoring tools and identify gaps.

6. Produce a preliminary State of Water Resources from a CS perspective within the current annual State of the Rivers report landscape

7. Make key recommendations on how to strengthen CS in water quality monitoring including in the following areas:

   i) How to consolidate and strengthen efforts and ensure knowledge sharing in SA and the region;

   ii) Gaps and challenges in research and implementation;

   iii) Opportunities for scaling including relevancy for national and international reporting;

   iv) Enabling the use of information coming out of CS;

v) Opportunities to strengthen and engage with youth to build their capacities and knowledge and foster interest in the water/ climate change sectors and support youth employment

Rationale:

In 2016, the WRC and partners called for a South Africa Development Community (SADC) symposium to assess the interest in Citizen Science (CS) across the region. Since then, there have been expeditions where Orange-Senqu River Commission (ORASECOM) toured the entire Orange river system using CS tools. In 2019, the WRC launched a CS monitoring toolbox, with MiniSASS that assesses water resource quality as one of the tools. Without doubts, there is a wave of interest in CS, but these actions and activities have been uncoordinated and piecemeal, hence there has been difficulty in upscaling efforts and result to generate national data and information that is so critical in water resource monitoring (WRM). This is especially concerning as South Africa's data collection ability is declining and becomes more constrained every year. Current national water resource quality monitoring systems are expensive and require the use of accredited scientific monitoring methods, implemented largely through Government mandated monitoring efforts and by a few private entities and businesses.

The WRC has started the development of a Water Research Observatory Strategy, where CS is highly placed as one of the focal areas for future data collection and reporting, including the use of technology. It will also provide a platform for other initiatives to leverage CS data to fill data and information gaps. Again, the development of the strategy is driven by a serious lack of water resource quality data in the country, that is so important to managing our precious water resources and for modeling of the availability and use of these resources in the future. Several efforts on data collection and hydroinformatics have focused on highly technical mechanisms for generating information on water resource quality, thereby undermining the role of citizen scientists in the process.

Hydroinformatics recognises the inherently social nature of the problems of water management and of decision-making processes and strives to understand the social processes by which technologies are brought into use. While the problems of water management and water resource quality monitoring are most severe in many countries across the globe, the resources to obtain and develop technological solutions are concentrated in the hands of the minority. The need to examine hydroinformatic resources and the social processes of hydroinformatics are particularly acute.

Water is the life-blood of every citizen, critical for survival and livelihoods. In South Africa, freshwater and all other ecosystems are highly threatened. Protecting, conserving and sustainability utilising these resources is a responsibility so massive, that it can no longer be left to national policy and to a limited number of business partners. The role CS can play in monitoring and assessing water resource quality needs to be recognised as an area of utmost importance, that can provide benefits much larger than one organization can achieve. Recognising the crucial role of CS in water resource quality monitoring and reporting in the country will require the availability of simple and credible tools, capable data collectors, data bases and reporting systems to support the IWRM. It has also been noted that the citizen science concept is rapidly developing in South Africa, with an inherent risk to duplicate tool development and sampling efforts and thus, making no impact on decision making by influencing policy.

The aim of this study is hence to highlight the value of CS as a scientifically credible method of collecting and reporting data on the quality of water resources in South Africa. The study also aims to determine the manner in which the CS sector can consolidate citizen science tools under one umbrella, thereby enhancing the monitoring of our natural resources and save costs.

Deliverables:

This study is a community-based and multisectoral/multidisciplinary in nature aimed at engaging the citizen scientists to effect meaningful change in water resources management for their livelihood and sectors that are affected most by ecosystem degradation. The premise is that if citizens' knowledge, particularly youth citizens, is improved, the greater understanding and insight as to the state of their resources empowers them to interact with authorities and co-manage their resources in a more meaningful way.

Deliverables should include at least the following and ensure to cover the specific objectives outlined above:

1. The state of citizen science in South Africa including mapping of citizen scientists-NGOs, citizen science efforts and the contribution that citizen science can make to *'learning to earning'* pathways for youth and support for young people to enter the green economy.

2. A report on the capacity/capability of CS to generate credible data and information to contribute to national and international water resource monitoring systems (see SDG:2021 report)
3. State of water resources report: CS perspective
4. Recommendations on sustaining a productive CS community, particularly a youth CS community of practise in SA/or SADC

Impact Area:

Empowerment of communities and other related knowledge tree impact areas

Time Frame: 24-months
Total Funds Available: R 1,500,000
Year one Budget: R 500 000