TERMS OF REFERENCE FOR A SOLICITED WRC-MANAGED RESEARCH PROJECT

THRUST	**Big Data Analytics; Building regional scenarios; Policy support; Research support**
PROGRAMME	**Big Data and Transboundary Water Collaboration**
TITLE	**Consolidation of data and application of big data tools to enhance national and transboundary data sets in Southern Africa that support decision-making for security of water resources.**

BACKGROUND TO THE SPECIAL CALL FOR PROPOSALS AND CRITERIA

This Terms of Reference (ToR) document is part of a suite of research calls that link to an initiative called "Big Data Analytics and Transboundary Water Collaboration in Southern Africa". This initiative is funded by USAID, the South African Department of Science and Technology (DST), and the SADC Groundwater Management Institute (GMI), managed primarily by the Water Research Commission (WRC), and with technical support from the US Geological Survey (USGS) and the IBM Research Africa Lab in South Africa.

This programme includes 3 main components: 1) a series of research calls on transboundary ground and surface water with a focus on big data potential and value for improving the management of the region's water resources, the creation of scenarios for the region and the support to regional strategies and policies; 2) the creation of a Community of Practise (CoP) related to transboundary water, including the potential contributions of big data analytics to transboundary water management; 3) a series of workshops and training opportunities for individuals involved in the projects and the CoP.

The overarching goals of this programme are to:

- *Deepen* water-related big data skills and capabilities for Southern African researchers and their students through research activities, training and engaging in a CoP;
- *Enhance* current understanding of shared groundwater resources and how they can contribute to management and delivery of sustainable drinking water and other productive uses;
- *Improve* transboundary ground/surface water management and collaboration.

This initiative has grown out of a series of USAID and partner-driven initiatives in the Southern African region over a number of years. The need for this program was cemented in a regional workshop that took place at the IBM Africa technology hub in Johannesburg in April 2017. At its core, this program acknowledges the importance of robust, sufficiently detailed and locally relevant data to inform local and regional decision-making in transboundary basins.

The program thus explores how enhanced big data capabilities can potentially improve the robustness of data, analysis and decision making in the context of transboundary ground and surface water decision-making.

This is part of a set of 4 separate calls for proposals to advance the goals of the programme:

Theme 1 Consolidation of data and application of big data tools to enhance national and transboundary data sets in Southern Africa that support decision-making for security of water resources;
Theme 2 Imagining solutions for extracting further value from existing datasets on surface and groundwater resources in Southern Africa;
Theme 3 Localizing transboundary data sets in Southern Africa: A case study approach;
Theme 4 Groundwater secure transboundary systems

Under this call, we seek proposals that **address the consolidation of data and application of big data tools to enhance national and transboundary data sets in Southern Africa that support water resources security decision-making.**

APPLICATION ELIGIBILITY

- Any organization based in the SADC region can apply to the call as project leader;
- The lead organization can partner with any institution globally to carry out the activities proposed;
- All documents requested in the application form and online process must be submitted for the proposal.

OVERARCHING GUIDELINES FOR RESEARCH PROPOSALS

- All proposals need to have a **transboundary dimension** (i.e. Any case/application must include two or more countries in SADC);
- Preference will be given to:
  - proposals related to **groundwater systems**;
  - proposals by consortia showing clear evidence of **big data capabilities**, as well as strong **water sector technical experience**;
  - proposals that show a strong **commitment to student development**.
- The proposals should be **creative and include novel elements** in their theoretical and practical approaches, while aiming at supporting the wider goals of the programme (see above). Submissions should also specifically address how the proposed activity will:

  - Identify and/or address gaps in knowledge, management and use of ground and surface water data;
  - Advance the use of data to address transboundary issues in water management and use, especially in water supply system for drinking water;
  - Have broader impact on the sustainable management of water resources, including the sustainable management of drinking water supply systems.

Please note the following:

The consortium of organisations, which is selected for funding, will be expected to engage in activities and events related to the **Community of Practice** and should budget for attendance at the programme's **three technical workshops**.

The opportunity will be provided for one data-focussed individual within the consortium to take part in an **internship programme with the IBM Research Africa Facility in Johannesburg** (Braamfontein), which includes comprehensive training in the latest methods in big data analytics, including classical and deep machine learning.

RATIONALE

The competition for finite and limited water resources due to growing population and uncertain future supply is widely accepted as a critical issue in transboundary water development and management. The coordinated and cooperative management of transboundary basins can help facilitate sustainable, efficient and equitable allocation of shared water resources among countries. Data, agreed upon and shared data management systems, and open lines of communication are central to achieving that goal. However, it is common that individual countries collect, store and process data within their own borders using varied, and at time incompatible, technologies and tools. The datasets for one country may be inaccessible to other countries thus limiting the value that can be accrued from managing the shared basin as a holistic and integrated system. Managing the transboundary basin/aquifer as a holistic system requires the collation of data from each country sharing the resource, which likely originates in complex and varied formats, into an integrated whole. Big data analytics is proposed as a framework to analyse the various datasets to derive new insights that can be used to guide decision-making at the transboundary basin scale.

OBJECTIVES

General:

The purpose of this call for proposals is to catalyse research that can help collate and consolidate existing data and to apply big data tools to enhance national and transboundary datasets in Southern Africa.

Specific:

- Identify data holdings within countries sharing the same water resource and facilitate the sharing of data as open source information for the holistic management of the transboundary system.
- Integrate and reformat all datasets for compatibility purposes and create a new standardised quality control system for capturing, storing and processing of data.
- Develop a consistent approach regarding the parameters and units of measure of data collection (monitoring points, water levels, well depth, abstraction, water in-storage, etc.) and protocols on how data are to be collected.
- Develop a shared data repository in which to capture, store and process data and information for the countries sharing the same water resource and make a recommendation on the long-term hosting of this repository.

- Develop and/or apply one or more data visualisation tools which will appeal to decision-makers and help engage with them, on issues such as drinking water security and sustainability.
- Apply big data analytics to create new insights for improved local decision-making.

DELIVERABLES

1. Workshops with key stakeholders to understand the status quo, training on tools applied and follow-up on implementation;
2. Comprehensively documented shared data repository with recommendations for long-term hosting;
3. One or more data visualisation tools and/or analytical workbenches for working with the data;
4. Policy brief recommending how new insights have been created through the use of big data analytics and how they can be downscaled to local decision-making systems;
5. A print-ready integrated final report, including lessons learned.

Please, take note that the deliverables are illustrative and may be tailored to suit the research workplan proposed.

TIME FRAME

18 months

TOTAL FUNDS AVAILABLE

R1 855 000