Collaborating on Big Data Analytics for Transboundary Aquifer Management in Southern Africa

A WATER SECURITY CASE STUDY

Challenge: Coordinating a multi-agency partnership and fund for big data analytics of groundwater in Southern Africa

The Big Data and Transboundary Water Management Collaboration for Southern Africa was launched in 2018 as a partnership between several public and private entities (Figure 1). One of the aims of the Collaboration was to establish a Community of Practice to find new ways to understand, manage, and collaborate around groundwater resources shared by two or more Southern African countries. Effective groundwater governance requires good and sufficient data to understand water availability and water quality, and the possibilities for abstraction and use. However, limited funding and capacity, as well as technology requirements, often constrain data collection and analysis. Big data analytics (see Box 1) can help fill information gaps by organizing

large datasets from different sources and using artificial intelligence techniques such as machine learning to analyze the data for patterns. The information gained from big data analytics can be used to inform policy and decision-making despite gaps in data or information to improve the management of transboundary groundwater resources. The Collaboration piloted big data analytics on the Ramotswa aquifer, shared by Botswana and South Africa, and the Shire aquifer, shared by Malawi and Mozambique.

The Collaboration funded research projects addressing a variety of topics, including data standardization, data availability, data sharing between countries that share

water resources, and the application of big data analytics to the resulting data sets. The research teams had the opportunity to leverage the expertise of USGS and IBM Research Africa to explore ways to use the latest technology to collect and analyze data to improve water resource management.

When the collaboration was launched, each partner made commitments to contribute, however, it was unclear who would coordinate and integrate the partners' activities. No single institution had the resources to facilitate the required discussions and decision-making processes for implementation of the research grants, trainings, and learning workshops.

Intervention: Coordinating a multi-agency partnership and fund

In 2018, the USAID Center for Water Security, Sanitation, and Hygiene requested support from the USAID Sustainable Water Partnership (SWP) to coordinate the Collaboration. In consultation with the partners, SWP appointed a coordinator to help facilitate discussions and tasks of the Collaboration. The coordinator started by supporting the call for research proposals and establishing a Community of Practice focused on hydrogeology and computer science in Southern Africa.

The SWP Coordinator spent the first few weeks building one-on-one relationships with the Collaboration partners to understand their role and goals for the Collaboration as well as levels of interest and time constraints. In doing so, the SWP Coordinator was better able to understand what each partner could contribute and how to work with all the partners to troubleshoot challenges and propose solutions.

To foster increased engagement more widely, the SWP Coordinator worked with the partners to organize three launch events, hosted by partners, to showcase the goals of the Collaboration. The events took place at IBM's office in Johannesburg and the Department of Science and Innovation offices in Pretoria and Cape Town. The events built ownership among a wider group of staff within each partner organization, strengthened the Collaboration, and increased the reach of potential interested parties.

The SWP Coordinator established regular in-person partner meetings hosted by WRC, DSI, and IBM Research on a rotating basis. During these meetings, the partners implemented a call for research proposals and evaluated the submissions. The Collaboration awarded four research grants by the end of 2018. Following WRC's best practice for administering research, the SWP Coordinator participated in Reference Group meetings with independent experts on each research topic to help guide the administration of the research activities and ensure the quality of the research. Four Reference Group meetings were held between 2019-2020, with all research teams and all partners invited to discuss the progress and outcomes of the research projects. The SWP Coordinator also organized regular meetings of the research team leaders to support integration and coordination of their work and deliverables.

The SWP Coordinator used an adaptive management approach to repeatedly assess whether the Collaboration was meeting its goals and define or adjust activities to fill gaps. Over time, through this adaptive management approach, the partners defined five work streams on which they requested guidance and facilitation from the SWP Coordinator (Figure 2).

The SWP Coordinator worked to ensure that the partner representatives and research team leaders had

Figure 1: Partners Participating in the Big Data and Transboundary Water Management Collaboration for Southern Africa, and their contributions

Partners	Contribution
Southern African Development Community – Groundwater Management Institute (SADC-GMI)	Funding for big data research projects
Department of Science and Innovation of South Africa (DSI)	
USAID	
Water Research Commission of South Africa (WRC)	Management platform for long-term sustainability of the Collaboration
IBM Research Africa Lab	Big data trainings and internships
Technical Assistance Providers	**Contribution**
United States Geological Survey (USGS)	Groundwater governance training
USAID's Sustainable Water Partnership	Coordination and training

numerous opportunities to share perspectives and participate in decision-making processes. A constant challenge for the partner representatives involved in the Collaboration were competing engagements. As a result, partners sometimes missed Collaboration meetings, which led to miscommunication or disagreements. To avoid miscommunication issues which could affect the Collaboration, the SWP Coordinator worked to ensure all stakeholders were in agreement with meeting agendas and would debrief with each partner on the meeting discussions and decisions. The SWP Coordinator helped focus decision making on identifying joint actions that mutually benefited the partners and the Collaboration.

The SWP Coordinator maintained regular communication with the SWP team, the USAID Southern Africa Mission, and the WRC Program Administrator. The close working relationship with the WRC helped facilitate an adaptive
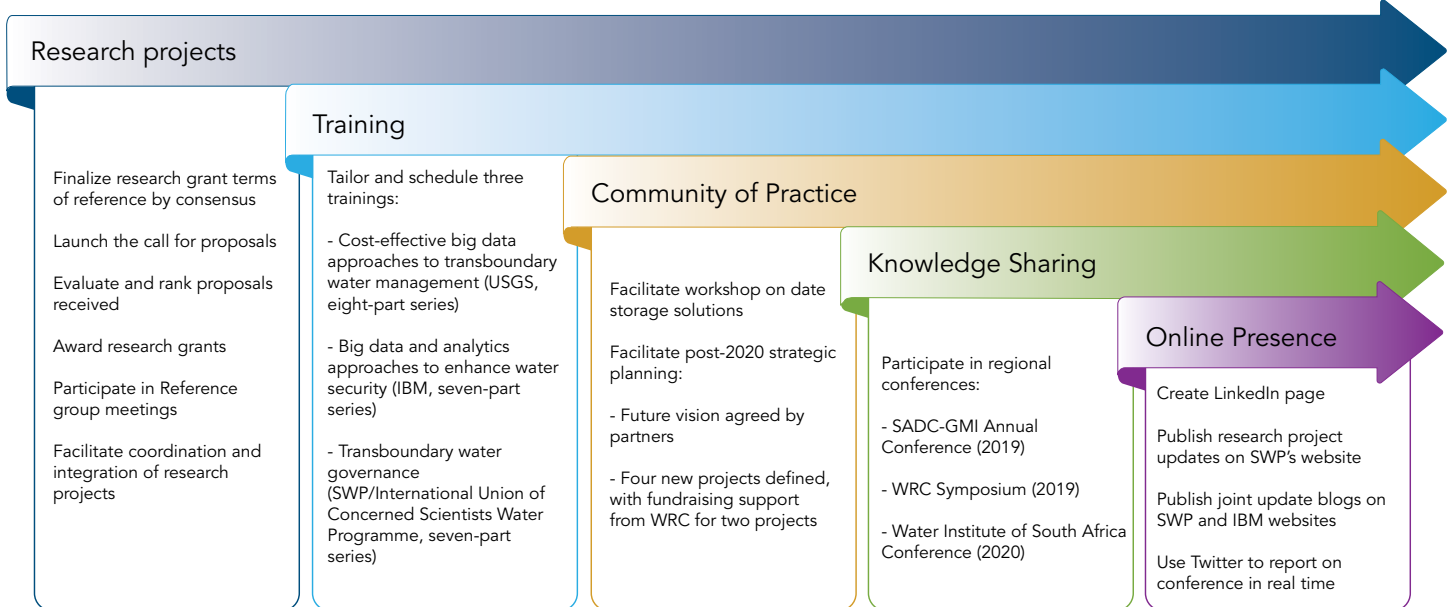
management approach and timely responses to key administrative and programmatic challenges.

Figure 2: SWP Coordinator's support to the Big Data & Transboundary Water Collaboration for Southern Africa

Research projects

Finalize research grant terms of reference by consensus

Launch the call for proposals

Evaluate and rank proposals received

Award research grants

Participate in Reference group meetings

Facilitate coordination and integration of research projects

Training

Tailor and schedule three trainings:

- Cost-effective big data approaches to transboundary water management (USGS, eight-part series)

- Big data and analytics approaches to enhance water security (IBM, seven-part series)

- Transboundary water governance (SWP/International Union of Concerned Scientists Water Programme, seven-part series)

Community of Practice

Facilitate workshop on date storage solutions

Facilitate post-2020 strategic planning:

- Future vision agreed by partners

- Four new projects defined, with fundraising support from WRC for two projects

Knowledge Sharing

Participate in regional conferences:

- SADC-GMI Annual Conference (2019)

- WRC Symposium (2019)

- Water Institute of South Africa Conference (2020)

Online Presence

Create LinkedIn page

Publish research project updates on SWP's website

Publish joint update blogs on SWP and IBM websites

Use Twitter to report on conference in real time

MEMBERS OF THE COLLABORATION AT THE LAUNCH EVENT

Lessons learned: Creating a culture of collaboration

Lessons learned about the qualities and skills needed to serve as an effective coordinator of a multi-organization collaboration include:

Building trust: The coordinator must understand the partner institutions and representatives involved in the partnership and the enabling environment to effectively facilitate discussions and decision making. The SWP Coordinator researched the partner institutions, including their priorities and goals for participating in the Collaboration, and built one-on-one relationships with the partner representatives.

Seeing the big picture and making connections: The coordinator's big-picture view helps facilitate how partners can combine efforts to achieve greater impact. The SWP Coordinator helped partners define and agree on actions to achieve the goals of the Collaboration. In some cases, this required the SWP Coordinator to help individual partners draw the connections between their work and the other components of the Collaboration. The SWP Coordinator also helped the research teams identify opportunities to integrate their work to support the goals of the Collaboration.

Facilitating participation and decision making: The coordinator can add value by ensuring that all partners participate and by working behind-the-scenes to facilitate decision making. The SWP Coordinator made an effort to ensure that all partners attended meetings where decisions would be made and engaged with them individually if they were not able to attend. The SWP Coordinator often held preparatory or follow-up meetings with partner representatives to assess their perceptions of a specific challenge, define potential options, and discuss how to reach consensus on difficult or potentially controversial issues.

Fostering inclusivity: The coordinator may determine that key stakeholders need to be added to make the collaboration more effective. The SWP Coordinator observed that the research team leaders could make important contributions to the Collaboration and advocated to include them in high-level decision-making meetings and planning sessions.

Mobilizing support: The coordinator can add value by recognizing when and where a collaboration may benefit from additional resources, such as training, information sharing, and involvement of new partners. The SWP Coordinator worked with the partners to confirm their interest in trainings delivered by the USGS, IBM Research, and IUCN, and helped facilitate a memorandum of understanding between WRC and the South African Council for Scientific and Industrial Research to support data storage solutions for the research projects.

Generating interest and motivation through publicity: It is important to showcase the collective work of a collaboration to generate interest and motivate continued work. The SWP Coordinator played an active role in creating buzz about the Collaboration, helped foster an active Community of Practice online, and worked with key outlets to document and share the work of the Collaboration.