ABSTRACT

The recently-established Groundwater Management Institute aims to be a centre of excellence in support of efforts to use groundwater sustainably in Southern African Development Community (SADC) countries. The setting up of the institute is being supported by the World Bank through grants from the Global Environment Facility and the Cooperation in International Waters In Africa for a period of 5 years, where after it is to be self-sustaining. Implementation of the initiative is being overseen by the SADC Water Division and the institute is being hosted by the University of the Free State in Bloemfontein. Through the development of partnerships with a range of governmental agencies, universities, the private sector and other networks, it is intended to integrate knowledge, skills and capacity across the region so that groundwater can be used beneficially and sustainably by communities that depend on it. This is to be achieved by supporting research, development of tools, collating existing information and training. This paper describes the envisaged structure of the Groundwater Management Institute, its vision and objectives, its modus operandi through partners and networking and the financial model for turning the initiative into a reality in the SADC region.

Keywords
capacity, collaboration, groundwater, management, resources

Proposed sub-theme
water and society, sustainable water supply and sanitation
INTRODUCTION

The Southern Africa Development Community (SADC) Secretariat, through the Water Division in the Directorate of Infrastructure and Services, received a grant from the World Bank to implement the five year regional project for Sustainable Groundwater Management in SADC Member States which seeks to mitigate the challenges of climate change, pollution and rapidly growing water demand in Southern Africa through strengthening the management and development of groundwater for social and economic development at regional, basin and national levels. The project started on 1 July 2014 and runs until 30 June 2019. However, due to some start up challenges with setting up the project implementation arrangements, the effectiveness date of the project is 30 June 2015.

It is estimated that there are over 30 identified transboundary aquifer systems with similar groundwater challenges across the 15 SADC Member States (Figure I). From the context of the regional nature of groundwater challenges, the project will implement priority actions in the work-programme for groundwater in the SADC Regional Strategic Action Plan for Integrated Water Resources Management (RSAPIII, 2011–2015) and in alignment with the Revised SADC Protocol on Shared Watercourses of 2000 and river basin agreements across the region. The SADC Member States will steer the project implementation through the SADC Subcommittee on Hydrogeology which will serve as the Project Steering Committee and report to the SADC Water Resources Technical Committee.

Through a competitive selection process run throughout the region, the SADC Secretariat selected the Institute for Groundwater Studies (IGS) within the University of the Free State (UFS) as the implementing agent. In this arrangement, the IGS hosts the SADC Groundwater Management Institute (SADC-GMI) which is the de-facto Project Implementation Unit for the Sustainable Groundwater Management in SADC Member States project. The SADC-GMI is expected to grow its brand while serving as the Project Implementation Unit using the competitive advantage within the IGS and the funds available within the project. By the end of the five-year funded project implementation period, SADC-GMI is expected to wean itself from project funding and operate sustainably as a renowned centre of excellence for groundwater management within the SADC region and beyond.
The Sustainable Groundwater Management in SADC Member States project is financed by the World Bank through an US$8.2 million grant from the Global Environment Facility (GEF) and US$2.0 million from the multi-donor Cooperation in International Waters in Africa (CIWA).

This paper describes the Sustainable Groundwater Management in SADC Member States project as the founding business case for the SADC-GMI.

Figure 1: Map of transboundary aquifers in the SADC Region
RATIONALE OF THE SUSTAINABLE GROUNDWATER MANAGEMENT IN SADC MEMBER STATES PROJECT

Groundwater is a fundamental resource for social, economic and environmental sustainability across the 15 Member States of SADC. The design of the Sustainable Groundwater Management in SADC Member States project is premised on several status quo and aspired social and economic scenarios within the region. The objective of this section is to briefly present these scenarios as a way to clarify the origins of the project.

Firstly, although the SADC Member States are endowed with abundant renewable groundwater resources estimated at about 2,500 m^3/capita/year, which is higher than either Europe or Asia, an estimated meagre 1.5% of the groundwater is utilised. At the same time, about 70% of the 250 million people in the SADC region rely on groundwater as their primary source of water for their livelihoods. These households need access to good quality groundwater which directly affects their wellbeing, livestock and productivity of subsistence farming. Human well-being, livelihoods, food security, ecosystems, natural habitats, industries and growing cities are directly reliant on groundwater. It is therefore imperative to enhance human socio-economic development through improved access to the abundant groundwater resources.

Background research undertaken during formulation of the project also revealed that although economic growth in the commercial farming, mining and industries is increasingly dependent on groundwater, groundwater management issues are often not granted equal priority in national and international water management and hence are not prominently featured in water policy, legal and regulatory environment particularly in the SADC region. Considering that the bulk of the population in the region is dependent on access to the otherwise abundant groundwater resources, it is a serious weakness that the national and international policy, legal and regulatory frameworks underestimate the importance of groundwater. Some of these glaring deficiencies in the management of groundwater have been linked to the lack of institutional and technical capacity in the Member States to implement requisite national reforms. The project therefore has as one of its key objectives to rectify these anomalies by raising the prominence of groundwater in the national and international policy, legal and regulatory environments, whilst also strengthening the institutional and technical capacity for implementation of commensurate national reforms.
Like surface water, groundwater is transboundary in nature and cuts across national borders. There are an estimated 30 transboundary aquifers and 14 transboundary river systems within the SADC region. While individual member states may do their best to manage their portion of the water resource systems, sustainable management thereof can only be achieved by adopting an integrated groundwater management approach illustrated in Figure 2.

![Figure 2: Framework for Integrated Groundwater Resources Management](image)

It has also been observed that besides the glaring lack of institutional capacity to coordinate the transboundary integrated groundwater resources management issues, both the national and international institutions experience a shortage of skills for groundwater planning and monitoring of compliance with standards and abstraction. Some notable consequences of this lack of capacity is overdrawing of the groundwater resources and pollution. The background research for the formulation of the project also concluded that SADC Member States often share similar groundwater challenges across the over 30 shared aquifer systems which further justifies the need for knowledge management and a coordinated approach to resolving these challenges. There is a need to establish sustainable mechanisms to build both institutional and
individual capacity at national and regional levels so that essential sustainable groundwater management functions are effectively executed.

The frequency of droughts in the SADC region is a matter of serious concern. These severe droughts which are associated with climate change also negatively impact on the availability of surface water to service the growing water demand in the region. Moreover, pollution from human settlement and development activities that include urbanisation, agriculture and mining also aggravate the access to water in the SADC Member States. The 2016 regional food security and vulnerability assessments indicate that the number of food insecure people in the region due to the El Niño-induced drought is about 40 million, which constitutes about 14% of SADC’s total population. By enhancing access to the relatively more available groundwater resources through the implementation of this project, some of the negative impacts of these severe weather conditions in the region will be alleviated.

The 15 Member States that are party to the SADC Treaty have adopted several strategic and policy instruments that enable integrated sustainable regional socio-economic development. Through the Revised SADC Protocol on Shared Watercourses of 2000 and the several river basin agreements in the region, the Member States are obliged to cooperate to enhance equitable and sustainable access to both surface and groundwater resources. Moreover, the SADC Regional Strategic Action Plan for Integrated Water Resources Management (RSAPIII, 2011–2015) contains agreed priority actions on groundwater resources management and development that need to be implemented in a coordinated manner at regional level. An opportunity exists to implement critical aspects of these regional strategic documents and foster regional integration through implementation of the Sustainable Groundwater Management in SADC Member States project.

Several previous and ongoing initiatives in the groundwater sector demand further follow-up or coordination respectively. The SADC Secretariat implemented the Sustainable Groundwater Drought Management Project from 2004 to 2010 where many achievements and lessons learnt from that project still need to be followed up. Moreover, it is also acknowledged that there several ongoing projects and initiatives at local, national and international level whose significance and impact might be limited at this stage due to lack of

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1 Source: SADC Secretariat – July 2016 [www.sadc.int](http://www.sadc.int)
coordination and cooperation at regional level. This new Sustainable Groundwater Management in SADC Member States project, through the SADC-GMI has an opportunity to take stock of other players, products and initiatives that can be synergised to maximise the equitable and sustainable access to groundwater resources within the SADC region. This includes incorporating efforts which strengthen the stewardship of existing groundwater resources, to those which utilise advanced technologies to collect and compile data on groundwater into centralised and accessible databases.

**INSTITUTIONAL INTERVENTION LOGIC FOR THE SUSTAINABLE GROUNDWATER MANAGEMENT IN SADC MEMBER STATES PROJECT**

The design of the Sustainable Groundwater Management in SADC Member States project also derives its logic from specific interests and mandates of the various institutions involved. This section briefly discusses the institutional intervention logic from the said stakeholders.

The 15 SADC Member States individually enjoy sovereignty which mandates them to plan and manage their groundwater issues independently. However, the transboundary nature of both surface and groundwater breaches administrative borders and compels member states to think regionally. This is the founding principle of the SADC Treaty which promotes regional integration and sustainable development. In the context of water, it has become apparent that the ongoing and future water-challenges facing the SADC Member States are not confined to administrative boundaries and hence they cannot be fully resolved through sovereign action. With more than 30 shared water aquifers identified throughout the SADC region, the approach adopted for this project is well aligned with the inter-governmental organisation of the SADC Treaty which has the goal of fostering cooperation and mutual benefit from shared waters among its 15 Member States.

The second institution from which the intervention logic of this project is designed in the World Bank. The World Bank has a long-standing commitment to global priorities and region wide programmes and water is one of their priority areas for implementing such programmes. In that regard, the World Bank supported the SADC Secretariat to implement the predecessor SADC Sustainable Groundwater Management Project (2005 – 2011) whose objective was to support the SADC Member States to develop cooperatively a strategic
regional approach to support and enhance the capacity of its Member States in the definition of drought management policies, specifically in relation to the role, availability (magnitude and recharge) and supply potential of groundwater resources. The current project, from the World Bank’s perspective is therefore a logical progression from the predecessor project in order to continue realising its institutional mandate and consolidating the gains already achieved.

The World Bank is also motivated to support this regional project because a substantial number of the Country Partnership Strategies for SADC Member States focusing on water as the key tool for economic growth, social development and environmental sustainability. These are the same themes contained in the current project. By extending support to the same Member States through a regional project, the World Bank will promote synergy and thus maximise benefits to the said Member States. In supporting the implementation of this project, the World Bank also has an interest to fulfil some of its high level objectives relating to the number of direct project beneficiaries aggregated by gender.

The Sustainable Groundwater Management in SADC Member States project will support the higher level objectives of the GEF in the focal area for International Waters through the development of the SADC-GMI to a recognised centre of excellence in groundwater management, and the enhanced capacity for sustainable transboundary groundwater management in the Ministries responsible for groundwater in SADC Member States. Moreover, the successful establishment and operationalisation of the SADC-GMI will fulfil the high level objective of the multi-donor trust-fund CIWA which supports the existence of a strengthened transboundary institution to improve regional cooperation.

The IGS accepted to serve as the project’s implementing agent and host of the SADC-GMI. Through this arrangement, the IGS enjoys a rare opportunity to extend its footprint into the SADC region and beyond through the SADC-GMI at minimal cost. The IGS boasts to be the leading groundwater research group in Africa on aspects related to fractured rock aquifers, industrial and mining contamination, groundwater governance and groundwater resources and lately on shale gas and hydraulic fracturing (fracking) in the Karoo\(^2\). The Institute provides these services through field investigations, the development of specialised field

equipment, a well-equipped commercial and water research laboratory, and a number of computer models for the management and operation of the aquifers, protecting them from pollution. These technologies have already been applied with excellent results in South Africa and some neighbouring countries. The IGS would like to extend the use of their expertise through this project.

**PROJECT DESCRIPTION**

**Development Objectives and Indicators**

The Project Development Objective (PDO) is to support sustainable management of groundwater at national and transboundary levels across SADC Member States to achieve social and economic development.

The corresponding Project Development Objective Indicators are:

a. Development of the SADC Groundwater Management Institute into a regionally recognised centre of excellence;

b. Transboundary and national institutions strengthened to improve regional cooperation; and

c. Enhanced capacity for sustainable transboundary and national groundwater management in the Ministries and departments responsible for groundwater in SADC Member States.

**Project Components**

The Project Development Objectives will be achieved by implementing activities in the four components briefly described below.

**Component A. Operationalising the SADC Groundwater Management Institute**

This component has five key activities. The first key activity entails the day-to-day running of the SADC-GMI through coordination and administration. Staffing, enforcing governance structures, setting up and managing organisational functions, progress reporting and overall project implementation fall under this area. The SADC-GMI will also execute its mandate to facilitate the smooth interface between the SADC Secretariat and the UFS as well as
facilitating the meetings and input of the SADC Subcommittee on Hydrogeology that also serves as the Steering Committee for the project.

The second key activity entails raising awareness, knowledge management and communication to inform, engage and maintain dialogue with key stakeholders of at all levels via various platforms including the project website and research programmes. National Focal Groups will also be supported through the use of small sub-grants to SADC Member States in order to enhance the functionality of national partnerships that foster the ownership of the project. Under this component, the project will facilitate the implementation of regional capacity building and training to technical groundwater practitioners, students and decision makers in SADC Member States through various forms including an internship and secondment programme.

The fifth key activity under this component supports initiatives that seek to secure long-term financial sustainability of the SADC-GMI. This activity also includes setting up and running a Sub-Grants Scheme to support national level activities such as convening national focal groups and implementing small scale pilots.

Component B. Strengthening Institutional Capacity for the Sustainable Management of Groundwater in SADC

This component also involves five key activities. In the first key activity on policy, legal and regulatory frameworks, the project will facilitate addressing the prevailing gaps in institutional groundwater management tools at national and transboundary levels through a range of methods including the modernisation and harmonisation of laws, policies and regulatory tools. Member States will also be assisted under the compliance and advocacy key activity to follow up on implementation of existing institutional management tools to enhance compliance of groundwater governance. Guidelines, standards and management tools will also be developed to enable groundwater practitioners in the Member States to benchmark and implement sustainable groundwater management practices. In order to assist Member States to effectively integrate the monitoring of groundwater into national policies and practices, support will be rendered to strengthen data management systems.
The fifth key activity under Component B entails enhancing transboundary cooperation through the integration and harmonisation of groundwater provisions between the national and basin level commitments. Collaboration with River Basin Organisation (RBOs) across the region with reference to solutions needed to address shared groundwater challenges and sharing of data and benefits will also be addressed.

Component C. Advancing Knowledge on Transboundary and National Groundwater

Three main activities under this component pertain to identifying best practices in the field through research and networking and sharing the knowledge through various platforms on Information and Communication Technology. As such the first activity entails supporting Transboundary Aquifer (TBA) Management institutions in Member States that include River Basin Organisations (RBOs) to find solutions to shared groundwater challenges through Transboundary Diagnostic Analysis (TDA) and Strategic Action Plans (SAP) alongside mechanisms for data collection and sharing. Potential TBAs are identified for these interventions include the Ramotswa Dolomite Aquifer (Botswana & South Africa), the Shire Valley Alluvial Aquifer (Malawi & Mozambique), the Tuli Karoo Basin Aquifer (Botswana, South Africa, Zimbabwe), the Eastern Kalahari Karoo Basin Aquifer (Botswana, Zimbabwe), and other TBAs classified with priority B in recent research on critical TBAs.

The second activity focuses on conducting research on groundwater challenges which will involve studies/pilots, information exchange on findings, training and implementation of solutions to emergent and priority groundwater management challenges. Priority topics for research include climate change, recharge, drought, pollution protection, expanding agriculture and food security, the role of remote sensing and geophysics technology, validation, groundwater buffering opportunities, mapping, monitoring and early warning systems, among others. The third activity will support the building of Information and Communication Technology platforms for knowledge sharing of data interlinked with a GIS platform and the project websites.

Component D. Promoting Groundwater Infrastructure Management and Development

The objective of Component D is to promote the development and funding of sustainable appropriate technology infrastructure to allow sustainable management of groundwater while
addressing growing challenges related to issues such as drought, recharge, pollution, conjunctive land-water management, water and food security, climate change, vandalism, operations and maintenance, etc. in Member States. The first activity in this regard is the development of infrastructure for improved groundwater utilisation, management and protection that involves developing, making available and training on design-tools related to the assessment, selection, mapping, siting, costing and designing of appropriate groundwater infrastructure solutions reflecting the geological and landscape aspects of groundwater in priority areas of Member States. The groundwater infrastructure solutions will include some of those pilot projects developed under the predecessor groundwater drought management project.

Impact evaluation and learning will also be supported in order to help monitor impacts, trouble-shoot and report on results taking into consideration community and gender as well as include learning and training based upon findings of the evaluations. Manuals for infrastructure solutions that can improve groundwater management will also be developed and disseminated as tools to enhance operational support for groundwater infrastructure development. This includes support for small infrastructure such as sand dams, infiltration banks and shallow wells and guidance tools for siting of wells and cost-effective well drilling among others. The fourth main activity under this component is the support to partnership development and securing funding for infrastructure development within governments, with private sector parties or with bi/multilateral partners and others to allow for scaling up of successful solutions. Small sub-grants will facilitate Member States developing the majority of the infrastructure pilots, in accordance with the procedures and obligations outlined in the future Sub-Grants Manual. The SADC-GMI may implement small scale civil works for demonstration or training purposes.

PROJECT IMPLEMENTATION INSTITUTIONAL ARRANGEMENTS

The institutional responsibilities for the project (Figure 3) are aligned with treaties, protocols, mandates and strategic action plans of SADC (SADC Treaty 1992, Article 14). The SADC Secretariat in Gaborone, Botswana, through the Water Division of its Directorate for Infrastructure and Services, will be the custodian of the project and recipient of the grant. The SADC Water Division’s main responsibility is to provide strategic guidance and management
throughout project implementation in line with its mandate “to attain the sustainability, integrated planning, development, utilisation and management of water resources that contribute to the attainment of SADC’s overall objectives of an integrated regional economy on the basis of balance, equity and mutual benefits for all member States”.

**Figure 3: Project implementation institutional arrangements**

SADC Member States will take an active part in developing and implementing the project through Member State representatives on the SADC Subcommittee on Hydrogeology, alongside focal groups and networks at national level. The SADC Subcommittee on Hydrogeology also acts as the Project Steering Committee that should meet at least twice per year. The SADC Subcommittee on Hydrogeology also reports to the SADC Water Resources Technical Committee. These arrangements build on those already established under the SADC Groundwater and Drought Management Project completed in 2011.

The UFS, through its IGS, was selected by the SADC Subcommittee on Hydrogeology as the implementing agent on behalf of the SADC Secretariat and to host the SADC-GMI. These hosting arrangements were endorsed by the SADC Council of Ministers in 2008 followed by
drafting of the SADC- GMI Charter and Mandate. The first Strategic Business Plan for the SADC-GMI for the period 2010 – 2012 was drafted in 2009. In June 2011, the SADC GMI was legally registered under South Africa’s Company Act, and Articles and a Memorandum of Association were notarially registered in South Africa (i.e., certified and signed by Attorney). By February 2014, the SADC Secretariat and the UFS had a final draft Memorandum of Understanding for hosting of the SADC-GMI. The UFS signed subsidiary agreements with the SADC Secretariat, the World Bank and the GEF.

The fiduciary systems of the UFS were deemed suitable to govern financial management and procurement of the project activities in accordance with World Bank Operational Policies and Bank Procedures. The responsibility for financial management and procurement activities of the project will reside with the UFS through the support of staff at the university and those to be employed in the SADC-GMI. The funds of the grants supporting the implementation of the project will be channelled directly to the UFS to bring efficiencies in project implementation, facilitate reporting, and foster clarity on accountability and governance.

According to its inaugural Strategic Business Plan (2010-2012) the vision of the SADC-GMI is to “ensure the equitable and sustainable use and protection of groundwater, as well as being a centre of excellence in the areas of groundwater drought management and management of groundwater dependent ecosystems in the region”. The corresponding mission for the SADC-GMI is:

- Raising the awareness and understanding of groundwater use, protection and management in Southern Africa, amongst politicians, managers, water users and the general public. One element of this is raising awareness around groundwater drought and drought management; and
- Building capacity to manage groundwater sustainably, effectively, and in the public interest. Currently the region is characterised by very different levels of capacity, both human and institutional. In this regard, institutional capacity is considered in its broadest sense to include factors such as the legal framework access to data and information, human capacity and knowledge and access to sufficient financial resources

The SADC-GMI is established as a not-for-profit company under South African law. It is guided and supervised by a Board of Directors with representatives of the SADC Secretariat,
SADC Member States and the University of the Free State. For the first 5 years of its existence, the SADC-GMI will act as the Project Implementation Unit of the Sustainable Groundwater Management in SADC Member States project. During this period the SADC-GMI is expected to secure long term funding to become a sustainable centre of excellence and groundwater expertise in the region providing research, training and advice to public and private sector clients. The first organogram for the SADC GMI is presented in Figure 4.

![SADC-GMI organogram](image)

**CONCLUSIONS**

Discussion in this paper demonstrates that the implementation of the Sustainable Groundwater Management in SADC Member States project and establishment of the SADC-GMI contribute directly to several sub themes for Water Resources Management: Water Security, Sustainability and Development in Southern Africa. This initiative contributes to improvement in our understanding of different components of the hydrological cycle and the spatial and temporal distribution of water in Southern Africa where there is fragmented understanding of groundwater which is the largest storage in the region. It also confirms that
groundwater maintains the base flow of many national and transboundary basins in Southern Africa during the dry season and is the main source of rural, urban and peri-urban water supply for household use through natural springs, shallow wells and boreholes, implying that any sustainable water security planning has to encompass groundwater development. The SADC-GMI initiative seeks to promote the development of monitoring systems that will avail data on the national and transboundary groundwater aquifer systems which will in turn promote regional integration.

The initiative will support the agenda for providing solutions for water security that include hydrological conditions, rapid population growth, urbanisation, increased per-capita water use, pollution of water resources, over-abstraction of groundwater and climate change and variability. These scenarios result in available freshwater resources being limited in quantity or quality and in turn negatively affecting equitable access to water resources. Furthermore the initiative also supports water security through the operationalisation of appropriate governance arrangements and building capacity across the region to manage groundwater resources. Suitable and reliable water infrastructure will also be developed to enhance equitable and sustainable access and utilisation of groundwater in the SADC region even during periods of drought.

**BIBLIOGRAPHY**


SADC Secretariat - [www.sadc.int](http://www.sadc.int)