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steemed Partners and Stakeholders, on behalf of the Organising partners, I wish to welcome you all to the 2nd Annual SADC Groundwater Conference. This year we convene under the theme, "Groundwater Contribution to Achievement of Sustainable Development Goals in the SADC Region".

This conference presents another opportunity to reflect and discuss the contribution of groundwater in attaining the Sustainable Development Goals (SDGs), in-particular SDG 6 that sets out to "ensure availability and sustainable management of water and sanitation for all" as promulgated in the Agenda 2030 of the United Nations. With water at the very core of sustainable development, SDG 6 does not only have strong linkages to all of the other SDGs, it also underpins them. By implication, meeting SDG 6 would go a long way towards achieving much of the 2030 Agenda, i.e. ending poverty, improving health, spurring economic growth, and sustaining ecological capital. Sustainable groundwater development enhances the potential to provide potable water to an estimated 40 percent of the 280 million inhabitants of the SADC region currently without access to adequate and safe drinking water and sanitation services. This potential of groundwater to enhance the attainment of SDG 6 has been inadequately acknowledged especially now when there are serious concerns on the widening gap between water demand and availability and the increasing dependency of nations on groundwater in the wake of the worsening impacts of climate change and water insecurity.

Central to the discussion are SDG 6 targets that relate to improving access to water and sanitation and implications on groundwater quantity and quality, water use efficiency and reducing water scarcity across all sectors of the economy. The need for increased efforts at the policy and technical level to sustainably develop and manage groundwater resources is also central to the conference deliberations. Reliable data to provide a basis for measuring progress towards attaining SDG targets is not always available, and so are the primary data on the status of groundwater. The limited availability of data is also aggravating the lack of groundwater information and knowledge necessary to inform policy and decision making. nature of the conference discussions that we have assembled via renowned keynote speakers will address the need for applied scientific rigour in order to understand the physical nature of groundwater resources, the need for reliable groundwater data and data for tracking progress towards SDG 6. We also envisage the deliberations to unpack the policy legal and institutional frameworks necessary to fully realise the role of groundwater. In cognisance of this vision, the conference sub-themes are carefully structured around the same subject matters.

Our core mandate as a Centre of Excellence is to promote sustainable groundwater management and provide solutions to groundwater challenges across the SADC region and we also support the achievement of the Sustainable Development Goal (SDG) 6 in the process. In a quest to fulfil our mandate, in collaboration with regional and international partners, we have successfully implemented a number of interventions that provide innovative solutions to groundwater challenges in the region. All SADC-GMI activities ensure that groundwater makes pivotal contributions to the achievement of SDG 6. SADC-GMI recently collaborated with the Malawian government to successfully pilot the exploration of a deep aquifer in Chimbiya village where a 100 metre deep borehole was drilled and infrastructure installed to supply potable water to an estimated 15000 inhabitants in the village. During the same period, we also embarked on a 12 months project to

create enabling policy, legal and institutional frameworks across the 16 SADC Member States to promote the sustainable utilisation of groundwater. The project identified existing gaps in the policy, legal and institutional frameworks in the Member States and at a regional level. A pilot project was implemented in Tanzania to demonstrate the roadmap required to close the gaps identified.

Another important project implemented in the last 12 months was the first regional Conjunctive Water Resources Management Research project undertaken in the Shire Transboundary River/Aquifer System that is shared between Malawi and Mozambique. This project culminated in development of key principles for Conjunctive Water Resources management to be used across the SADC region considering that there are more than 20 similar Transboundary Aquifers requiring similar research.

We acknowledge that without information, the decision makers will not be able to make well-informed decisions. As a result, we implemented the Capacity Building for Groundwater Data Collection and Management Project across all SADC Member States in the past 18 months. The project assisted in identifying existing gaps in data collection and data management while simultaneously building the capacity of the Member States' staff in the public sector on effective groundwater data collection and management tools including navigating through some softwares. The project culminated in the participatory elaboration of the SADC-wide framework for Groundwater Data Collection and Management to guide Member States on the subject matter. The project also ran an internship programme that enhanced the building of skills and empowerment of two young professionals from each Member State.

All our diverse activities are aimed at ensuring that we live and fulfil our mandate of promoting equitable and sustainable management of groundwater in the region, which in turn contribute to achievement of SDG 6. After all, groundwater is more resilient to climate change than surface water and hence we cannot afford to overlook its significance in contributing to water security and sustainable development, both in the region and on the African continent.

The third issue of "The Well" newsletter coincides with the 2nd SADC Groundwater conference hence the collection of stories for the issue is centred around the conference theme "Groundwater Contribution to Achievement of Sustainable Development Goals in the SADC Region". We have carefully selected stories that speak to the theme for your stimulated reading during and post the conference. "The Well" is one of the SADC-GMI's premium communication platforms aimed at sharing information, ideas and experiences on groundwater issues in the region. External contributors are also welcome to contribute content for the newsletter. We also accept advertisements from institutions who would like to advertise with the publication. Please contact us on the details provided at the back of the newsletter for more information. To stay informed on SADC-GMI activities, follow us on our social media platforms.

We hope you enjoy the content in this edition of "The Well" newsletter, and also enjoy the two and the half days deliberations during the conference.



MOT DE BIENVENUE DIRECTEUR EXÉCUTIF DE SADC-GMI (M. JAMES SAURAMBA).

hers partenaires et parties prenantes, au nom des partenaires organisateurs, je vous souhaite à tous la bienvenue à la 2e Conférence annuelle sur les eaux souterraines de la SADC. Cette année, nous nous réunissons sous le thème « Contribution des eaux souterraines à la réalisation des objectifs du développement durable dans la région SADC ».

Cette conférence offre une nouvelle occasion de réfléchir et de débattre de la contribution des eaux souterraines à la réalisation des Objectifs de développement durable (ODD), en particulier l'ODD 6 qui vise à « garantir l'accès de tous à des services d'alimentation en eau et d'assainissement gérés de façon durable » comme le prévoit l'Agenda 2030 des Nations Unies. L'eau étant au cœur même du développement durable, l'OMD 6 n'est pas seulement étroitement lié à tous les autres OMD, il les sous-tend également. Par conséquent, atteindre l'OMD 6 contribuerait grandement à la réalisation d'une grande partie de l'Agenda 2030, c'est-à-dire l'élimination de la pauvreté, l'amélioration de la santé, la stimulation de la croissance économique et le maintien du capital écologique. La mise en valeur durable des nappes phréatiques améliore le potentiel d'approvisionnement en eau potable d'environ 40 % des 280 millions d'habitants de la région de la SADC qui n'ont actuellement pas accès à une eau potable et à des services sanitaires adéquats et sûrs. Ce potentiel que renferme les eaux souterraines permettant d'améliorer la réalisation de l'OMD 6 n'a pas été suffisamment reconnu, surtout maintenant que l'écart grandissant entre la demande et la disponibilité de l'eau et la dépendance croissante des nations à l'égard des eaux souterraines en raison de l'aggravation des effets du changement climatique et de l'insécurité hydrique suscite de graves préoccupations.

Au centre des débats se trouvent les cibles de l'OMD 6 qui concernent l'amélioration de l'accès à l'eau et à l'assainissement et les implications sur la quantité et la qualité des eaux souterraines, l'efficacité de l'utilisation de l'eau et la réduction de la pénurie d'eau dans tous les secteurs de l'économie. La nécessité de redoubler d'efforts aux niveaux politique et technique de manière à mettre en valeur et gérer durablement les ressources en eaux souterraines est également au cœur des délibérations de la conférence. On ne dispose pas toujours de données fiables permettant de mesurer les progrès accomplis dans la réalisation des

objectifs des OMD, de même que de données élémentaires sur l'état des eaux souterraines. La disponibilité limitée des données aggrave également le manque d'information et de connaissances sur les eaux souterraines nécessaires pour éclairer les politiques et la prise de décisions.

Nous sommes ravis que la complexité et la nature multidimensionnelle des débats tenus dans le cadre de la conférence que nous avons rassemblées par l'entremise d'orateurs principaux renommés aborderont la nécessité d'une rigueur scientifique appliquée afin de comprendre la nature physique des ressources en eaux souterraines, le besoin en matière de données fiables sur les eaux souterraines et les données permettant de suivre les progrès vers l'Objectif 6. Nous envisageons également les délibérations visant à présenter les cadres juridiques et institutionnels politiques nécessaires de sorte à réaliser pleinement le rôle des eaux souterraines. Conscients de cette vision, les sous-thèmes de la conférence sont soigneusement structurés autour des mêmes sujets.

Notre mandat principal en tant que centre d'excellence consiste à promouvoir la gestion durable des eaux souterraines et à fournir des solutions aux défis que pose les eaux souterraines dans toute la région de la SADC. De plus, nous appuyons également la réalisation de l'objectif 6 du développement durable (OMD). Dans le but de remplir notre mandat, en collaboration avec des partenaires régionaux et internationaux, nous avons mis en œuvre avec succès un certain nombre d'interventions qui apportent des solutions novatrices aux problèmes posés par les eaux souterraines dans la région. Toutes les activités de la SADC-GMI garantissent que les eaux souterraines contribuent de manière décisive à la réalisation de l'Objectif 6.

La SADC-GMI a récemment collaboré avec le gouvernement du Malawi pour piloter avec succès l'exploration d'un aquifère profond dans le village de Chimbiya où un forage de 100 mètres de profondeur a été effectué et une infrastructure installée visant à fournir de l'eau potable à environ 15 000 habitants dans le village. Au cours de la même période, nous nous sommes également lancés dans un projet de 12 mois visant à créer des cadres politiques, juridiques et institutionnels habilitants

NOTA DE BOAS VINDAS DIRECTOR EXECUTIVO SADC-GMI (MR. JAMES SAURAMBA).

stimados Parceiros e Partes Interessadas, em nome dos parceiros Organizadores, desejo dar as boasvindas a todos na 2º Conferência Anual sobre Águas Subterrâneas da SADC. Este ano, reunimo-nos sob o tema "Contribuição das Águas Subterrâneas para a Realização de Objectivos de Desenvolvimento Sustentável na Região da SADC".

Esta conferência apresenta outra oportunidade para reflectir e discutir a contribuição das águas subterrâneas na consecução dos Objectivos de Desenvolvimento Sustentável (ODSs), em particular o ODS 6, que se propõe a "garantir disponibilidade e gestão sustentável de água e saneamento para todos" conforme promulgado na Agenda. 2030 das Nações Unidas. Com a água no centro do desenvolvimento sustentável, o ODS 6 não só tem fortes ligações com todos os outros ODS, mas também os sustenta. Por implicação, cumprir o ODS 6 contribuiria para alcançar grande parte da Agenda de 2030, ou seja, acabar com a pobreza, melhorar a saúde, estimular o crescimento econômico e sustentar o capital ecológico. O desenvolvimento sustentável das águas subterrâneas aumenta o potencial para fornecer água potável a cerca de 40 por cento dos 280 milhões de habitantes da região da SADC, actualmente sem acesso a serviços adequados e seguros de água potável e saneamento. Este potencial de água subterrânea para melhorar a consecução do ODS 6 tem sido insuficientemente reconhecido, especialmente quando há sérias preocupações sobre a crescente lacuna entre demanda e disponibilidade de água e a crescente dependência das nações em relação às águas subterrâneas na esteira do agravamento dos impactos da mudança climática e insegurança da água.

No centro da discussão estão as metas do ODS 6 que se relacionam com a melhoria do acesso à água e saneamento e as implicações na quantidade e qualidade das águas subterrâneas, eficiência do uso da água e redução da escassez de água em todos os sectores da economia. A necessidade de maiores esforços a nível político e técnico

para desenvolver e gerir de forma sustentável os recursos de água subterrânea é também central para as deliberações da conferência. Dados confiáveis para fornecer uma base para medir o progresso em direção ao alcance das metas dos ODS nem sempre estão disponíveis, e assim são os dados primários sobre o status das águas subterrâneas. A disponibilidade limitada de dados está também a agravar a falta de informação e conhecimento sobre a água subterrânea necessária para informar as políticas e a tomada de decisões.

Estamos entusiasmados com o facto de que a complexidade e a natureza multidimensional das discussões da conferência que reunimos por meio de renomados palestrantes atenderão à necessidade de rigor científico aplicado para entender a natureza física dos recursos hídricos subterrâneos, a necessidade de dados e dados confiáveis sobre águas subterrâneas. para acompanhar o progresso em direção ao ODS 6. Também contemplamos as deliberações para desmembrar as estruturas legais e institucionais de políticas necessárias para realizar plenamente o papel das águas subterrâneas. No conhecimento desta visão, os subtemas da conferência são cuidadosamente estruturados em torno dos mesmos assuntos.

O nosso mandato principal como Centro de Excelência é promover a gestão sustentável das águas subterrâneas e fornecer soluções para os desafios das águas subterrâneas em toda a região da SADC e também apoiamos a realização do Objectivo de Desenvolvimento Sustentável (ODS) 6 no processo.

Numa missão para cumprir o nosso mandato, em colaboração com parceiros regionais e internacionais, implementamos com sucesso uma série de intervenções que fornecem soluções inovadoras para os desafios das águas subterrâneas na região. Todas as actividades da SADC-GMI garantem que as águas subterrâneas façam contribuições fundamentais para a realização do ODS 6.

SADC-GMI BOARD MEMBERS









James Sauramba

Trevor M. Shongwe

Maria Amakali

Eelco Lukas

James is qualified civil engineer with an MBA. He grew up in Zimbabwe and has wide experience in the SADC region, worked in Malawi, Mozambique, Namibia, South Africa, Tanzania and Zimbabwe. His work has involved water and development and climate change. James is charged with the establishment of the SADC-GMI, its ongoing management and securing its future

Mr. Shongwe is representing the substantive Chief Water Engineer and currently Director of Water Affairs in the Ministry of Natural Resources and Energy of Eswatini. He is charged with the planning and development of Eswatini's sanitation projects, infrastructure surface and underground water resources. As the country's focal point for the SADC Regional Strategic Action Programme, he is actively involved with transboundary water negotiations and other regional water issues.

Maria Amakali is a Director in Kingdom of Eswatini. He is the Directorate Water Resources Management in the Department of Water Affairs in Namibia. She is a water resource manager with extensive experience in issues related to transboundary water management, integrated water resources management and water supply security issues in Namibia and SADC. She participated in several SADC water management projects, as a technical task team membe and Commissioner on several international shared river basin Kunene and Cuvelai Basins, as well as GWP-SA board. She is a Director on the SADC Groundwater Management Institute board.

Eelco Lukas grew up in the Netherlands and is a civil engineer by training. After obtaining his Civil Engineering's degree Eelco emigrated to South Africa and started working for the University of the Free State (UFS) where he qualified as a hydrogeologist. He is the developer of the Windows Interpretation System Hydrogeologists (WISH) and is currently the Director of the Institute for Groundwater es at the University of the Free State and the host for the Southern African Development Community - Groundwater









Dr Lugomela

Zandile Kabini

Michael Marler

Dr Patrice Kabeya

Dr. Lugomela is a seasoned with 20 years' hydrologist experience in hydrology and water resources management with the Ministry of Water -Tanzania. Dr. Lugomela served as the National Decision Support System (DSS) Specialist for Tanzania during the development of the Nile Basin DSS from 2007 to 2012 where he successfully participated in its preparation. He was also one of the Task Force members representing Tanzania in the Development of the New Water Release and Abstraction Policy for Lake Victoria Basin from 2007 to 2012. During his tenure as an Assistant Director (2012 -2019), he successfully supervised the preparation of Integrated Water Resources Management and Development (IWRMD) Plans in different Basins of Tanzania, among other responsibilities.

Dr. Lugomela is currently one of Tanzania's representative in the Nile Equatorial Lakes Technical Advisory Committee (NELTAC), an advisory body to the Council of Ministers (NELCOM) on all matters related to the Nile Equatorial Lakes Subsidiary Action Program Coordination Unit (NELSAP-CU) which is based in Kigali. He is the current Director of Water National Hydrological Adviser to the Permanent Representative of Tanzania with WMO who is also the Director General of Tanzania Dr. Lugomela has made several publications and lectures on part time basis at the University of Dar of Science and Technology (NM AIST) based in Arusha.

Zandile Kabini holds the following qualifications: Bachelor Commerce (Bcom) Informatics, Bcom (Hons) Informatics, Diploma in Business Analysis, Management Development Programme and a number of corporate Governance certificates from the Institute of Directors South Africa (IODSA). She is currently pursuing a Mater of Commerce (Business Management) degree.

As an ICT professional she has vast experience in ICT sector providing Management Business and advisory through consultation within Government (National, Provincial and Local). Zandile previously served as a Board Chairperson of ODI Water and Audit & Risk Committee of Road Traffic Management Corporation (RTMC).

She currently serves on the Audit & Risk Committee of the Department of Sport and Recreation (SRSA), ICT Steering Committee of the National Regulator for Compulsory Specifications (NRCS), the Board of Boxing SA (BSA), Non-Executive Director of Broadband Infraco Executive Director for the SADC-Groundwater Management Institute (SADC-GMI).

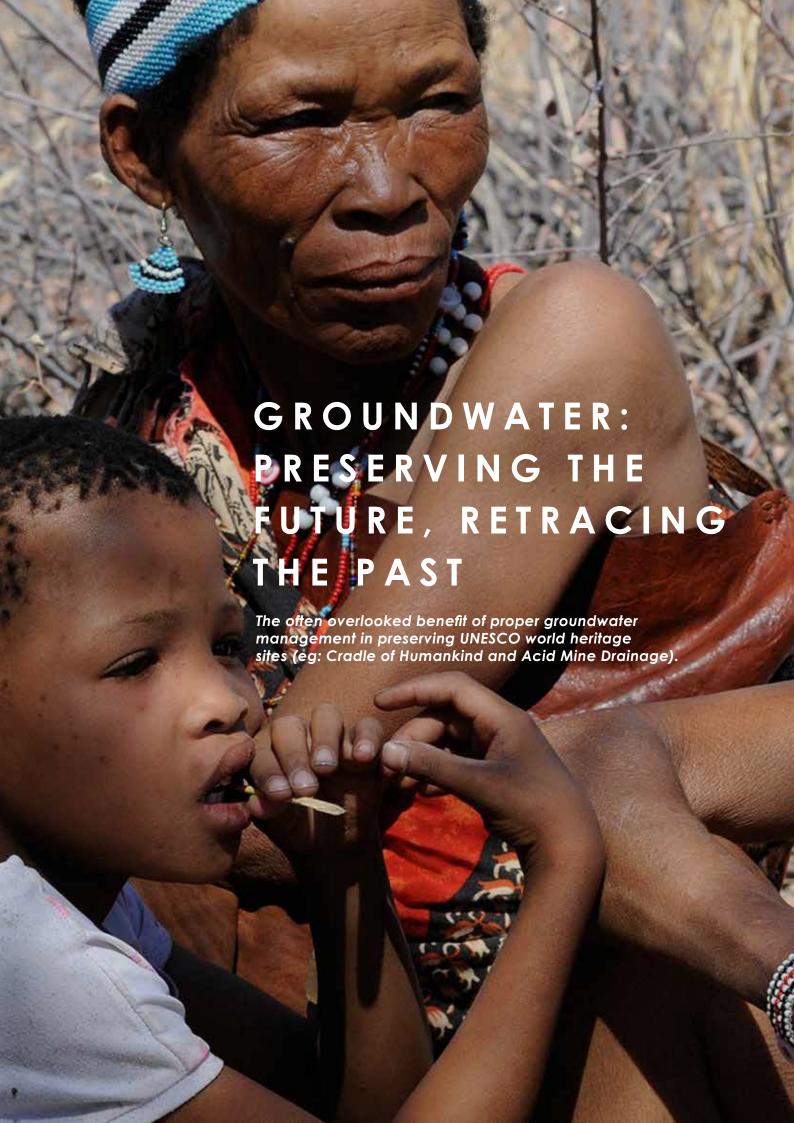
Michael is a Civil Engineer Dr. with wide-ranging experience in the Water Sector. Municipal Infrastructure and Management, Waste Asset Management and Renewable Energy. He is currently a Trustee of an NGO whose mandate is to assist Rural Communities gain access to water and sanitation with particular emphasis on community involvement implementation.

He has worked as a Consultant and as a Technical Adviser Regional employed by Development Corporations and DFI's, including Development Bank of Southern Africa. At the Development Bank he was a team member on a number of regional projects in the SADC Region.

Patrice Kandolo Kabeya hold a Ph.D. in Economics and International Development, University of Bradford, United Kingdom. His areas of expertise include: Water Management, Economic Analysis for Investment Projects, Water Water Institutional Development, Application of research to water economy, Econometrics, and applied economy for economic development.

He has lectured at various universities in the United Kingdom, and Western Balkans Countries. In the United Kingdom, he lectured at the University of Huddersfield, Leeds Beckett University, and University of Bradford. In the Western Balkans Countries, He lectured at EPOKA University in Albania. He worked for the Common Market for Eastern and Southern Africa (COMESA) Secretariat under the Investment Promotion and Private Sector Development Division.

Currently he is the Senior Programme Officer- Water at Southern African Development Community (SADC) Secretariat, Water Division, Directorate of Infrastructure.







atural World Heritage sites are of the planet's most significant protected areas, or, as the United Nations Educational, Scientific and Cultural Organizations (UNESCO) describes them, areas of 'outstanding universal value'. These sites, whether cultural or ecological, are protected by international treaties.

According to Peter Shadie, the director of the World Heritage Programme at the International Union for Conservation for Nature, the classification is based on four criteria: exceptional natural phenomena or beauty; geological processes; ecological and biological processes; and its biodiversity. The Union, Shadie explains, is the official advisory body for natural World Heritage sites globally. He says we have a collective responsibility to protect these sites, from one generation to the next.

OLDUVAI GORGE - TANZANIA

The Olduvai Gorge is in the Ngorongoro Conservation Area in Tanzania, and meets all the criteria, from breathtaking beauty to extraordinary biodiversity. Underlying these conditions, however, is an ecosystem heavily dependent on the aquifer that underlies it.



Olduvai has significant heritage assets, not only in terms of natural biodiversity but also in human history - boasting a rich fossil record, this is where the remains of the early human ancestor Homo habilis were found. The area has proven invaluable in terms of furthering the understanding of human origins and evolution, and is to date considered one of the most important paleontological sites in the world.

Homo habilis is the scientific name for the "Handy Man", believed to be the first early human species who lived around 2 million years ago and was the first to make use of stone tools.

The first of these tools were discovered in Olduvai - in the field of archeology, these early stone tools are still known as Oldowan technology, a name that has been borrowed from this site

BUT WHAT DOES THIS HAVE TO DO WITH GROUNDWATER?

The question of how and why the Olduvai has the greatest concentration of these stone tools had, for a long time, gone unanswered. This, along with what happened to the once thriving group that lived here, seemed to be a secret the Ngorongoro Volcanic Highlands that feed the regional springs will not divulge.

A paper by Mark Cuthbert and his colleagues titled "A Spring Forward for Hominin Evolution in East Africa" attempts to answer some of these questions. See, when the Olduwan culture thrived a little more than 2 million years ago, their burgeoning civilisation was supported and influenced by thriving natural springs. But during this time, the East Africa Rift Valley was also undergoing a massive drying-out phase.

Cuthbert and his colleagues' research focuses on the lag in time, from when water enters an aquifer to when it flows out from springs. They say that while the rest of the continent was drying out, the springs and wetlands of Olduvai likely continued to flow, supported by the groundwater of the region. This groundwater flow sustained the springs for between 100 to 1000 years with no recharge from rainfall.

These springs, and the groundwater that sustained them, were critical in the early ancestors' decision to stay at Olduvai, helping the inhabitants and their development thrive while others wilted away. But when the springs faltered, so did the population of the garge.

While the East African Rift Valley took around 2000 years to dry up completely, the Homo habilis inhabitants of the gorge had a vital buffer period of close to a millennium, allowing for advancements not seen elsewhere at the time. This buffer proved critical in giving these early ancestors a chance to dabble in things like economics, allowing them to build the biggest stone tool industry at a time when intense aridification was resulting in the mass extinction of animals and plants. This shift in climate is also what forced other groups to migrate, leaving the African mainland in order to survive.

In this context, at least one hypothesis is presented as an answer to the question: What happened to the Olduwan culture? The springs dried up.

MODERN IMPORTANCE OF WORLD HERITAGE SITES

Like the Olduvai Gorge whose springs of life sustained the first forays into technological evolution, World Heritage sites today are still invaluable.

Peter Shadie says these are not just iconic places with exceptional nature. "They also provide benefits that contribute to economies, climate stability and human well-being."

The Cradle of Humankind is a World Heritage Site centred around the Sterkfontein Caves, about 50km from Johannesburg in South Africa's Gauteng province. The network of limestone

caves that stretch below the area have been, and continue to be, invaluable to humanity's understanding of its own history and own journey. The caves are a paleontological gift that just keeps giving.

While the Olduvai Gorge offers insight into early culture and innovation, the Cradle is the best place to begin retracing our origins as humans. And the vast underground caverns and lakes have played a vital role in the preservation of the treasure's that these sites hold.

More than a third of all hominid fossils discovered prior to 2010 were found here - about 40% of all fossils of the earliest human ancestors.

New species include what are believed to be our closest ancestors: Homo naledi and Australopitheticus sediba, discovered as recently as 2013. In an underground cavern known as the Dinaledi Chamber, more than 1 500 Homo naledi fossils were discovered - the most extensive continental discovery of a single hominid species.

This region, and the caves that hold the keys to humankind's early days, were also shaped by groundwater and groundwater-dependent ecosystems. While hominids may have lived across the continent, the traces of their existence can only be found at sites such as these, where the conditions allow for fossil formation and preservation.

CULTURAL HERITAGE AND NATURAL BIODIVERSITY



In neighbouring Zimbabwe, the sites of Great Zimbabwe and Mapungubwe in the Greater Mapungubwe Transfrontier Park beckon to all with an interest in the history and evolution of state formation in pre-colonial Southern Africa.

Robin Peterson is a freshwater ecologist at South African National Parks and says their cultural heritage department oversees archeological sites like Mapungubwe, Masorini and the Cradle of Humankind. The cultural assets that these sites hold are extensive.

In the national parks they oversee groundwater also has its own story to tell, with clear links to the cultural heritage of the area. Peterson says to retrace humankind's long history with groundwater, one needs only to look at the sites of the different springs that can be found in the parks, and the traces of early life around them.

"There are San paintings," Peterson says, "and they also named the groundwater springs. They settled there because of those springs." To this day, areas like Bitterfontein (Bitter Fountain) in the West Coast National Park and Soetfontein (Sweet Fountain) Nature Reserve and still retain names based on the tastes of the springs central to early settlements in the area...

Peterson says biodiversity in South Africa's Kruger National Park is highly dependant on groundwater, which feeds the park's seasonal rivers. "You can go to the river now, and although it doesn't rain there for most of the year, you will still find pools." Peterson says groundwater is essential to the ecosystem of the park, as supplies of surface water that are dependent on these underground reserves are central to the survival of fauna and flora. This is true not only for terrestrial animals, but also for aquatic biodiversity, and for 'refugee fish' living at the edge of their geographic habitat to escape the effects of climate change.

"A lot of tourists come to our parks. The Kruger National Park in particular is a big tourist attraction for the Big Five," Peterson says, referring to South Africa's handful of large land mammals that are synonymous with the region's ecotourism. He says tourists also want to see the rich biodiversity in its natural setting. "It just feels better as a tourist to see that," he explains, "than to see a man-made concrete structure with animals drinking out of a trough."

Peter Shadie says in World Heritage sites where groundwater plays a fundamental role in the ecosystem, relevant state parties must ensure that the aquifers are properly monitored, regulated and managed to protect, not only the environment, but also the local communities dependent on them. This means ensuring that these areas remain free from pollutants like acid mine drainage that pose a threat to biodiversity and human health.

Poorly planned and executed industrial activities like mining, oil and gas exploration and resource exploitation can have catastrophic effects. "They can contaminate drinking water, lead to decline in species diversity, affect tourism potential, and contaminate groundwater supplies," he explains.

While increased tourism is one of the many benefits expected when an area receives World Heritage site status, he warns that this might mean that additional resources and management strategies will be needed to maintain the balance. "It can increase the pressure on sensitive ecosystems if not well managed." The effects of this could be far-reaching - for the environment and biodiversity and for culture and heritage.

The preservation of SADC's aquifers and preservation of the regional groundwater integrity is not only vital for Africa's future, but also for the preservation of its past.



A look at developments in climate finance, the renewables and agricultural sector to see how environmentally sustainable energy generation is tied to groundwater's contribution to food security.



BERTHA DLAMINI: AGRICULTURE, SOLAR IRRIGATION AND GREEN INVESTMENT



he agriculture sector plays a pivotal role for Southern Africa's economic growth and stability. A significant percentage of the region's population still relies on agriculture, not only for food but also for economic activity. When the sector is successful it contributes towards economic growth, which is necessary for food security and the reduction of poverty in the region.

The sector is also an important foundation for local, regional and international trade. In the past years we have seen that poor performance in the sector resulted in overall poor economic performance, which in turn affected the entire region. This means that agriculture, with the right support, can catapult the economic performance of the region, especially when there is equitable participation for women and youth.

Every sector is now exploring ways to adopt and effectively use clean energy solutions. The agricultural sector is poised to benefit from this windfall of different forms of renewable energy, which they can produce, use and even sell excess capacity to the local communities and companies.

In developing and emerging countries, as is the case for most of Southern Africa and the rest of the continent, access to the electricity grid is not always possible due to a lack of infrastructure. This puts farmers in a precarious position as they cannot fully rely on traditional grid-tied electricity solutions. In these instances, independent and alternative energy systems are among some of the solution for the sector if it is to secure clean power sources.

Solar irrigation has become one of the preferred energy supply methods and farmers are starting to invest in this as a sustainable solution. Access to finance, however, remains a challenge for different players in the energy and power sector on the continent. This is especially true for women and youth in the market.

Bertha Dlamini is founding President of the African Women in Energy and Power (AWEaP) and founding chairperson of Gen X Theatre Africa, an initiative geared at accelerating youth participation in Africa's Power and Energy sector.

She is an advisory board member at Power Gen Africa and plays the role of strategic advisor to the Association for Municipal Electricity Utilities – Women in Electricity

FOUR REASONS WHY SOLAR HAS SUDDENLY BECOME ATTRACTIVE

- Financing and cost for solar solutions continued to drop, this is true for Solar Powered Irrigation Systems (SPIS) too. This has made solar a competitive and viable energy source for farmers
- Rural electrification is progressing at a very slow pace and alternative sources of energy for agriculture and other sectors have suddenly become very attractive
- The volatility of fuel prices pushes farmers to seek alternative energy sources
- SPIS have the potential to increase agricultural productivity since they can improve access to water.

Investors are certainly keen to support clean solutions, especially those aligned with UN Sustainable Development Goal 17. SDG 17 focuses on creating global partnerships to mobilise financial resources, capacity building, research and technology cooperation.

Solutions such as SPIS provide investors an excellent opportunity to invest in assets that positively affect the environment. However, this is a nascent market for both the agriculture sector and the farmers in it.

For now investors are still exploring the best ways to support SPIS. And farmers and the agriculture sector at large need to provide credible information on the solution to enable investors to perform risk assessments for investment. For African Women in Energy and Power (AWEaP), we see this as an opportunity to explore opportunities for women and youth participation in the broader value chain.

There is a lot they can contribute either as manufacturers, installers or in the maintenance and services space that includes designing tailored finance solutions. Other important areas of involvement are the protection of infrastructure from theft and vandalism.

WOMEN POWER: FINANCING CLIMATE RESILIENCE

he African Women in Energy and Power (AWEaP) initiative accelerates African women entrepreneurs' participation in the Power and Energy sector. Armed with a vision to eradicate energy poverty on the African continent, they lead the conversation in investment in climate action, renewables and prospects for SADC's agricultural sector.

The network has a unique perspective into investment and the Water-Energy-Food Nexus, offering a bird's eye-view on how environmentally sustainable development can be resourced. For the renewables sector in SADC, there is no time like the present to reflect on financing climate action.



Nelisiwe Magubane is chairperson of Matleng Energy Solutions, a black woman-owned company in South Africa that provides solutions to a wide range of challenges in the energy sector. With more than 25 years experience, Magubane is now among the most influential figures in the Southern African power sector. As a company, Matleng's core services are Renewable Energy, Energy Efficiency and Demand Side Management, (EEDSM), Electrification, Reticulation, Distribution and Transmission.

According to Nelisiwe Magubane, the chairperson of South African-based Matleng Energy Solutions, SADC's market for renewable resources has experienced unprecedented growth. She says the prospects for the region have never been better. "The fact that we as SADC are more affected by climate change-related incidents has helped ensure that the renewable energy sector is totally embraced," Magubane explains.

She says it is no surprise that commercial banks and other private green bond issuers have joined the party. "It is expected that there will be significant growth in this market." Magubane says while investors in the renewables market

are also looking for high yields, liquidity and low variance, they must place openness and accountability higher up in their priority list. "It goes without saying that the reputations of the green bond issuer or green bond verifications are impeccable," she explains.

One reason that this is necessary is to reduce information asymmetries in the market. The high watermark placed on accountability is also to avoid suspicion of 'greenwashing' a practice that occurs when companies make misleading claims about the environmental benefits of their projects or technology.

GREEN BONDS EXPLAINED

Climate change puts excessive strain on the resilience of communities, and this makes the search for innovative instruments to finance climate action more necessary now than ever. To date, green bonds have attracted the most interest.

Green bonds are a form of debt security that investors use because they are more predictable, less risky and less volatile than investing in stock markets. According to the World Bank, green bonds differ from other traditions investments in that they are specifically issued to raise capital for climate and environmental projects.

After the European Investment Bank issued the first ever green bond in 2007, other major multilateral development banks have followed suit. The World Bank, African Development Bank (AfDB), the International Finance Corporation all currently fund major climate action projects in sub-Saharan Africa. Private banks, cities, utilities and corporates have also moved into the space.

THE GREEN BOND PROCESS

Issuers of green bonds usually follow a four-step process. The first step is to define a criteria for the kind of green projects they want to support. These are usually projects that support climate resilience and low carbon development. Projects that fit the criteria are then put through a rigorous selection process which involves inputs from a wide range of experts, including environmental specialists.

The third step involves disclosing how the investment will be allocated and how proceeds from the bond will be disbursed to eligible projects. The last part of the process is monitoring the implementation of the green projects and keeping an eye on key environmental sustainability indicators.

DESNEI LEAF-CAMP: THE GREEN BOND MARKET IN SADC



Desnei Leaf-Camp: Head of Acquisitions, Investments & Financial Advisory at ENGIE Southern Africa. Desnei Leaf-Camp is also the director at African Women in Energy and Power. In her 16 years in the sector she has worked with Independent Power Producers and financial institutions to raise over \$1.4 billion in financing for renewable energy projects in Sub-Saharan Africa. She has also raised an additional \$170 million for non-energy related projects.

nvestors in green bonds are looking for the same thing that investors in ordinary bonds seek; a good return on their investment. However, with green bonds they also get the benefit of investing in projects that are socially and environmentally responsible.

The vast majority of green bonds are issued to finance renewable energy and climate resilient projects. The strong pipeline of renewable energy projects across the continent should provide the critical mass needed to underpin a vibrant African green bond market.

While green bonds issuances in the Global North has been rising steadily over the past decade, the development of a green bond market in Africa has been surprisingly slow. Africa is extremely vulnerable to climate change, while capital to finance climate mitigation is scarce.

Only three countries in Africa have successfully issued green bonds: namely South Africa, Namibia and Nigeria. The first municipal green bond, worth R1.5bn, was issued by the City of Johannesburg in 2014. The City of Cape Town followed suit three years later when in 2017 it issued its first green bond valued at R1bn and oversubscribed four times. The City's green bond has been certified by the Climate Bonds Initiative, while international ratings agency Moody's also awarded the bond an excellent rating of GB1. The first

corporate green bond in South Africa was launched in March 2018 by Growthpoint Properties. Issued on the Johannesburg Stock Exchange, the \$94 million green bond will be used to fund green buildings and green initiatives. In April of the following year, Nedbank became the first commercial bank in the country to issue green bonds of more than R5bn, which were all oversubscribed. The proceeds will be used to finance renewable energy projects developed under the Renewable IPP Procurement Programme.

Namibia is only the second country in the region to have issued a green bond. In December 2018 Bank Windhoek, a wholly Namibian-owned commercial bank, announced the successful issuance of Namibia's first green bond. This positioned Bank Windhoek as the first commercial bank to issue a green bond, not just domestically but across the Southern African region.

In December 2017, Nigeria became the first country in Africa to issue a sovereign bond. A second issuance in the form of a Series II Green Bond of up to \$42 million could be issued towards the end of 2019. Nigeria also became the first country in Africa to issue a Climate Bond Certified corporate green bond. Kenya is also planning to issue green bonds in the coming months and is currently finalising listing requirements.

ARVANA SINGH: SOUTH AFRICA'S FIRST PRIVATE BANK-ISSUED GREEN BOND



Arvana Singh is Principal at Nedbank Corporate and Investment Bank. She is an experienced investment banker with a demonstrated history of working in the financial services industry.

In April 2019 Nedbank became the first bank in South Africa to list a Renewable Energy Bond on the green segment of the Johannesburg Stock Exchange. She takes us through the listing what investors in green bonds are looking for.

The green bond market in SADC, particularly relating to the energy sector, is in the early stages of development and a growing area of interest. Nedbank, who is a lead financier of renewable energy projects in South Africa, launched its first 'use of proceeds' renewable energy bond in April 2019.

The funds raised through the green bond auction, which was over 3 times subscribed, are being utilised by Nedbank to finance new solar and wind projects. As investor mandates come on stream to support green and impact based initiatives throughout SADC this could spur further issuance in the future. This is encouraged further by climate action initiatives like the WWF Nedbank Green Trust that has invested more than R47m in 23 water stewardship and conservation programmes.

There are a few obstacles that would need to be addressed before accessing the market, which include reporting and data collection. Once embedded correctly, however, this can prove beneficial to the issuer.

WHAT GREEN INVESTORS ARE LOOKING FOR IN PRIVATE BANKS

The impact metrics associated with green bonds are valuable to impact-based investors who are looking to commit funds in instruments that would enable them to earn a commercial return, while simultaneously having a positive impact on the environment.

The avoided carbon dioxide emissions associated with financing projects which assist in shifting the energy mix to renewable energy is in line with an Environmental Social and Governance (ESG) sensitive investment philosophy. This is becoming increasingly prevalent in investor mandates. The infrastructure component of renewable energy plants is also appealing to investors who have mandates to invest in infrastructure-based assets.



t is becoming increasingly complex to plan adequately and manage resources as the effects of climate change become evident, especially in water-scarce regions like SADC. This is not only a problem for those in the water sector. It poses a challenge for everyone, from healthcare practitioners to development officials examining the impact on quality of life and trying to assess whether mitigation efforts have, in fact, made a difference.

Big data-related solutions are becoming more critical, especially in situations where decision-making about scarce resources and their management involves using inputs from various sources.

Jonathan Lautze is a researcher at the International Water Management Institute (IWMI). He says big data analytics are proving very useful in water management.

"Data is the foundation for effective decision-making on water management," says Lautze, adding that big data analytics can expand the pool of available knowledge, making use of new, more digitised approaches to data collection.

"Big data can also be used to wade through large amounts of data to identify trends, which are useful in planning and management," Lautze explains. He says these techniques are particularly useful when faced with the large amounts of diverse data coming from rivers, lakes and aquifers, and could even enhance data exchange between countries.

James Sauramba, the SADC Groundwater Management Institute's executive director, says collaborations like the one the institute has with the US Agency for International Development and South Africa's Department of Science are crucial for regions water sector. The three organisations partnered to fund the Big Data and Transboundary Water Collaboration in Southern Africa project.

Sauramba says the partnership helps the region collect data and share information about gaps identified in the water sector. "The project places emphasis on utilizing the power of big machines to collect and analyse information and close the current gaps" He explains. In the long-term the project aims to establish a community of practice where big data analytics can inform policy and decision-making.

Patience Mukuyu, also an IWMI researcher, says one of the studies they work on looks into data exchange between countries and regions with shared water resources. While the study is ongoing, preliminary results are promising. According to Mukuyu, there are a number of basins where data is consistently being exchanged.

"One such example is the Inkomati Basin," she says, "where data, including water levels and environmental flow requirements, are exchanged regularly between South Africa and Mozambique."

BIG DATA TOOLS FOR EVERYDAY WATER MANAGEMENT

Data is not only useful when planning broad water resource management between countries. Water must be managed daily on a smaller scale as well, which includes the monitoring of boreholes and other water points to ensure basic service delivery in places like hospitals and schools. This is necessary for data intense areas like forecasting and early warning systems.

The mWater initiative, the Water Evaluation And Planning (WEAP) tool and the NDC-SDG Connections platforms are just a few examples of tools that can be used in these processes, and to get a sense of how big data analytics can be deployed on a daily basis in order to make informed decisions about water management.

mWater INITIATIVE



mWater is an open-access initiative that helps enhance health and sanitation services by helping track water-related data and water quality. The mWater platform has over 40 000 users in 158 countries who take part in mapping and monitoring water and sanitation sites, conduct mobile surveys, and collaborate with local government to provide real-time data.

WASH FIT is a mobile application developed by mWater through a collaboration between the World Health Organisation (WHO) and UNICEF. The platform has indicators for water quality, sanitation, healthcare waste and hand hygiene. It also has indicators for environment, cleanliness and disinfection and allows users to monitor management in health facilities.



The mWater initiative includes easy-to-use test kits that health workers, water utility managers and community organisations can use to test water quality. Tests can be conducted on boreholes, shallow wells, springs and tube wells and tap water. They measure pollutants from sewage contamination like e-coli and check whether water has residual chlorine, which safeguards water from additional contamination after it has been treated.

WHAT YOU GET IN THE MWATER DATA PORTAL:

- Maps detailing water points, catchment areas, etc
- Surveys like the Rapid Assessment Tool for Water, Sanitation, and Hygiene or RapidWASH
- User reports on issues affecting water
- An SDG Indicator Library that helps users keep track of the relevant Sustainable Development Goal indicators.

Total Lives Impacted per Co	
Country	Beneficiaries
Mozambique	25,547
South Africa	2,431
Zambia	1,000
Zimbabwe	150

WATER EVALUATION AND PLANNING



Water Evaluation And Planning is a software tool developed by the Stockholm Environment Institute.

According to Dr Katharine Vincent, the director of Kulima Integrated Development Solutions, the WEAP tool was coproduced in partnership with several stakeholders in Malawi, including the Ministry of Agriculture, Irrigation and Water Development and stakeholders from the private sector. Kulima is a consultancy of professionals committed to addressing the risks associated with climate change in Africa.

Vincent says this collaboration between stakeholders hopes to ensure that the tool accurately reflects the needs of those most affected, while also ensuring that the people of Malawi are able to continue making use of the tool unassisted when the developers and funders step back.

PROJECTS APPLYING WEAP



WEAP lists a number of projects that have made use of the tool since its conception. Hovering over any one of the dots on the map shows the project's details such as its objectives and duration. APDF detailing how researchers and other practitioners in the water sector have used WEAP on their specific projects is also available.

WEAP TRAINING FOR THE SADC REGION

WEAP has useful tools for integrated water resources management. It allows you to visualise relationships between water sources like rivers, reservoirs and boreholes, and nearby industrial sites and water treatment plants. It also includes model-building tools and can run on any computer using Windows XP, Vista, 7, 8 or 10 with a minimum of 256 MB RAM. WEAP is not easy to use for those unfamiliar with the system, however a number of tertiary institutions offer training on the software.

There are currently eight tertiary institutions in SADC that offer WEAP training as a module in their undergraduate or ??? (did you miss post) graduate curriculum.



Madagascar

University of Antananarivo

Mozambique

Eduardo Mondlane University

Namibia

University of Namibia

South Africa

Rhodes University University of the Witwatersrand University of the Western Cape

Tanzania

Sokoine University of Agriculture

Zambia

University of Zambia

NDC-SDG CONNECTIONS



NDC-SDG Connections is another software tool developed by the Stockholm Environment Institute. This tool links the climate action countries have pledged to take in their Nationally Determined Contributions, as signatories of the Paris agreement, with the progress they are making in the SDGs. When looking at Malawi, for example, the visualisation shows that for SDG 6.5, relating to clean water and sanitation for all, 39% of actions focus on Integrated Water Resource Management, with remaining 61% targets watershed management. In contrast, Angola dedicates 50% of its activities to groundwater management, with the rest split evenly between Integrated Water Resource Management and Surface Water Management.

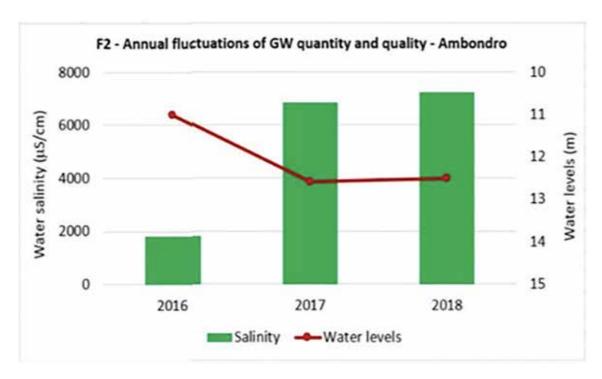
STILL IN THE PIPELINE: MADAGASCAR'S GROUNDWATER EARLY WARNING SYSTEM

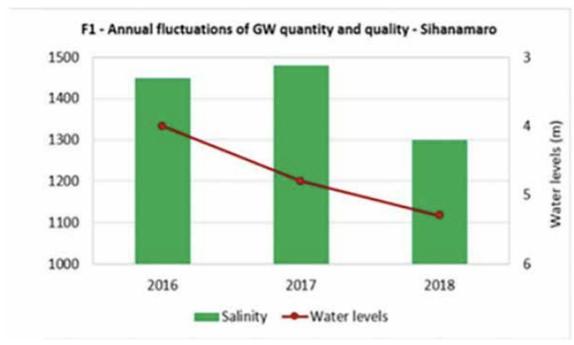
One of the most exciting deployments of big data analytics has been in climate change-related risk management. In Madagascar, UNICEF plans to implement a Groundwater Early Warning System (GEWS) for the country's water stressed southern region - a first for the country. There is currently no

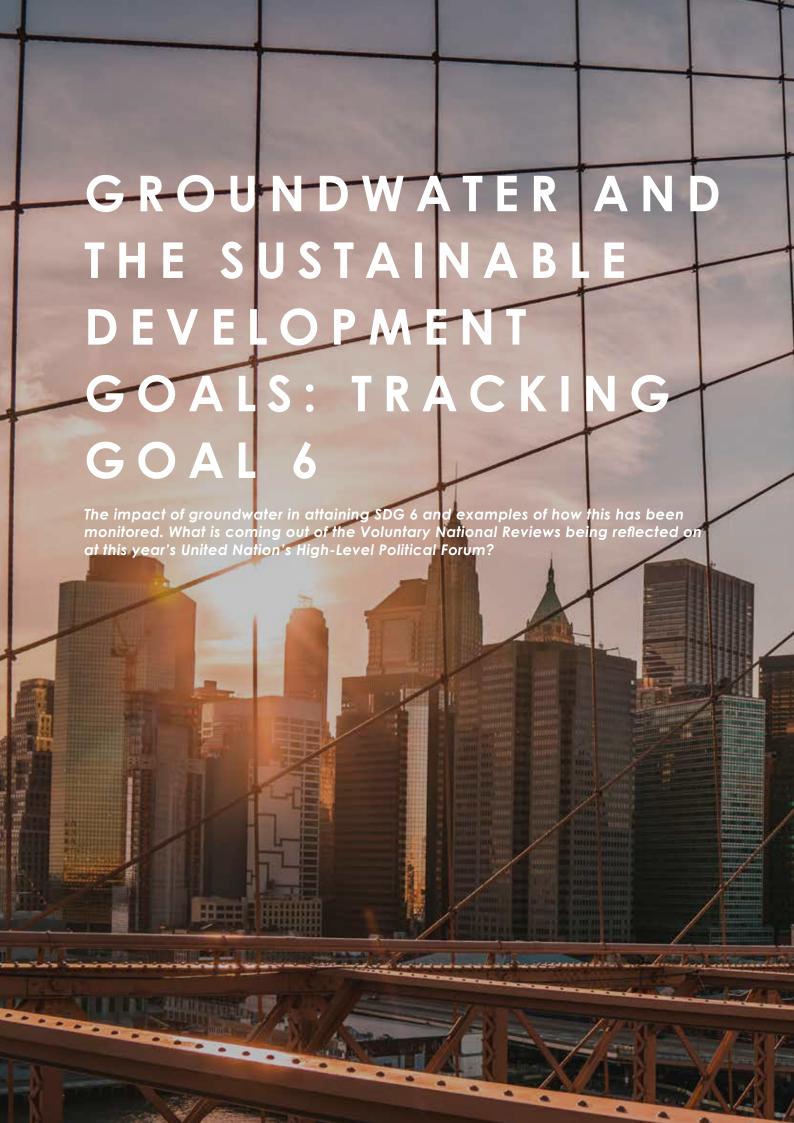
national monitoring system in Madagascar to help authorities estimate risks like depletion, or assist in humanitarian efforts during times of severe water stress.

When UNICEF monitored groundwater in two sites in the south they were able to pick up issues like dropping water levels in Sihanamaro and high salinity in Ambondro. The high salinity in Ambondro means the water supply can no longer be used for drinking and cooking. And while the region await interventions like new boreholes or a desalination unit, people are forced to filter surface water for consumption.

The GEWS initiative is funded by the European Commission's European Civil Protection and Humanitarian Aid Operations under "Disaster Risk Reduction, Preparedness and Resilience Building in Madagascar". GEWS will help the region plan in advance for water shortages and help mitigate the impact in times of drought.









POLLUTION: AN INVISIBLE THREAT TO REACHING GOAL 6

Pollution has posed a growing threat since the second half of the twenty first century, particularly to young groundwater. According to the United States Geological Survey, old groundwater is water that entered an aquifer before 1950.

Young groundwater on the other hand has trace elements that reflect the impact human activities have had on the environment. This water is likely to have traces of substances like tritium, which was blown into the atmosphere when nuclear bombs were detonated. And, unlike the old groundwater, it is also likely to have contaminants from recent manmade sources, such as pesticides, nitrates, and solvents.

A recent study funded by the Water Research Commission (WRC) in South Africa detected the presence of plastic particles in municipal water. Dr Nonhlanhla Kalebaila is research manager for Water Use and Waste Management at the commission, and says this presence of plastic particles is due to poor waste management. "The extent of pollution could be linked to the adjacent land uses practices and pollution levels," Kalebaila explains.

According to Kalebaila because the levels of global have reached critical levels this is not just a South African problem. She says to combat this people need to adopt a culture of responsible plastic use and waste sorting. This will channel plastic waste to recycling facilities rather than landfill sites.

Kalebaila says this kind of pollution has an impact on the progress towards reaching the UN Sustainable Development Goals by 2030. "South Africa is a signatory to the UN Sustainable Development Goals, committing to ensuring availability and sustainable management of water and sanitation under SDG 6 and sound management of chemicals and waste under SDG 12 on Sustainable Consumption and Production," Kalebaila stressed.

According to Sputnik Ratau, the spokesperson for the Department of Water and Sanitation in South Africa, domesticating SDG 6 is not without its challenges. Ratau says measuring a sub-goal like 6.3 is challenging if there are no defined water quality objectives in place. Sub-goal 6.3 focuses on improving water quality through reducing pollution and eliminating hazardous contaminants,.



"The lack of ambient groundwater quality objectives is the main challenge," Ratau says. The challenge is establishing the correct source of data to assist with relevant SDG 6 parameters. "For example in case you have two samples for each monitoring point, is the mean or the average or actual value the correct parameter to base a decision on?" he asks. Ratau says because quality of groundwater has to be maintained at pristine levels. Obtaining a baseline for groundwater that is indicative of natural conditions complicates the process of developing a methodology for sub-goal 6.3.

"The more data we have, the more we are able to determine aquifer characteristics, the better we can link aquifers to ecosystems, to major surface water reservoirs," he adds.

GOAL 6.5: INTEGRATED WATER RESOURCES MANAGEMENT

Under Sustainable Development Goals 6, where countries pledge to ensure availability and sustainable management of water and sanitation for all, Target 6.5 is the only one that specifically references the need for transboundary cooperation. Two indicators are measured.

Target 6.5.1 looks at the degree of integrated water resources management implementation. The other indicator, Target 6.5.2 looks at the proportion of transboundary basin area with an operational arrangement for water cooperation.

By 2018 about 40% of countries around the world were implementing IWRM through long-term programmes. These countries have already found mechanisms that tailor IWRM elements into their national policies. Their main challenge is remaining focused and building on their successes.

The Synthesis Report 2018 on Water and Sanitation says an estimated 41% have just started implementing but are struggling to get buy in from stakeholders. The remaining 19% have only just started developing elements of IWRM.

THE MARGINALISED IN THE SDG DIALOGUE

According to African Monitor's Executive Director Namhla Mniki-Mangaliso, the voice of the marginalised in sustainable development is important. African Monitor compiled the Citizen's Report, which mobilised youth from 30 marginalised communities in 10 African countries.

This is an image from a city where about more than 339 high net worth individuals live. Johannesburg is Africa's richest city, the heart of Africa's mining industrial complex. While Africa's major cities are centers of economic opportunity, too many of their residents still find themselves in the grinding poverty and squalor targeted for the Sustainable Development Goals to eradicate by 2030.



The report generated data from household surveys and community hearings with gender indicators embedded in the questions.

Mniki-Mangaliso says, "Because of its focus on the marginalised communities – guided by the principles of leave no one behind," the initiative stood out. Including the marginalised in the SDG earned the Citizen's Report a spot among the top three inclusive projects at the SDG Action Awards in 2019.

HIGH-LEVEL POLITICAL FORUM ON SUSTAINABLE DEVELOPMENT: SADC COUNTRIES, GROUNDWATER AND THE SDGS

South Africa, Mauritius, Lesotho and eSwatini presented their Voluntary National Reviews at the High Level Political Forum on Sustainable Development held from 9 to 18 July 2019 in New York. Although this years iteration saw an increase in SADC countries presenting from just one to four, Namibia, the lone presenter in 2018, was notably absent.

The overarching theme in the presentations this year is the effort by countries to align SDG domestication with National Development Plans and the African Union's Agenda 2063

Lesotho

The main focus for Lesotho regarding transboundary water resource management is capacity building. This is also reflected in recent development projects like the "Strengthening Capacity for Climate Change Adaptation through Support to Integrated Watershed Management Programme in Lesotho".

Lesotho has also mobilised citizens to use low hanging fruits like keyhole gardens to conserve water while improving food security. The 23,150 keyhole gardens constructed in Lesotho impact about 115,590 people.

eSwatini

In the Kingdom of eSwatini the SDGs are under the Ministry of Economic Planning and Development. The kingdom has paid special attention to the need for support from development institutions and also wants to develop the use of renewable energy to harvest water.

eSwatini has scored some successes in transboundary water resource management. The National Water Policy creates an enabling environment. It builds on tools like the Transboundary Water agreements with Mozambique and South Africa and the Climate Change Policy adopted in 2016.

Mauritius

In her presentation Mauritius recognises water as an essential commodity. Everyone in the country has access to safe water and half of the potable water comes from groundwater. While the country has arguably attained the SDG goals regarding water and sanitation there is still an acknowledgement of the need for saving water, more research and technology transfer to mitigate against climate change.

South Africa

The African Monitor Citizen's report on South Africa picked up issues such as an inadequate budget for climate action, contradictions in how the country has implemented its international commitments. Added to these is the Climate Change Bill that is yet to pass into law. The bill is important because once enacted it will trump other legislation when a conflict arises on sections regarding climate change.

Before the High Level Political Forum meeting Africa Monitor and other civil society groups hosted a symposium on the Voluntary National Reviews. Here civil society organisations were able to engage government and business on creating mechanisms that would work at the grassroots level.

Mniki-Mangaliso says this interaction was important because, in the case of South Africa, "Civil Society Organisations noted that most of the critical indicators that government is lagging behind on, directly affect the bottom 40%."





ccess to climate finance for Least Developed Countries (LDCs) was among the concerns discussed during deliberations at the Bonn Climate Change Conference. According to the 2019 Inter-agency Task Force on Financing Development report more resources can be allocated to developing countries strengthen their resilience to climate change.

Of the \$100 billion developed countries committed to mobilise for climate finance by 2020 only \$70 billion had been mobilised by 2016. They made this pledge at the Fifteenth Conference of Parties of the United Nations Framework Convention on Climate Change (UNFCCC) in Copenhagen in 2009.

At the Bonn Climate Change Conference held in June 2019 howfunding mechanisms such as the Global Climate Finance's (GCF) Readiness and Preparatory Support Programme can assist Least Developed Countries was an important part of the discussion. The programme assists developing countries build the capacity needed for their National Adaptation Plans to meet GCF funding criteria. According to the UNFCCC's Subsidiary Body for Implementation, which monitors implementation of the Paris Agreement, eight LDCs were among the 77 countries who submitted proposals for funding for the programme. Among the 24 proposals approved LDCs made up seven.

SOME CLIMATE ACTION FROM SADC's LDCs

Currently the seven LDCs in SADC are Comoros, Mozambique, the Democratic Republic of Congo, Madagascar, Malawi, Lesotho and Zambia. Angola on the other hand is on par to graduate from this group by 2021. Climate finance is crucial for these countries. According to the Sustainable Development Goal 6 Synthesis Report 2018 on Water and Sanitation, only 62% of people in LDCs have access to a basic drinking water service compared to 89% of the global population.

For countries to qualify for the Readiness and Preparatory Support Programme they have to show that they have viable adaptation plans in their national policies. Parties to the Paris Agreement demonstrate their commitment to combating climate change by submitting Nationally Determined Contributions to the effort to reduce carbon emissions by 2030. The National Adaptation Plans that the GCF look at are based on adaptation strategies outlined in these contributions.

Angola has committed to stabilize its emissions by reducing greenhouse gas emissions by up to 50% below current business as usual levels by 2030. To realise this they will focus on power generation from renewable sources and reforestation.

Comoros is committed to reducing its greenhouse gas emissions by 84% by 2030 compared to baseline emissions in the same year. The country also wants to push ahead with geothermal energy as a renewable alternative.

In the mountain kingdom of **Lesotho** major water resource management initiative currently underway in Lesotho is the

Global Environmental Facility Funded "Climate Change Adaptation for Sustainable Rural Water Supply in Lowlands Lesotho" project.

The project has some innovative thinking and puts an emphasis on managing community vulnerability to climate impact. Some of its priorities include an investments in climateresilient infrastructure such as boreholes of appropriate depth and rainwater harvesting. Other efforts are aimed at establishing resilient institutions supported by a conducive policy framework.

The kingdom also plans to have a targeted awareness-raising campaign that will make use of public gatherings, schools, sports, and media outlets.

Malawi is a low greenhouse gas emitter and contributed only 0.04% of the total global emissions in 2015. However, the country predicts that by the year 2040 its greenhouse gas emissions are likely to see a 38% rise if mitigating action is not taken. The bulk of the emissions are likely to come from an increase in coal powered energy generation to cater for growing energy demand.

The country's Nationally Determined Contribution envisages a massive deployment of solar technology and plans to install 20 000 solar PV systems by 2030.

The basis of Malawi's climate action on its NDC is the country's National Climate Change Management Policy. Groundwater features on its efforts at capacity building in integrated water resources management (IWRM).

Madagascar aims to reduce emissions by 14% in 2030. On climate action the country has put an emphasis on developing its capacity to minimise plan ahead and minimise the impact of climate change-induced weather events. Examples of climate action in the country are the Disaster Risk Reduction, Preparedness and Resilience Building Madagascar.

A Groundwater Emergency Warning System for the country is still under development. This initiative is funded by EU/ECHO HIP and will be used in the Madagascar's southern region where water supply coverage is the lowest.

The **Democratic Republic of Congo** will rely on its National Action Program for Adaptation to Climate Change for a 17% reduction in carbon emissions 2030 under a conditional pledge.

Mozambique wants to improve its capacity for integrated water resources management and ability to build climate resilient hydraulic infrastructures. The country is already implementing the Pilot Programme for Climate Resilience (PPCR) funded by the Strategic Climate Fund. The Strategic Climate Fund is implemented by the African Development Bank (AfDB). According to the AfDB, the PPCR has \$1 billion in pledges aimed at helping countries integrate climate risk and resilience into their core development planning.







SDG 6: LEAVING NO ONE BEHIND

The sixth Sustainable Development Goal, or SDG6, is summarised by the United Nations (UN) as ensuring "availability and sustainable management of water and sanitation for all." It looks to address how water scarcity, flooding and lack of proper wastewater management put a break on social and economic development.

This goal is pursued under significant challenges for developing countries, especially at a national level. When the heads of state met in 2018 at the UN's high-level political forum, some disheartening admissions came to light.

The general message being presented was that countries were still falling short when it came to ensuring that nobody is left behind. "The world is not on track to meet SDG 6," read a UN report after the forum. "Billions of people worldwide still lack access to safe drinking water and basic sanitation."

It was a sobering admission. In 2018 water stress was still above 70% in 22 developing countries and the poorest of the poor are at the risk of being left behind.

As the international community grapples with the challenge of social inclusion in development, it is worth revisiting previous initiatives and drawing on the lessons gained. The International Drinking Water Supply and Sanitation Decade programme, pursued from 1981- 90 and driven by the United Nations Development Programme (UNDP) and World Bank, is notable for its key lessons about the importance of involving women in water resource management.

The case of Malawi is worth revisiting.

WATER MANAGEMENT AND GENDER MAINSTREAMING: LESSONS FROM THE WATER DECADE

Malawi has long emphasised community involvement in water resource management, especially in areas with a high number of low-income households. Malawi's history of involving

women in water management paints a picture of how gender sensitivity and gender-sensitive resource management can help ensure that water supplies are managed both effectively and sustainably.

The Piped Supplies for Small Communities, which piloted in Malawi and Zambia, is a typical example of how gender dynamics can affect access to water sources and water resources. The initiative, now an international case study cited by international development agencies like the World Wank, started on the outskirts of Malawi's urban centres.

THE SHIFT TO COMMUNITY MANAGED WATER SUPPLIES

In the 1980s the Malawian government was faced with the challenge of supplying reliable and affordable water to 24 000 people living on the fringes of 50 urban centres. In 1993, Fabiano Kwaule, who was part of the Ministry of Works in Malawi at the time, told how the majority of people living in these areas relied on open water sources that were often unhygienic, contaminated and unreliable. Quality water in these areas was only accessible from vendors at a very high cost

To solve this the government embarked on the massive Urban Communal Water Point Project in 1981, with the support of the United Nations Capital Development Fund and the World Health Organisation. The plan was ambitious – 600 public water points were built to cater for the water needs of low-income fringe-urban families. In 1985 the initiative was praised for its success, with all water points constructed and the affected population able to access clean water. This was regarded as one of the resounding successes of the Water Decade, spanning from 1981 to 1990.

However, problems soon emerged. One was that over time this new system became dysfunctional – the water points were poorly located and poorly designed, which led to incorrect use. A bigger problem was that the system had become financially unsustainable, with people simply refusing to pay local tap committees for the water they accessed.



Tap committee members had keys to the water points and were responsible for collecting financial contributions from each household on a monthly basis.

It soon emerged that one of the major causes of the problems being experienced was that local water committees were made up almost exclusively of men, who were operating outside of the neighbourhoods for the greater part of each day.

The men sat at the fore and dominated water committee meetings, relegating women to silence in the back. Upon investigation, however, Fabiano Kwaule said it was found that men had a marginal involvement on water issues before these committees were formed. This is because they often worked or operated businesses away from their residential districts. They sought to control these structures because they saw them as an external invasion that weakened their influences in their communities.

The male-dominated local tap committees effectively silenced the very people who were most affected by water supply issues – women were the ones who used the water points during the day when men were away at work.

By the late 1980s the widely-held assumption that it was inappropriate to equip women with technical skills needed to maintain the water sources was falling flat. In 1987 the UNDP and the World Bank found that women were unwilling to use particular handpumps, claiming they required "postures or movements which they regard as strenuous or undignified".

At this point the two organisations presented their study, Community Water Supply: The Handpump Option, which was a report aimed at explaining why handpumps were a viable option for communities in addressing water challenges by exploiting groundwater.

The report found that contrary to popular belief, equipping women with these skills was compatible with many of the cultural roles they already filled. In Bangladesh, the women trained as handpump caretakers demonstrated enthusiasm

because they had a vested interest in keeping the pump working, as they were the ones responsible for providing water for their families.

MALAWI'S PIPED SUPPLIES FOR SMALL COMMUNITIES: VINDICATION OF THE GENDER MAINSTREAMING APPROACH

In the case of Malawi, the community-managed water supplies had become unworkable. By 1988 the Piped Supplies for Small Communities sought to increase the involvement of women in tap committees. There were deliberate efforts to have 60% female representation in these structures. Men were also encouraged to have a positive attitude towards the women's increased involvement.

The response was overwhelming. But at the end of the process, a complete reversal occurred, with the committees comprised 90% of women members. This shift has been attributed to culturally sensitive consultations with the women in the community. Women were engaged separately, either during meetings or at places where they gathered for their daily activities. In today's language these can easily be referred to as 'women's caucuses'. Special leadership training and courses on community financial management were also organised for women, as well as technical training for the water systems and water management.

The result? Women stepped up and started redesigning the water points, making them more convenient for access and use. Membership to these water points improved, as did the management of hygiene and sanitation. And most importantly, the tap committees started making a surplus income and were eventually able to sustain themselves completely.

This is just one example of many, where project successes and project sustainability hinged on the inclusion of the community's women, who proved themselves to be, not only the main consumers within the water sector, but important stakeholders that no project can afford to sideline.



Climate change-induced severe weather events and changes in rainfall patterns have a visible and devastating impact on food security and the resilience of SADC's agricultural sector. Here we look at the extent of food insecurity in SADC



round 41.2 million people in 13 countries are affected by food insecurity. This according to the SADC 2019 Synthesis Report on the State of Food and Nutrition Security and Vulnerability in Southern Africa, which was released in Namibia in July. The SADC Regional Vulnerability Assessment Committee met in Windhoek for the report's release, and to discuss the worrying picture it paints.

The report shows that from April 2018 to March 2019 food insecurity in the SADC region had increased by 28%. This means that over the past four years the food insecure population has spiked from about 30,4 million people to an astounding 41,1 million - a hike of around 10 million people since 2015.

This is according to data collected by National Vulnerability Assessment Committees (NVAC). Each SADC member state has a NVAC that carries out annual and periodic vulnerability assessments in their respective countries.

Dr Katharine Vincent echoes what the synthesis report says about the worsening food security situation in the region. "There are times, like this year, when the legacy of the tropical cyclones and floods in Mozambique, Zimbabwe and Malawi will reduce the size of the harvests in those countries. Drought and conflict also play a role in affecting food production" says Vincent.

Vincent is the director of Kulima Integrated Solutions, a consultancy of professionals with expertise in climate change adaptation. Among other publications, she is also the co-author of "Climate Risk and Vulnerability: A Handbook for Southern Africa."

The synthesis report says while pests, economic challenges and conflict in areas like the DRC and northern Mozambique have impacted food security, climate change has worsened the situation.

The recent droughts has been devastating on water supplies needed by the region's agricultural sector. The synthesis report says over 30 000 drought-related cattle deaths were recorded in Namibia between October 2018 and April 2019.

In South Africa, the AgriSA Agriculture Drought Report 2018/2019 says that around two-thirds of producers in the country report severe to critical stress levels on their groundwater and surface water resources. The AgriSA report reflects responses from 23 provincial agricultural organisations representing about 30 000 producers.

According to the report groundwater levels are moderately high in Gauteng and normal in Mpumalanga, while in the rest of the country's nine provinces the levels are moderately low, low and very low. In these seven provinces the drought outlook is critical and conditions are expected to worsen if rain is not forthcoming in the near future.

Vincent says food security is not only affected by factors on the production side, as market drivers have a significant impact too. "Prices at the market obviously reflect supply, and if supply goes down, prices go up. There may be food available but not everyone can afford to buy it," Vincent explains.

SADC's growing food security challenges come at a time when the long term outlook for the wider agricultural sector in Africa does not look promising. A joint report published by the Organisation for Economic Co-operation and Development (OECD) and the UN's Food and Agriculture Organisation says Africa's share of the worlds imports for food products like rice is likely to increase from 35% to 49% by 2028.

In addition, the report says while this demand for imports will be driven by factors such as growing incomes and rapid population growth, total agricultural land use in Africa is not expected to expand significantly. And, if this grim outlook persists, farmers will be forced to find more innovative ways to increase production.

Vincent says a turn to newer technologies will go a long way towards improving the livelihoods of those involved in rural agriculture and can help boost production rates. "However, technology alone is rarely a silver bullet," she points out. She says without specific attempts to ensure accessibility of marginalised groups, it can reinforce inequalities, making the rich richer and the poor even poorer.

She says technology is only useful when considered in a wider context. "With irrigation, for example, this is often considered useful in dry lands but, in the context of climate change and increasing demands on water resources, it will only be sustainable if future water availability has been taken into account."



TREVOR SHONGWE

Director of Water Affairs in the Ministry
of Natural Resources and Energy
Kingdom of eSwatini

was born in Central Eswatini at Matsapha in the Manzini Region. I come from a family of six boys and five girls. The Shongwe-Mabhengeta's, who I come from originate from Nduma in the Hhohho region and are related to the Queen Regent Dzeliwe, the mother of King Sobhuza. As the Kingdom of eSwatini we are a nation with one language and are proud of our rich culture, which plays a great role in national unity.

I completed my lower education at Hillside Primary School in 1991. I obtained my first degree in 1997 at the University of Swaziland, where I got a BSc Degree with Majors in Maths and Physics. I went on to obtain an MSc in Water Resources Engineering and Management at the University of Zimbabwe in 2003. After that I enrolled with Leeds Metropolitan University for my MSc in Leadership and Change Management in 2011.

Growing up, I had a passion for automotive engineering but university training gave me great exposure to other opportunities. Hence at university I grew a passion for civil engineering, which then drew me to the water sector.

I joined the Ministry of Natural Resources in 1999 as an assistant Dam Supervisor and was confirmed into the position in 2001. In 2006 I was promoted to the position of Water Engineer. In 2008, I was promoted to the position of Chief Water Engineer before becoming the Director of the Department in 2018 when I took over from the then Director, who went on retirement.

A place like Manzini sounds like it has abundant water. What are your earliest memories of how water was managed?

I grew up in a rural set up where we were collecting water from springs. One of our responsibilities as young people growing

up was to look after the springs. We made sure that the water is always clean. It was our responsibility to go and dig and then put up structures to make sure that the water is well protected. We were also responsible for making sure that even the cattle we looked after won't go close to the water sources.

We used to have abundant water resources at those times. A lot of swimming happened. We really loved swimming and they had a big challenge keeping us away from the rivers because swimming was part of our daily lives. The passion for clean water started from there. If the water was polluted we had a struggle getting water to our families. We had a responsibility to get good water everytime we go to the river we got good water. If we came after the cattle had moved into the water we had to wait for a bit of time for the water to settle.

That passion then grew and we knew we had to take good care of our water resources. We valued the resource. We didn't get our water from taps, something that is prevailing at the moment. Our children don't know anything about streams.

How involved are communities in water protecting and conserving water resources today?

Communities are still involved. The only difference is that currently water is viewed as a right. Many of the responsibilities have now shifted from the people to the government. People say, "You have an obligation to give us water." In those days it was us who had a responsibility for the upkeep of water resource. At those times the other advantage was that the water was abundant. Now there is serious competition for the resource, the water is not as easily available. Now there is an obligation to make sure that competing users note that water has to be accessible for the people.

Communities at those times had strategies to manage water sources. They used to even tell us stories. They used to say that

if you were a boy and you got into places where people collected water there were animals like crabs. They'd say if you are a boy, and the crab bites you, you will turn into a girl. Those strategies were not really about scaring us about changing into the other gender because no one wanted to change to the next gender. Those kind of things placed the responsibility on the communities. They said you need to protect your sources and to have strategies to make sure that the water was clean. We used to drink from the springs and cholera and other issues were not there because we were very responsible. No one would actually go pee in the water, there was nothing like that. But nowadays I believe the basic human right to water has shifted the focus. It is more like government is given the obligation than the communities themselves.

How important is the governance aspect of water management to the kingdom?

Currently we are lacking in human capacity. Economies are going down, there are a lot of retrenchments and many people are now unemployed. Government used to perform a lot of roles and reached out to motivate communities about conserving water through its own platforms. But now the government is saying let's decentralise, let's take the responsibilities back to the people. You cannot be sitting in one area and managing water resources throughout the country.

We are trying to bring back the communities but it is not an easy thing because now there are advanced technologies. We used to have very simple techniques for water management - the stories and those kinds of things - they were instilled in people's minds such that people would not mess up the water sources. Currently technology is driving people's access to the resource.

There is pumping and all sorts of technology that need capacity and it is very limited. Government can have this capacity but then if you take these systems to communities you also need to build capacity. Decentralisation is coming with those challenges. All our efforts are now saying let's engage the communities. We must use appropriate technology that they can manage so that we enhance water resource management.

Why is putting the Sustainable Development Goals and AU 2063 at the core of development planning

We view water as the driver to the fulfillment of the overall Sustainable Development Goals because it is cutting across. When you address other issues regarding the SDGs water will always be there. Water and sanitation basically, because you need to have a healthy population for economic growth.

And as the water sector we are given a mandate to make sure that there's adequate water of sufficient quantities for the well-being of our citizens to be productive for economic benefit. We see ourselves as the make or break in the fulfilment of the SDGs.

Currently as the water sector we realise we are not working in isolation. We are considering issues related to energy, food and water. So there's what you call the water, energy and food nexus and planning is currently along those lines. In our meetings we invite the people from agriculture for food security.

We also invite people from the energy sector because for our projects you can't just build a dam for potable water supply. You take the water from the dam to generate electricity, you irrigate and then you also provide water for people to try to drink.

To get investment on these projects this mix has to be there. Water is viewed mostly as a social benefit but if you bring in energy then there's economic value and returns on investments will come in. Irrigation is also viewed as an economic activity which can bring in the money into the projects. So the food, energy and water nexus is actually the way to go. Currently we're looking at that.

The kingdom is piloting emerging technologies like solar pumping. Have these had any impact?

With rising energy costs at most of our water management projects are now faced with serious challenges, especially community managed systems where communities are actually contributing units for powering them. So we are putting up solar systems. Currently we have challenges with vandalism and theft but that is an issue we can overcome.

We also need communities to assist in safeguarding the systems. If we can invest in that there is a lot of energy we can harness from the sun and this can help the schemes be sustainable. We have put up a number of these and they are delivering the results.

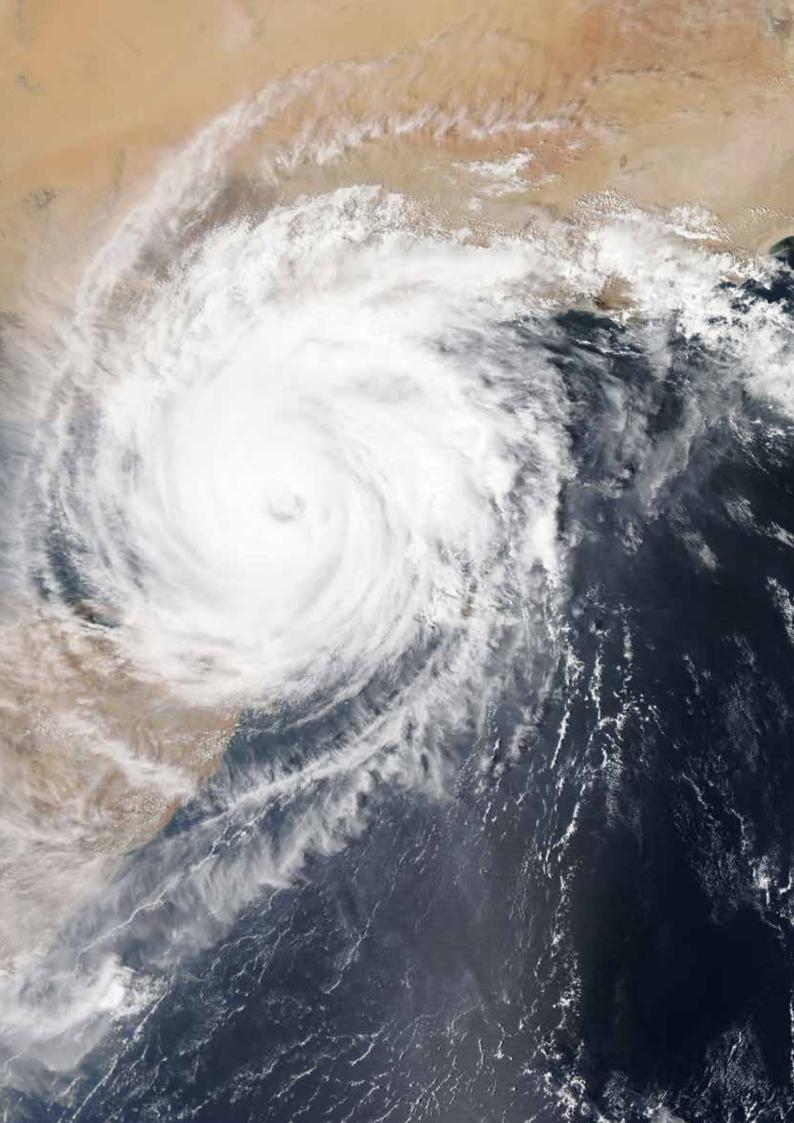
We are still experimenting but if they get accepted by communities and deliver the energy potential then we have to seriously consider them as far as investment is concerned. The only challenge is the energy output, our country is so mountainous and we need serious power to drive those units up the mountains. If we are successful with that then I think solar powered energy is the way to go.

We are not saying it is cheap, for us it is still expensive technology. But it has the advantage that once you have invested maintenance over time becomes less. It can actually push and ensure that these projects are continuously supplying the required water to the people. Currently most of our schemes are down because of energy costs, especially the electricity driven boreholes.

What message do you have for the region's leaders and other stakeholders in the development space?

Currently there's a great emphasis that says let's industrialize and make sure that we have projects with multiple benefits. Take for instance the transport sector, you have this network of railway lines.

In the energy sector the grid is shared within the states for what are we seeing. From the water sector we are saying for industrialization to move forward water has to be a driver for economic activity. You can't talk industrialization and not talk water. So water that has to be pitched high up in the regional and the AU agenda.



SPACE EXPLORATION AIDS GROUNDWATER RESEARCH

NASA's Gravity Recovery and Climate Experiment has brought new tools for groundwater management that will help in closing knowledge gaps for SADC. The technology is already being applied by scientists to monitor storage in the Vaal River Basin.

Recent years have seen massive new strides in space exploration - a Chinese mission to the far side of the moon, and the first ever images of a black hole, which gives credence to Einstein's theories about the nature of time and space. But these exciting new frontiers have real-world implications on Earth too. As exciting as it is to look into the furthest reaches of our solar system, space exploration technologies can also be used to give us a new perspective on our own planet, opening exciting opportunities in groundwater research.

NASA's Gravity Recovery and Climate Experiment (GRACE) has many applications, but one that excites the SADC-GMI teams the most is the current gaps in information and knowledge about groundwater resources and how it can be filled - using images captured from space.

Khuliso Masindi is an associate lecturer at Wits University's School of Geosciences, and says the GRACE satellites provide data that was previously unobtainable on a regional level in a cost-effective way.

Masindi is currently using data from the GRACE satellites to calculate groundwater storage in the Vaal River Basin. This river basin caters to the water needs of Lesotho, South Africa and Botswana, as well as the arid country of Namibia.

"The GRACE satellites provide an opportunity for researchers in the SADC region to conduct groundwater research at a regional scale. The integration of the GRACE satellites with other space-based technology and sparse measurements can be used to estimate changes in groundwater storage, which can support decision making related to groundwater management."

This technology helps overcome a long-standing problem faced by researchers in the region - to date, groundwater data for the SADC region has been scarce. Masindi says that while a combination of satellite technology has been used in other regions like Europe and Asia, there have been very few studies in Southern Africa that make use of satellite images in groundwater research.

WHY GRACE SATELLITE IMAGES ARE IMPORTANT

The birds-eye view of groundwater resources offered by GRACE has revealed some serious concerns, but the very same technology might also be used to come up with the necessary solutions. According to the Jet Propulsion Laboratory at the California Institute of Technology, researchers using data from GRACE discovered that a significant part of the world's population consume groundwater, without much knowledge about how much of this valuable resource remains.

NASA's Gravity Recovery and Climate Experiment was launched in March 2002 and has made data about the world's largest aquifers, collected between 2003 and 2013, available to researchers.

According to the data, 21 of the world's 37 large aquifers have exceeded their sustainability tipping point and are being depleted. In the SADC region, the Congo Basin is among those aquifers under significant distress.

"When combined with land surface models, the GRACE satellites provide information about changes in groundwater storage in a basin. Water managers can use this information in their planning and hazard preparedness," Masindi says.

Masindi says for SADC, this is crucial. "Monitoring and collection of groundwater information must be a priority for any groundwater research, but there must be a sharing and integration of this information. Groundwater research must be communicated with policymakers to inform decision making."

While satellite observation techniques such as GRACE have been widely used in groundwater research in Europe and Asia, the SADC region has never had access to the resources or the data collected by using this technique. Now, however, regional decision-makers can use these data sets and findings to better manage the water resources of Southern Africa and beyond.



or nearly two decades, the United States has strongly pushed for the electrification of rural areas of sub-Saharan Africa to raise the standard of living. It has carried out these goals via the USAID's Power Africa and the World Bank, and under the UN Sustainable Development Goal on Energy (SDG7).

And yet, it remains unclear whether electrification can actually improve living standards in rural areas of sub-Saharan Africa.

As researchers, we have previously documented the positive effects of electrification schemes. Still, we think that money earmarked for rural electrification in sub-Saharan Africa might be better spent elsewhere.

Providing people with clean drinking water and sanitation infrastructure may do more to improve living standards than providing them with electricity.

In addition, water and sanitation provisions are generally less expensive than rural electrification. They could improve many more lives at the same cost.

POWER VERSUS WATER

The electrification of low-density rural areas in Nicaragua, Guatemala and KwaZulu-Natal has increased the number of working women. Rural electrification substantially increased household living standards in India

However, South Asian rural electrification schemes often did not reach the poor. Similarly, in Ghana and Rwanda, economic opportunities were not obviously increased. In Ghana, electricity remains prohibitively expensive for newly connected rural households. In Rwanda, grid electrification did not result in significant new income generation in rural areas.

While there is some potential for off-grid solar energy to improve agricultural productivity in Africa, very small-scale solar provisions are unlikely to do so.

Solar provisions may be commercially viable, but they are not necessarily the most cost-effective source of clean energy. A home installation in sub-Saharan Africa may cost U\$\$500-1,000, far above what most rural households can pay.

DIRTY DRINKING WATER

Electrification of rural areas may not be the most cost-effective way of improving health and wellbeing.

In sub-Saharan Africa, two out of three people lack access to electricity, but 40 per cent do not have clean drinking water and 70 per cent lack adequate sanitation.

The burden of waterborne childhood diseases is great. One in nine children under age five dies every year in sub-Saharan Africa. Diarrhea from dirty drinking water is the second major cause of death, after malaria.

Drilling wells, disinfecting water and providing sealed sewerage services improve population health remarkably.

A reduction in the incidence of childhood diarrhea lowers the likelihood of childhood stunting (impaired growth and development), being underweight and susceptibility to other disease.

Water and sanitation provisions might save or improve many more lives for the same cost as either grid or solar electricity.

SOFT POWER AND LOCAL POLITICS

The push for electricity may be more about soft power than it is about empowerment.

The World Bank and the UN agencies aim to pre-empt Chinese control over strategic infrastructure in Africa. Household water pipes and improved sanitation do not hold the same strategic importance as electricity. But these international taxpayer-financed infrastructure investments may not reflect the population's priorities.

It may also be influenced by the local political economy. As part of a post-civil war peace dividend, the rural electrification plan in Guatemala connected Indigenous households.

Electrification increased the amount of time Indigenous women spent earning money outside of the home. Still, the real winners may have been the two privately owned electricity companies, which received US\$650 from the government for each new household connection.

The willingness of African governments to engage in electricity projects may depend on potential gains realized by key players in state-owned enterprises or government. These considerations can easily be hidden behind a humanitarian veneer.

YOUR TAX DOLLARS AT WORK

International taxpayer-supported investments in rural areas in Africa should prioritize infrastructure that will result in the greatest improvement in living standards for a given outlay. In many remote rural areas, this may not be electrification.

As a member of the United Nations, Canada contributes taxpayer money to the loans and grants provided to the governments of developing countries, often at below-market interest rates.

But the fixed costs of grid electrification are very high. Local economic activities may never pay enough to support the full cost of providing even a minimal level of grid electricity service. Governments and international taxpayers may need to continuously subsidize electricity provision to rural households. Even when electrification is solar, the need for subsidies may remain.

International taxpayers could have instead contributed that same tax dollar to a more effective intervention.

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Tafadzwa Makonese Senior Research Fellow, Sustainable Energy Technology and Research Centre, University of Johannesburg



WHAT ARE THE MAIN CHALLENGES FACING ZIMBABWE'S ENERGY SYSTEM?

Zimbabwe has a severe energy crisis because its major sources of electricity are struggling to keep up with demand. Kariba power plant dam – where Zimbabwe gets 57% of its electricity – has low water levels due to poor rains last year. At the moment the dam, which sits on the border of Zimbabwe and Zambia, is producing just 34% of what it usually can. If Kariba stopped producing Zimbabwe would lose about 358 MW daily, that's about 300 000 homes without power.

On top of this, Hwange colliery – which provides almost all of Zimbabwe's coal for power generation – is producing less because of old and deteriorating infrastructure.

Currently Zimbabwe produces 1100 MW of power against a national demand of 1500 MW. This leaves a supply gap of 400 MW. The deficit is catered for by imports from Mozambique and South Africa.

But payments for these imports aren't easy to keep up with. For the past 10 years Zimbabwe has been going through a currency crisis caused by hyperinflation. This has severely eroded the power of local currency, leaving the Zimbabwe Electricity Supply Authority in a financial quagmire. They currently owe Eskom, South Africa's power utility, over \$33million.

Because of these challenges, any drop in national production means the government has to ration electricity. The government recently started a load shedding plan to prevent the collapse of the country's power grid.

WHAT ARE THE SHORT TO MEDIUM TERM SOLUTIONS?

One short-term solution could be small solar power systems that are rolled out while the government works to improve national power generation through additional hydropower plants, solar and wind farms.

Small solar systems are an effective source of electricity in off-grid communities or they could be set up as mini-grids in communities that constantly suffer from power-cuts. Zimbabwe has enough solar power to support these.

These solar systems could be made cheaper through the introduction of subsidies and tax incentives. Even better, the government could waive taxes on all certified systems coming into the country.

And more needs to be done to publicise the use of gas in urban and rural households. Gas is underused in Zimbabwe, partly because it is more expensive compared to other energy sources including kerosene. The government could look for investments through private partnerships to build gas mines. Zimbabwe has over 40 trillion cubic feet of potentially recoverable methane gas in the Lupane-Lubimbi area. Considering the cost of building infrastructure to transport the gas from the production sites, it would be significantly cheaper to exploit these than to import from Mozambique.

Industries that need to cope with power cuts should turn to energy storage. In Johannesburg, South Africa, some industries have integrated energy storage into their microgrids – the solar energy is stored in batteries that are used when the grid fails.

ARE THERE EXPERIENCES FROM OTHER COUNTRIES, IN FIXING A DILAPIDATED ELECTRICITY SYSTEM, THAT ZIMBABWE CAN DRAW LESSONS FROM?

Nepal and Bangladesh are good examples.

In 2014 Nepal was experiencing up to 12 hours of power cuts for the residential and industrial sector. This was finally stopped in 2017. Nepal invested heavily in run-of-the-river microhydropower plants. These are hydroelectric systems that harvest the energy from flowing water to generate electricity in the absence of a large dam and reservoir – as opposed to conventional hydroelectric power plants which rely on the power of water falling from a large distance.

It all paid off when water levels in major rivers rose and power could be generated. By 2018 the country produced 1000 MW from 782 MW in 2016.

Zimbabwe relied heavily on the Kariba Dam power station, without establishing more hydropower plants elsewhere. It has huge small-hydro potential.

Bangladesh meanwhile shows how energy-saving behaviour – like turning off lights in unused rooms, use of solar water geysers, and use of energy efficient home appliances – under its national energy efficiency and conservation master plan reduced demand by up to 51%.

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GROUNDWATER FOR ZAMBIAN WATER SECURITY

ocated 125km east of the capital city of Lusaka, the Chongwe District in Zambia is home to more than 100 000 people who rely on groundwater for their water needs, accessed through communal taps. The taps, however, are few and far in between and community members often queue for hours to access the water they so desperately needs for domestic and economic activities.

The taps that are accessed, are failing to keep up with the demands of the community. SADC-GMI, as part of its Sustainable Groundwater Management in SADC Member States project supported by the World Bank, plans to change this. SADC-GMI has awarded a grant to the Government of Zambia to implement a groundwater mapping and development project in Chongwe.

Three new boreholes will ease the strain on existing water resources and improve access to clean water for the 137 461 residents of the community, lessening the devastating effects of water shortages on the region's population. The water shortages in Chongwe are acute and caused by a number of factors such as increased demand due to population growth, the effects of climate change and variability, and due to over-abstraction surface water is no longer a reliable source of access for the people of the area. Over-abstraction occurs when water is used faster than it can be replenished, causing levels to fall.

While a wellfield was developed by the Lusaka Water and Sewerage Company (LWSC), the SADC-GMI pilot project in Chongwe will supplement the existing cluster of boreholes, easing water shortages in the area. The project also aims to identify and characterise a local aquifer in the Chongwe region with a sufficient productive capacity to be used for settlement-level water supplies. The three additional boreholes will supply an additional 100m3/hours to the existing water reticulation system.

When visiting the Chongwe District, representatives from SADC-GMI and the World Bank met with Her Royal Highness Senior Chieftainess Mukamambo II. She told the delegation that in 2017 and 2018, the water supplies in the district dropped drastically, leaving the community in dire need of water. She expressed her gratitude on behalf of her chiefdom and the community for the support in resolving the water challenges plaguing them for years. This assistance and support, she said, did not go unnoticed and was not taken for granted.

Kenneth Nyundu is an engineer and the director of the Ministry of Water Development, Sanitation and Environmental Protection. He said this project is a starting point and that the operations could be upscaled and rolled out country-wide, mapping all of Zambia's existing groundwater resources to develop effective plans for achieving, maintaining and enhancing water security.



Her Royal Highness Senior Chieftainess Nkhomeshya Mukamambo II- explaining the water challenges faced by Chongwe community



MONITORING ZIMBABWE'S GROUNDWATER RESOURCES

he Greater Harare region in Zimbabwe is highly dependent on groundwater, with 2 800 boreholes registered in the area and approximately 80% of households relying on groundwater for their potable water supply.

As a result of the number of boreholes sunk and the high rates of groundwater consumption, the abstraction rate now exceeds the rate that groundwater supplies can be recharged. This is known as groundwater mining, and threatens the sustainability of these resources that so many depend on. Unsustainable water withdrawals, however, are not the only problems the region faces in terms of its groundwater supplies. Harare is also plagued by deteriorating groundwater quality, which makes monitoring these sources all the more essential. Through effective monitoring, trends in groundwater levels and quality can be detected.

The Zimbabwean pilot project focuses on two challenges the Greater Harare region faces: the information needed to inform decision-making surrounding groundwater usage is limited, and there are challenged when it comes to characterisation. The SADC-GMI grant availed to the Government of Zimbabwe through the World Bank is for the implementation of monitoring in the Upper Manyame and Nyangui Sub-Catchments and will help to address acute water shortages in the Greater Harare region.

Alfred Muriya is the acting chief environmental regulatory planner at the City of Harare Department of Works. He says the project will help provide solutions to many problems related to the utilisation of groundwater in the region, while also creating a better understanding of the groundwater system and informing policy formation. These outcomes will all help the Greater Harare region to manage its groundwater allocation sustainably going forward.

With a population of over 2 million people, the Harare Province is Zimbabwe's most populous province, with just more than 16% of the country's population living in an area equal to 0.22% of the total area of Zimbabwe. By providing access to clean water, Muriya says they also hope to reduce the waterborne diseases which affect the community.

The project objectives include the characterisation of the aquifer system in Greater Harare, the setup of optimal groundwater monitoring and near-real time water quality and water level data collection system, while estimating groundwater quality and quantity, determining groundwater quality trends, and developing hydrogeological maps for the Greater Harare. Three production boreholes will be drilled at state-owned institutions, in areas identified as critically in need of water. The general community will benefit from these three production boreholes.

Chief Executive Officer of the Upper Manyame Sub-Catchment Council Wensley Muchineri says the monitoring project is vital for planning. "It is essential to determine whether we are using the groundwater in a sustainable manner, and to know the abstraction and the recharge rate of the resource. The Groundwater Monitoring Network pilot project will enable us as Water Managers to make objective decisions whether the allocation regime we are currently applying is sustainable or not," he said.

Muchineri adds that the project will benefit the Upper Manyame Sub-Catchment region in terms of policy formulation and enable the institute to make qualitative decisions based on proper research. The data collected will also enhance the understanding of groundwater and surface water interaction while determining the recharge and discharge zone of groundwater in the region.

Muchineri emphasises that it is critical that the project is sustainable even after the funding of the World Bank. For this reason, he says the Government of Zimbabwe will educate the community about the importance of the project and its benefits to the community, and will train them in how to maintain the infrastructure in good condition.



t least 70% of the Southern African population is dependent on groundwater to support their livelihoods. The demand for water will continue to increase due to factors like population growth, changing lifestyle-patterns and climate change. If managed correctly, groundwater resources in Southern Africa can ensure long-term water supply to meet these escalating demands, acting as a buffer to protect the region's populations and their livelihoods against the conditions that climate variability will bring.

The importance of groundwater in the SADC region cannot be underestimated, but one of the key limitations when it comes to effective and sustainable management of this resource is the lack of decision-making information. This can be traced back to the lack of quality groundwater data among member states. The Sustainable Groundwater Management in SADC Member States project is one of the ways in which SADC-GMI is responding to this challenge. The project, supported by the World Bank with funding from the Global Environment Facility (GEF) and Cooperation in International Waters in Africa Trust Fund (CIWA), comprises of four main components. SADC-GMI implemented the "Capacity Building on Groundwater Data Collection and Management in SADC Member States (DataCoM) project under the auspices of two of these components of the GEF-funded project, namely: Component B, which is "Enhancing institutional capacity of governments in SADC Member States and transboundary organizations" and Component C, which relates to "Improving availability of and access to knowledge, scientific research and data on groundwater".

The DataCoM project, implemented from July 2018 through to April 2019, focused on identifying gaps, capacity building and training in data collection and management. It also promoted the widespread sharing of data. SADC-GMI contracted the International Groundwater Resources Assessment Centre (IGRAC) from the Netherlands and the Institute for Groundwater Studies (IGS) at the University of the Free State in Bloemfontein in South Africa to implement the project. As part of the project, IGRAC and IGS undertook an assessment in 12 of the 15 SADC member states on the conditions of data collection and data management.

The assessment confirmed that limited human resources, equipment and financial capacity needed to collect, analyse, manage, retrieve and share data were among the main constraints. Inconsistencies in data access, use and interpretation also pose a significant challenge. The assessments also found that lack of appropriate organisational and planning framework for the use of technical guidelines, due to lack of clear direction in how they should be used.

SADC-WIDE FRAMEWORK:

One of the key outputs of the DataCoM project was the development of the SADC-wide Framework for Groundwater Data Collection and Data Management. The primary aim of the framework is to fill the gaps between the SADC-wide regional strategies and policies and the technical guidance and manuals that already exist in the member states.

The project provides a dynamic framework for the organisational and planning structures in the member states that are responsible for collecting and managing groundwater data using strategic, innovative and cost-effective tools. The framework acknowledges the differences between the various countries, such as capacity, while taking unique challenges and needs in terms of groundwater data collection and management into consideration.

The framework is formulated on the basis that while policies, strategies and technical guidelines on groundwater data collection are available in the SADC region, there is an urgent need to consolidate these and then forge a collective direction in their effective implementation.

Due to the lack of appropriate organisational and planning framework for use of the technical guidelines to implement the existing policies and strategies on water resources including groundwater, the SADC-wide Framework for Groundwater Data Collection and Data Management was developed. The framework will now serve as an instrument to drive policy and strategy implementation while making use of existing technical guidelines.

THE FRAMEWORK WILL:

- Assist member states that are currently facing difficulties in groundwater data collection and data management to develop adequate procedures at a national level, taking financial and human capacity and level of development into consideration.
- Enhance transboundary and regional cooperation through harmonisation of practices across member states in terms of data collection and management, while facilitating data exchange.
- Contribute significantly to the implementation of regional protocols and strategies in the SADC region.

The framework is structured into ten chapters that address various critical aspects of groundwater data collection and data management. Among these are borehole siting and drilling, groundwater monitoring, field data collection, databases, data sharing and data reporting. The framework also assists in implementing priority actions in the work programme for groundwater in the SADC Regional Strategic Action Plan for Integrated Water Resources Management (RSAP IV, 2016-2020).

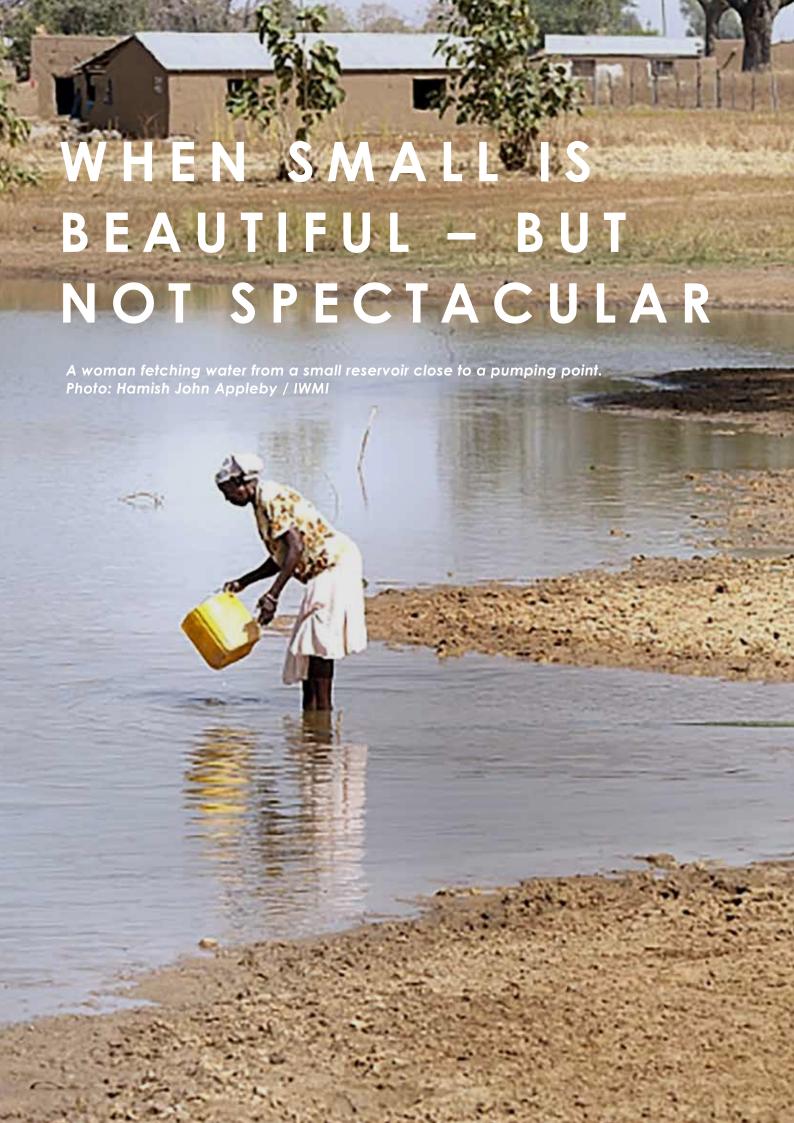
FRAMEWORK TARGET AUDIENCE:

The framework is mostly targeted at officials who have a role in coordinating groundwater data collection and management. It is not a technical guideline for staff going out in the field to collect data.

CAPACITATING YOUNG PROFESSIONALS TROUGH AN INTERNSHIP PROGRAMME:

The DataCoM project also included an internship programme that engaged two young professionals from each of the member states and two students from the Institute for Groundwater Studies at the University of the Free State. Each of the young professionals was given small assignments to complete under the supervision and guidance of the project teams and the national focal persons already serving as the interface between SADC-GMI and the member states. This enabled the young professionals to gain experience, while introducing them to the international groundwater community. A total of 24 young professionals were part of the internship during the project. At the project's closing workshop, the framework was shared with SADC member state decision makers who will influence its implementation in their respective countries.

The framework is available of the SADC-GMI website and can be accessed at www.sadc-gmi.org under the sections titles SADC Framework for Groundwater Data Collection and Management and The State of Groundwater Data Collection and Management in SADC Member States.



TAKING STOCK OF A WIDESPREAD WATER INTERVENTION IN AFRICA

As African countries respond to worsening natural disasters, there is a risk that quick fixes may come at the expense of long-lasting solutions. Such appears to be the case with small reservoirs across Africa, which are often constructed as an emergency response to drought and its devastating consequences for rural people. This is one reason why small reservoirs, though widely perceived to offer multiple benefits, present a decidedly mixed picture in terms of their actual performance.

A recent study carried out by the International Water Management Institute (IWMI) takes stock of 4,000 small reservoirs in East, Southern and West Africa. These are commonly defined as having a minimum surface area of 100 hectares and a storage capacity of less than 30 million cubic meters, behind a dam less than 15 meters high. While many such reservoirs are concentrated in the Limpopo and Volta River Basins, they are also common in countries elsewhere, including Ethiopia and Tunisia. National governments have invested heavily in this intervention, as have donors – among them the African Development Bank (AfDB), Bill & Melinda Gates Foundation and US Agency for International Development (USAID).

IWMI's study offers the first comprehensive analysis of the impacts of small reservoirs, with the aim of providing much-needed guidance on how to improve their performance and sustain their important benefits. Available now as IWMI Working Paper 189, the study builds on several previous efforts, which highlight the need for more reliable data and a better understanding of local contexts, particularly power dynamics (which shape the distribution of benefits), while offering various recommendations for better governance.

Based on a desk study of 80 published documents (more than half in refereed journals) plus field research for more detailed analysis of 10 small reservoirs in southern Zambia, the IWMI study documents a wide range of benefits. They derive primarily from more reliable access to water for domestic and productive use, including irrigation, livestock watering and commercial activities, like brick making. These uses translate into positive impacts, particularly stronger household food security, higher incomes and women's empowerment. They also come at a modest cost, however, involving fees for water users, occasional conflicts over competing uses for water and some health effects arising from waterborne diseases.

Despite the favorable balance of benefits over costs, reports rate the performance of small reservoirs as

mixed to poor, reflected in much shorter operational periods than originally planned. Poor functioning results chiefly from rapid sedimentation as well as weak local governance (which contributes to inadequate maintenance) – on top of poor sitting from the start. In northern Ethiopia, for example, some small reservoirs have silted up within half of their expected lifetime.

The field work in Zambia largely reinforced these findings from the desk study. With respect to the longevity of small reservoirs, for example, researchers found that older dams (built in the 1960s) function well for much a longer time (28 to 61 years) than those built in the 1990s, which lasted only 5 to 19 years, before requiring rehabilitation.

Field research also revealed that the failings of small reservoirs ultimately stem from short-term planning, which is often part of an emergency response to drought. To promote investment in small reservoirs, according to the IWMI study, advocacy organizations tend to create a "positive narrative" around the benefits, which may disguise small reservoirs' less than spectacular performance. Given the poorer quality of newer small reservoirs, the field research further suggests that investing in the rehabilitation of old reservoirs may be more cost-effective than constructing new ones. The danger, though, is that this may give rise to a counterproductive "build-neglect-rebuild" cycle, in which organizations seek short-term payoffs from relatively low-cost investments in rehabilitation. Without long-term monitoring, investors have little or no incentive to build small reservoirs that last.

In search of ways to expand and sustain the clear benefits of small reservoirs through better performance, the IWMI researchers propose a more holistic long-term approach and offer several recommendations to this end:

- Switch to more informed evidence-based planning of small reservoir construction, with clear performance benchmarks for local institutions (for example, with respect to provisions for controlling sedimentation).
- Create a more active role for national organizations in the maintenance and management of reservoir infrastructure.
- Conduct regular monitoring of small reservoirs to guide long-term management and investment in rehabilitation.

As climate change puts ever greater pressure on rainfed agriculture through more frequent and severe drought, governments and donors would do well to ensure that their investments in small reservoirs can stand the test of time.



ater in the Cape Flats Aquifer is polluted by cemeteries, waste water treatment works, landfill sites and informal settlements

The groundwater we are extracting from the Cape Flats to augment drinking supply and make us more drought resilient, is too polluted to use without it being treated.

According to the City' of Cape Town's Water Outlook Report of 31 December, drilling and testing during 2018 revealed that "in general", the water from the Cape Flats Aquifer "is not suitable for immediate human consumption and must be treated to potable standards before it enters the reticulation system". This results in higher costs per unit of groundwater.

The aquifer stretches from False Bay to the Tygerberg hills and to Milnerton. The target is for groundwater from the aquifer to contribute up to 48 million litres (MI) per day - almost 9% of our drought restriction targets of 550MI per day - by July next year.

Initially, according to the City's report, it was hoped that potable water could be pumped out of the aquifer by September last year, but this was re-assessed after good autumn rainfall and estimates of the cost of treating the water before piping it into the drinking water system. The boreholes producing the highest yields are the most polluted. To date no water from the aquifer has been used to augment the supply of drinking water supply.

What the City's report does not state is the level of pollution in the aquifer, nor the sources of pollution. The City has not answered questions on pollution and the extra cost of treatment sent by GroundUp eight days ago.

But a number of studies of the aquifer, dating back to 2006, indicate the pollution comes from landfill sites, waste water treatment works, storm water runoff, informal settlements, agricultural runoff, and cemeteries. Leakage from underground fuel storage tanks is also a source of contamination. All of these, except agricultural runoff and fuel storage, are part of the infrastructure managed by the City.

In 2006, which is the year the DA took over municipal governance in Cape Town, Segun Adelana and Yongxin Xu, in their paper Contamination and protection of the Cape Flats Aquifer, South Africa, identify pollution sources, and call for protection of the aquifer.

"In the Cape Town Municipality contaminant sources related to human settlement activities are cemeteries, storm water and wastewater systems," said Adelana and Xu. They said water was leaching from groundfills into the aquifer and the lack of sanitation in informal settlements also meant groundwater was being contaminated by pathogens from human waste.

Their findings are backed up in a 2008 modelling of the aquifer which was prepared for the Department of Water Affairs and Forestry, as it was then known.

RIVER SYSTEM POLLUTION

A 2015 report on the aquifer by water resource development and management consultancy Umvoto confirms the 2006 findings. "This large resource of groundwater has deteriorated over the past decades and is now non-potable in certain areas, with varying levels of contamination. The deterioration is due to a combination of pesticides and fertilizers from agricultural practices, waste-water treatment plants, informal settlements, unlined or leaking canals, leaking sewerage pipes in some areas and, storm-water runoff," says the report.

The 2015 report also notes that the Lotus River and Kuils River systems, which recharge the aquifer in winter, are among the most polluted river systems in the city.

This is confirmed by the City's own State of the Environment Report of 2018, which reveals the Lotus River system failed the minimum guidelines for intermediate contact (such as kayaking or sailing) for ten months of the year. The Eerste/Kuils River was suitable for intermediate contact for less than five months of the year.

The City's Five-Year Integrated Development Plan for 2017-2022 recognises that Cape Town's natural resources are "increasingly at risk of depletion and degradation, and action needs to be taken to ensure their proper management and, therefore, their continued availability".

And the City's Climate Change Policy approved in July 2017 notes the need to monitor Cape Town's air and water quality (drinking water, sewage effluent, inland and coastal waters, estuaries, and groundwater) and "take appropriate legal action where required".

However, it is very hard to find out what monitoring is in fact taking place, as the City stopped publishing its twice-yearly Inland and Coastal Water Quality Reports in 2013. Mayco Member for Water and Waste Services Xanthea Limberg maintains that the results of these reports are publicly available because they are presented at catchment management meetings and to Protected Area Advisory Committees. However, the report presented to the Zandvlei committee, for instance, details only the test results for Zandvlei. There are no results for other water bodies.

GroundUp has not been able to determine whether committees of this sort exist for the Lotus River or Eerste River/Kuils River system. And when GroundUp requested a report on all the water bodies tested by the City, Limberg said a city-wide report could not be made available, only results for specified areas.

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LINDSEY SMITH: DEPUTY DIRECTOR: CRADLE OF HUMANKIND WORLD HERITAGE SITE GAUTENG DEPARTMENT OF ECONOMIC DEVELOPMENT

In the case of the Fossil Hominid Sites of Sterkfontein, Swartkrans, Kromdraai and Environs, commonly known as the Cradle of Humankind World Heritage Site, the karst and groundwater systems are considered as extremely important attributes that underpin the Outstanding Universal Value of the World Heritage Site.

Through the protection and management of the groundwater, mainly through limiting the extent of development on dolomitic ground, the broader ecosystem and biodiversity also receives protection, conservation and management.

ASSESSING THE ACID MINE DRAINAGE THREAT

In relation to the Cradle of Humankind World Heritage Site (COHWHS), the potential threat of acid mine drainage has received a large amount of international and national attention. This was initially due to the lack of credible, scientific information about the impact of acid mine drainage on the karst, groundwater and fossil resources of the site.

In order to determine the extent of the risk, the Management Authority for the World Heritage Site contracted the Council for Scientific and Industrial Research in 2011, to conduct a Situation Assessment of the Surface Water and Groundwater Resource Environments in the Site. This modelled, for the first time, the extremely complicated hydrological and geohydrological systems and their interrelationships.

From this Study, it was clear that there are at least 10 separate and distinct groundwater compartments, all of which interact differently with the others. Of these 10, only one is impacted by acid mine drainage, leaving the vast majority of the groundwater systems underpinning the World Heritage Sites as unimpacted by acid mine drainage.

Importantly, the Hydrovulnerability Study considered two things. The first was the hydrophysical aspect involving surface water-groundwater interaction and groundwater rest level, etc. The second part looked at the hydrochemical components and delved into water quality aspects associated with the respective fossil sites. Ultimately, the large majority of fossil sites were found to have low to very low vulnerability. This can be attributed to two things. First, their location in groundwater compartments that are hydrogeologically separate from those where the contaminated water impact is manifested. The second is their substantial elevation above the ambient groundwater level.

The petrographic study showed that the likely effects of AMD ingress into the karst aquifers of the COHWHS will lead to a rise in the pH of the influent mine water (as a result of the dissolution of dolomite) to a value comparable to that of the ambient karst groundwater. Influent mine water would therefore tend to react at the point of first contact with the dolomite, resulting in both neutralisation of the mine water

and the prevention of further neutralisation from taking place. Over time the mine water would migrate further and further into the karst aquifer, and the buffering capacity of the aquifer would reduce progressively. Ultimately, therefore, allowing the continual ingress of raw and untreated acid mine drainage would not be sustainable management intervention.

FINDING SOLUTIONS

Based upon the 2011 Situation Assessment the Management Authority has implemented an extensive groundwater and surface water quality and quantity monitoring. Since 2013, the Department of Water and Sanitation has implemented a Short Term Solution treatment plant for acid mine drainage at the point of decant (approximately 20km away from the World Heritage Site).

This Short Term Solution plant pumps acid mine drainage from the mine void to the surface and partially treats the polluted water by adding limestone to substantially raise the pH of the water. The existing monitoring programme has demonstrated the positive impact of the Short Term Solution on water quality. The Management Authority works closely with the Department of Water and Sanitation and the newly resurrected Intergovernmental Task Team on Acid Mine Drainage in order to ensure that the Long Term Solution for acid mine drainage comes to fruition.

In addition, the management authority has recently undertaken a more focused risk assessment and risk prevention strategy for those fossil sites that were initially determined as having a high vulnerability to acid mine drainage in the 2011 Situation Assessment. This risk assessment focused on the likelihood of contact between the groundwater and the fossil bearing deposits, using the groundwater table elevations, its potential maximum levels, groundwater quality and the proximity in relation to the elevation of the fossil sites. Interventions were also identified through scenario planning.

This risk assessment and risk prevention strategy clearly showed that the actual likelihood of fossil deposits being negatively impacted by acid mine drainage is low, or remote, and only one site was determined as having a moderate vulnerability. It was only through conducting such intensive studies and having an ongoing monitoring programme that the Management Authority can safely say that the acid mine drainage is not a threat to the palaeontological heritage resources in the Cradle of Humankind.

All of this information, including the 2011 Situation Assessment, the monitoring reports and the 2018 Vulnerable Fossil Site Risk Prevention Strategy have been communicated to the World Heritage Committee. The site has submitted several State of Conservation Reports that also includes a focus on the impact of acid mine drainage. Through the State Party, the Management Authority will continue to keep the World Heritage Committee abreast of the impact of acid mine drainage on the site and on the Outstanding Universal Value of the World Heritage property.



WHAT'S IN THE LIFT PARTNERSHIP?

Climate change-induced severe weather events and changes in rainfall patterns have a visible and devastating impact on food security and the resilience of SADC's agricultural sector.

Here we look at the extent of food insecurity in SADC

What may have started as an attempt to speed up innovation in the water sector has evolved into something much more, resulting in an exciting technology partnership between South Africa's Water Research Commission (WRC) and the Water Research Foundation (WERF). The Leaders Innovation Forum for Technology, or LIFT, hopes to do just that.

WRC's partnership with the WERF grew out of parallel efforts between the two organisations - while WERF was developing a platform to showcase emerging water technologies, WRC was busy experimenting with the Water Technologies Demonstration Platform (WADER).

WADER provides a platform to showcase water technologies still in their demonstration phases. These technologies and projects are varied and diverse-from the Council for Scientific and Industrial Research and its project into how much water apple orchards actually use, to other projects looking at cost-effective ways to remove heavy metals like iron and manganese from boreholes.

The aim, according to WRC's CEO Dhesigen Naidoo, is to bring water innovations closer to the market and to the people who will ultimately benefit from them. The LIFT partnership has also yielded an innovation hub, hosted by WRC, which Naidoo says is creating opportunities in the South African water sector.

"It allows Southern African technologies to be posted on the US-site for broader global exposure on other markets," said Naidoo. "This platform could accelerate emerging technologies to be adopted more rapidly in both South African and other global markets."

The Intelligent Water Systems and the Future of Smart Utilities project, which will run until 2020, is one of the projects that LIFT has been involved in and aims to assist water utility providers. It will help them anticipate the changing nature of providing utilities to cities in a digitising world.

The project includes investigations into how utilities can take advantage of advanced metering infrastructure to capture high volumes of data from customers, improving billing problems, encourage efficiency and assisting in the enforcement of conservation policies. Some of the ongoing initiatives are aimed at empowering water utilities to cope with digital, technology-driven changes in the utilities industry.

There is also a move to anticipate the skill requirements for tomorrow, while looking at how the industry can attract more workers to fill the skilled positions available in the industry. This partnership also hopes to introduce advanced metering infrastructure to assist utility providers with water metering - a persistently sore point between utility providers and their consumers.

OPPORTUNITIES

For our sector to thrive, it is vital to foster development across national and organisational boundaries, by opening wide the tenders, vacancies and opportunities that are available to us. To advertise an opportunity in The Well, please get in touch.

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SOUTHERN AFRICAN DEVELOPMENT COMMUNITY GROUNDWATER MANAGEMENT INSTITUTE (SADC-GMI)

WORLD BANK ASSISTED

Project ID: P127086

Issuance Date: 20 August 2019

REQUEST FOR EXPRESSIONS OF INTEREST (EOI)
CONSULTING SERVICES – FIRMS SELECTION
ASSESSMENT OF GROUNDWATER RESOURCES
DEVELOPMENT PRIORITY INTERVENTION AREAS IN
THE SADC REGION

Contract No. ZA-SADC-GMI-126014-CS-QCBS

BACKGROUND: The Southern African Development Community (SADC) Secretariat, through the Directorate of Infrastructure and Services - Water Division, in Gaborone, Botswana received a grant through the World Bank to implement the Sustainable Groundwater Management in SADC Member States project. The SADC Secretariat has delegated the implementation of the project to the Southern African Development Community Groundwater Management Institute (SADC-GMI), a newly established regional centre of excellence on groundwater management, hosted by the University of the Free State in Bloemfontein, South Africa. The SADC-GMI intends to build on previous work and pilot projects developed under the SADC Groundwater and Drought Management Project which undertook research into and built understanding of groundwater-related risk identification and management (for example, Drought Vulnerability Mapping and Economic Valuation Studies). The SADC-GMI is therefore initiating activities that contribute to mitigating the impacts of climate and droughts on the most vulnerable of populations in the SADC region where 40% of the population does not have proper and secure access to drinking water, while they rely on groundwater as the primary and often the only source of water. There is need to bring the role of groundwater in securing water supply during periods of droughts to the forefront.

THE OBJECTIVE OF THE ASSIGNMENT: The overall objective of the study is to assess groundwater resources and identify areas that are prone to groundwater drought in the SADC region by making use of existing geospatial, hydrological and hydrogeological datasets and a revised Groundwater Drought Risk Map of the region. The study will further identify the most suitable infrastructure interventions in the areas in most need.

SCOPE OF WORK AND SPECIFIC TASKS OF THE CONSULTANTS:

To achieve the objectives of this assignment, the successful consultant will be expected to implement the following core tasks which are not exhaustive: • Revise groundwater drought risk map. • Review and incorporate approaches taken in

similar studies provided by SADC-GMI on similar projects undertaken on the African continent. • Determine the surface water availability and variability over the SADC region. • Determining the population centres that are most in need of water supply interventions. • Identify the most adequate and cost-effective water supply solution for the centres in most need. • Perform an inventory and assessment of the groundwater resources and groundwater infrastructure in the priority areas. • Perform a high level feasibility of implementing the identified interventions in the priority areas.

TIMING OF THE ASSIGNMENT: This is a once-off assignment without any obligation for followup work and it is intended to be implemented over approximately 12 months.

ELIGIBILITY: The ideal Consultant should be a registered firm with proven experience in Hydrogeology/ Water resources planning/ Hydrogeo-spatial analysis, or related discipline; plus a track record of more than 10 years in mainstream groundwater and water resources planning and management in sub-Saharan Africa, particularly the SADC region. Firms demonstrating a proven track record of successfully completing at least 3 similar projects, of which 1 should have been in the SADC region are preferred.

EXPRESSION OF INTEREST SUBMISSION REQUIREMENTS: Interested consultancy firms are requested to submit an expression of interest. The expression of interest should include the following; a) Valid Business License b) Registration Certificate of TIN and VAT c) Company Certificate Registration/Incorporation d) Evidence showing that the firm is a legal entity (certificate of registration); e) Experience of working in a similar geographical region (SADC region); f) Availability of Professional Key Staff with Suitable Qualifications in the field of assignment; g) Evidence of at least 3 similar projects previously successfully completed, of which 1 was in the SADC region; h) Evidence showing the technical and managerial capabilities of the firm in the field of assignment; i) Brief description (not more than 3 pages) of the proposed Methodology of carrying out the scope of the work; i) The EOI submission should not exceed 30 pages. Further information can be obtained at the address below during office hours i.e. 08:00am4:00pm, Monday - Friday or at procurement@sadcgmi.org Bidders must submit Request for Expressions of Interest (EOI) by e-mail to procurement@ sadc-gmi.org or submit the documents in a sealed envelope by hand or post to the address provided below by 12:00 noon (RSA Time) on 20 September 2019. Request for Expressions of Interest envelopes shall be marked No. ZA-SADC-GMI-126014- CS-QCBS: ASSESSMENT OF GROUNDWATER RESOURCES DEVELOPMENT PRIORITY INTERVENTION AREAS IN THE SADC REGION Attention: Procurement and Grants Offi ce, SADC Groundwater Management Institute, Institute for Groundwater Studies, University of the Free State, Bloemfontein, SOUTH AFRICA Office Tel: +27 51 401 7721, www.sadc-gmi.org

