

Improving groundwater development and management for greater water security

By [Dr Shafick Adams](#)

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It is estimated that groundwater constitutes 13% of South Africa's water supply. This seems like a relatively small amount compared to the supply from surface water resources. However, this 'mere' 13% provides water to 56% of the population, either as a sole source or combined with surface water. That is just over 34 million people within 23,746 settlements (78.5% of all settlements in the country).



Dr Shafick Adams, executive manager, Water Research Commission. Source: Supplied

Groundwater is a strategic water resource used to meet the water security needs for more than half the South African population. On average, groundwater is underutilised in South Africa, with considerable opportunity for expansion. Expanding the use of groundwater can help communities and the state build resilience to the impacts of climate change and other drivers of water demand, such as urbanisation, population growth, industrialisation, and agricultural expansion.

In South Africa, groundwater is mainly found in complex geological formations and is typically a local resource. Hydrogeologists play a vital role in the exploration and sustainable management of groundwater resources. These geoscientists specialise in studying groundwater, including its properties, distribution, and movement through rocks and sediments beneath Earth's surface. In addition, they design and manage wellfields, develop, and implement operating rules to ensure that these systems are operated and maintained as efficiently as possible.

South Africa has a competent core of hydrogeologists across the public and private sectors – except where it matters the most. One would think that with the strategic nature of this resource for meeting water security needs and the

complexity of our aquifer systems, that most water service providers and municipalities would have in their employ hydrogeologists.

Unfortunately, as far as we can establish, only one metro employs three hydrogeologists and one in a single district municipality, two out of the 254 municipalities have in their employ skilled groundwater personnel. It is thus no surprise that groundwater is being labelled “unreliable” and “dirty” by decision-makers that do not ensure that these strategic water supply schemes are adequately resourced.



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Competent management of groundwater schemes essential

Groundwater is the invisible resource on which many people rely, across the world, for water and food security. It is the resources preferred where no bulk pipeline can and will reach. Competent management of groundwater schemes is essential to ensure that they provide safe and reliable water supplies, protect the environment, and promote sustainable use

of groundwater resources.

This is especially true for the complex fractured aquifers that characterise the South African landscape. Our understanding, development and management of these complex systems are well supported by excellent research products. These aquifer systems, because of the fractured characteristics, require systematic exploration and development at the wellfield or borehole scale. This is an intense activity but, done right, can provide sustainable water supplies.

Let's take a quick detour. Water stored in surface reservoirs is easy to visualise and understand. As an example, a dam that is at 100% of full storage capacity is easy to visualise (a full bucket). Now try to visualise a body of rock with complex porosity systems (fractures and/or pore spaces). If we saturate these with water, the complexity of determining (or visualising) how full it is, is much more difficult. To unravel this complexity, hydrogeologists use various indirect and direct methods to determine the volume of water within these systems, including the flow through these bodies of rock. It is not something that anyone can do.

Once these aquifers (an aquifer is an underground layer of permeable rock, soil, or sediment that contains and transmits water) are explored and developed, it needs more direct and indirect measurements to maintain reliable and clean supplies. Incompetent management of groundwater schemes can lead to inefficiencies, increased costs, and reduced performance. Competent management, on the other hand, can help optimise operation and maintenance costs, ensure efficient use of resources, and maximise the lifespan of groundwater schemes.



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Suitable permanent skills required

If we hope to improve water and food security while becoming climate resilient, then we must insist on adequate resources to manage and develop local groundwater systems. It requires suitable permanent skills at municipalities that use groundwater as a sole or conjunctive resource. In some municipalities, there is a glimmer of hope as they explore alternative ways to improve the development and management of their groundwater resources. In a few instances, there are excellent champions for groundwater – the institutional entrepreneurs.

Institutional entrepreneurs are characterised by their ability to identify and exploit opportunities for change, challenge existing practices and norms, and mobilise support for their initiatives. They achieve this through proper planning and budgeting for help. This help comes from the private sector. National and provincial water and sanitation hydrogeologists assist where they can. Locally and globally, hydrogeological experience has moved away from the public sector into the private sector.

Highly sought-after experts

In the South African context, as interest in groundwater waned, many of these sought-after experts simply left the country. Hydrogeologists trained on these complex aquifer settings are indeed sought after internationally and generally neglected locally. In September, South Africa will host a global groundwater congress where the latest developments will be discussed and showcased. Unfortunately, at the time of writing, no municipal official has registered for this event.

The role of hydrogeologists is essential for ensuring the sustainable management of groundwater resources, which are critical for human survival and economic development. If we are indeed serious about making communities resilient while continuing to adapt to a hotter and drier climate, we need to correct this mismanagement of groundwater, especially in the municipal arena. The strategies, plans, tools, and expertise exist to do this.

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