Raising a glass to SA's groundwater

As South Africa stands on the verge of its third decade of democracy it offers a time of reflection of what has been achieved over the last two decades since that historic day in 1994 when all South Africans voted for the first time. For the local groundwater sector, the 20-year celebration of South Africa's democratisation offered the opportunity to reflect on its own journey. Lani van Vuuren reports.

To celebrate the sector's achievements, the Water Research Commission (WRC) with the Department of Water and Sanitation (DWS) and the University of the Western Cape published a new book, *20 Years of Groundwater Research, Development and Implementation in South Africa*. The book was launched in Cape Town late last year.

According to co-author and WRC Research Manager, Dr Shafick Adams, the book is the result of a decision to take stock of the achievements of groundwater hydrology in South Africa while celebrating 20 years of democracy. "The book highlights the changes that have taken place in terms of groundwater resource development and management in South Africa since the political transformation of the country." The main author of the book is Everhard Braune, a well-known groundwater specialist.

There is no doubt that the groundwater sector has experienced enormous change over the last two decades. Arguably the greatest accomplishment has been the incorporation of groundwater as a public resource through the National Water Act (NWA) of 1998. Earlier groundwater legislation was based on the riparian system, founded partly on the principles of Roman-Dutch law. Under this system, the rights to groundwater were held by the owner of the overlying property, who could essentially abstract groundwater with little or no control.

Today, in terms of the NWA, South Africa's groundwater is recognised as a common asset, whose ownership is vested in the state and which is subject to all the stipulations of the Act. Groundwater has now been included in a variety of policies, strategies and regulations, and is now recognised as a crucial link in the integrated water resource management chain.

How much groundwater do we have?

The total volume of available, renewable groundwater in South Africa (known as the utilisable groundwater exploration potential) is 10 300 million m^3/a (or 7 500 million m^3/a under drought conditions). We currently use between 2 000 and 4 000 million m^3/a of this groundwater.

The change in legislation also meant that groundwater could now take its rightful place as a significant source in meeting the country's water supply demands. This resource has been instrumental in South Africa jumping from just little over 60% of population having access to safe water in 1994 to 95% today. The majority of these supplies (50% to 90% of communities served depending on province) have been served from groundwater sources.

"In terms of volumes it represents a very small portion of the overall water supplied, but in terms of the national objective of development and the elimination of poverty and inequality, it represents major progress," explains Dr Adams. "In addition, groundwater has moved from an ignored resource to within the top three options for many areas."

Even in South Africa's towns and cities, groundwater is becoming increasingly important. Around 22% of towns use groundwater as a sole source while 34% use groundwater in combination with surface water.

With opportunities of surface water development becoming increasingly scarce, groundwater will and needs to play a bigger role to meet the country's growing water requirements into the future. "In the last three years groundwater developments have grown faster than surface water developments in the context of total water use in South Africa," reports DWS's Fanus Fourie, also a co-author. "This is not surprising if you consider that 40% of all groundwater in South Africa has not yet been used or developed."

Greater use of groundwater sources does indeed hold great promise for accelerating sustainable access to improved water services and augmenting supply in many parts of the country. The lead times for developing groundwater resources are far shorter than typically found in big surface water development projects, which allows for delivery of the benefits far sooner. There is also scope for substantial cost savings in developing local decentralised groundwater-based schemes, instead of big regional surface water schemes with major pipelines conveying water from distant impoundments.

The NWA for the first time explicitly requires the establishment of a water resources information system and regular monitoring and assessment of resources. A unique feature of South Africa's groundwater occurrence is the predominantly fractured rock environment. Through systematic and increasingly integrated work these systems are now well understood in terms of modes and emplacement, fracture development and hydraulic behaviour.

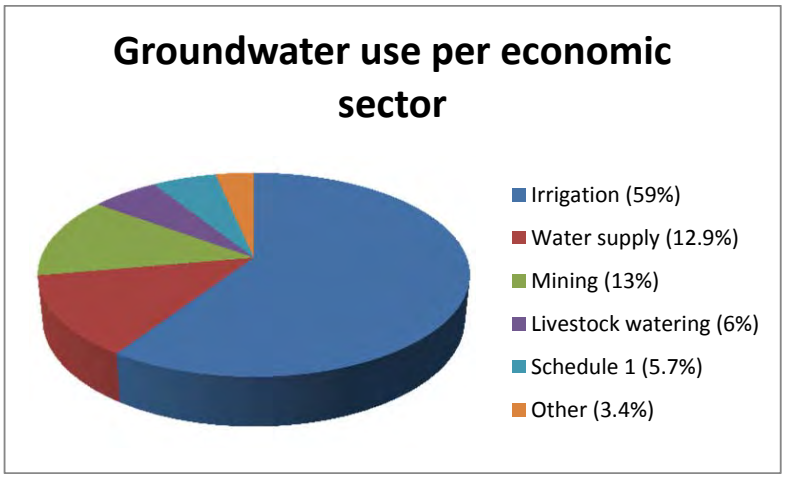
The systematic countrywide quantification of South Africa's groundwater resources followed out of a national groundwater mapping programme of the then Department of Water Affairs and Forestry, launched jointly with the WRC in 1992. Its first output, largely based on the lifelong work of Dr JR Vegter, was a series of national maps and explanatory documents published in 1995. In parallel, the department published a set of 21 hydrogeological maps covering the country at a scale of 1:500 000.

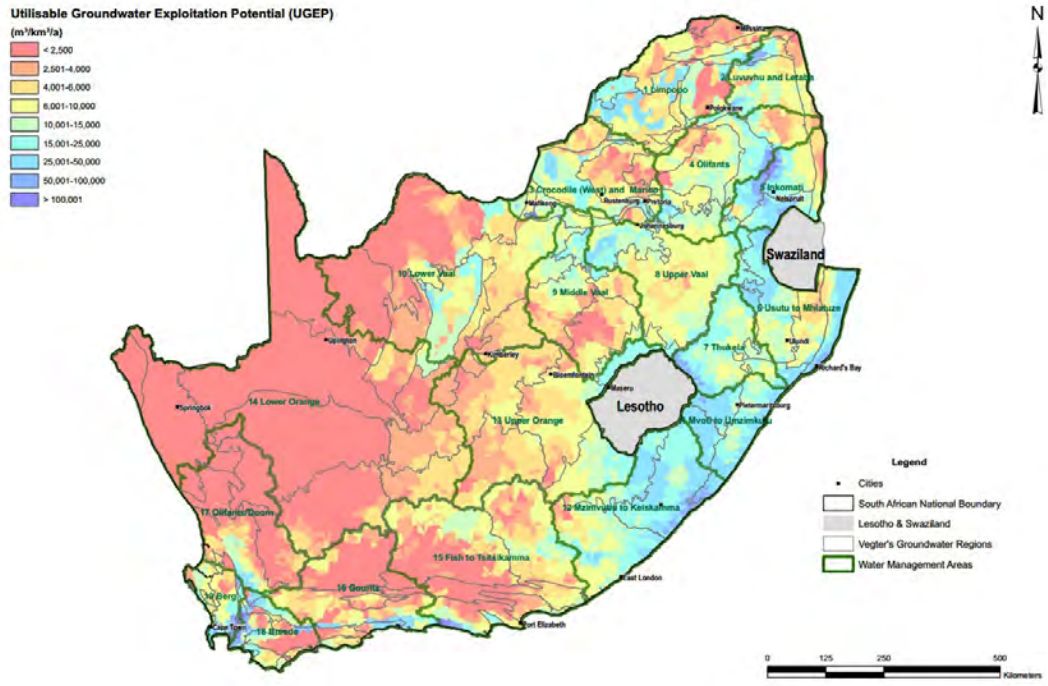
For Fourie, the latter is a significant highlight for the sector as it was a national attempt to characterise the country's groundwater. This eventually led to the Groundwater Resource Assessment Phase 2 (GRA2) project, the key findings of which were eventually included in the fourth iteration of the Surface Water Resources of South Africa, or WR2005.

The South African groundwater sector is supported by a small, but productive research community, to which the WRC readily contributes. "The WRC has been strategically funding projects to meet both current priorities and future needs. It has a strong groundwater portfolio, even with limited funds available," reports Dr Adams. "At the same time, the WRC has been partnering with the Groundwater Division of the Geological Society of South Africa in creating awareness of the resource and providing training and knowledge sharing platforms."

The current research portfolio speaks to both current and anticipated future issues. For example, the WRC is funding several projects around the issue of unconventional gas mining. "The latter projects are designed in such a way that the knowledge gleaned from them

Who is using groundwater in South Africa?





South Africa's utilisable groundwater exploration potential (Source: WR2005).

can be applied much wider than just the unconventional gas industry," says Dr Adams. At the local level, where groundwater is mostly used, the Commission is also developing the required tools and capabilities to manage groundwater resources optimally.

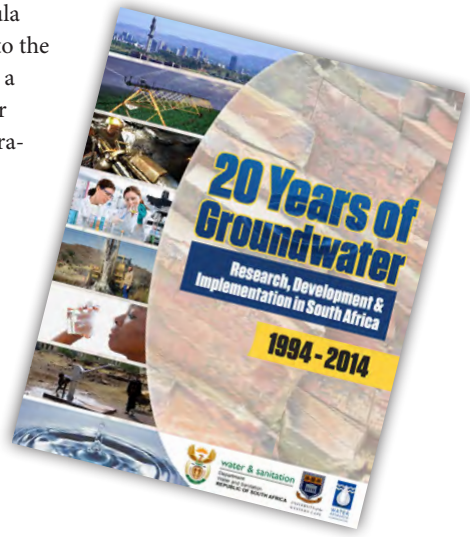
Much of this research has found its way through the various stages of policy and strategy formulation into implementation. A sterling example is the Artificial Recharge Strategy, says Fourie. "South Africa was only the second country in the world to develop such a strategy in addition to all the practical guidelines, tools and information. This placed us in the big leagues with Australia, India and the USA."

Dr Adams has much praise for South Africa's groundwater professionals. "South Africa certainly does not have a skills or capability shortage [in this sector] and most groundwater problems can be solved by local professionals. The challenge we do have is that most of these skills sit within the private sector. This does not necessarily bode well for implementation and enforcement. We have hundreds of local municipalities using groundwater – sometimes as a sole source – but they rarely have groundwater professionals in their employ. This is something that must change and is of great concern, especially if we want to unlock more groundwater for drinking water supplies and economic development."

The failure of some groundwater schemes has caused many municipalities to distrust this resource. However, investigations of failed groundwater supply schemes show that while the blame is often placed on the resource the real cause is almost always either due to failure of infrastructure (e.g. blocked borehole screen) or unsuitable pumping regimes that are related to lack of monitoring.

Groundwater-based systems are typically used in small scattered settlements – which are precisely the areas where the institutional resources capable of supporting reliable delivery of fuel and spares, quick dispatch of spares and ready access to skilled maintenance personnel are least likely to be found. This is an issue which must be addressed going into the future.

There is no doubt that groundwater still has much to offer South Africa. If managed correctly our aquifers can go a long way to ensuring South Africa's water secure future. As DWS Minister Nomvula Mokonyane concludes in the foreword to the book "All of South Africa's citizens have a role to play in ensuring the legacy of our underground treasure remains for generations to come."



To order the book, *20 Years of Groundwater Research, Development and Implementation in South Africa* (**SP No. 78/14**) contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; Email: orders@wrc.org.za or Visit: www.wrc.org.za to download an electronic version. ❑