



Letters and Opinion

The Cuban engineer conundrum

The CEO of the Water Research Commission (WRC) saw fit in the July/August edition of *the Water Wheel* to attack the South African Institution of Civil Engineering (SAICE) and Consulting Engineers South Africa (CESA) for their strong objections to the employment of Cuban engineers by Government when there is a shortage of work in the country for engineers.

Contrary to official perceptions we do have considerable skills available in the private sector. The serious delays in implementation of the National Development Plan (NDP) being one of the prime factors. The other is the procurement process, which does not recognise the specific needs for the engagement of consultancies to assist the Government. I believe that a measured response is required as it appears that the CEO has a lack of understanding of the regulation of the engineering profession by the Engineering Council of South Africa (ECSA) in South Africa and what is happening in the industry.

The Washington, Sydney and Dublin accords are not designed to tie South Africa to the "Apartheid Era biases". I think it is unfortunate that the CEO should see fit to attach a racial connotation to these accords. They are much more a link with the wider international world of engineering for professional engineers, technologists and technicians.

The Institution of Civil Engineers London (ICE) qualifications (MICE and FICE) are over a hundred years old, and probably enjoy a greater worldwide recognition than any other professional engineering qualification. That is certainly my experience after more than 20 years working internationally, and over 40 years of membership of the ICE. The number of Chinese engineers from Hong Kong and Singapore who seek the MICE annually is growing every year. Membership of the American Society of Civil Engineers (ASCE) is also widely recognised.

It is therefore not surprising that ECSA has broadly followed the ICE and ASCE models in defining their regulatory system and membership of the Washington accord gives recognition to the standard of education and training of South African engineers. It says effectively that a South African Pr Eng will have his/her qualifications recognised by all countries that are signatories to the

accord. It also allows the qualifications of engineers from other countries to be assessed in line with the standards laid down so the comments on Peking university are essentially irrelevant. There is no indication that this process has been applied to the qualifications of the Cuban engineers. Until such time as it is and they meet the required standard they will be working at risk in this country. It must never be forgotten that the objective of the ECSA regulations is the protection of the public and not the protection of the engineers.

The comments by [SAICE incoming President] Dr Chris Herold in *the Water Wheel* (May/June 2015) highlight the shortage of skills in the water sector and particularly the loss of skills in recent years in the public sector. There are many contributory factors that have led to this shortage, among which are the over-zealous application of affirmative action and skilled engineers taking early retirement (encouraged by the government?) leaving the public sector desperately short of skills. The huge salaries of councillors and town managers in the medium and smaller municipalities have made it impossible for them to offer fair compensation to engineers and technicians to run their services. What happened to the position of the City engineer? There was a time, which older engineers will remember, when the public sector was the primary training ground of engineers.

Introducing Cuban engineers into this mix will not solve the problems. They will be on two-year contracts, will need to learn the language, become conversant with local procurement procedures and contract forms and local customs. Who is going to mentor the Cubans in the first instance? The same comment would apply to imports from elsewhere. Just about the time that they can contribute usefully their contracts will be up and they will return to Cuba. All the experience gained is lost. There is also a significant cost to the process and government has not been very forthcoming on this.

How many local engineers could have been hired? Would this not have been preferable as there is a greater likelihood of continuity and growth? The primary requirement is that the candidates must be able to see a clear career path and not be treated as temporary employees who can be moved

out with an irrational application of BEE or political deployment of improperly qualified personnel. This sadly has happened (the recent PRASA fiasco with inappropriate locomotives worth over R2.5 billion is a classic consequence). We need to provide opportunities for all the skilled people we can educate and train.

Clearly the CEO is not aware of the extent to which the major South African consultancies have been taken over by major international practices. It is fair to say that all our bigger firms are now foreign owned. Is this not a reflection on the skills and capabilities of South African engineers? At the same time it permits them to draw on in-house international skills whenever necessary.

As someone who has been involved in interviewing young engineers for their PR Eng qualification for some years now it is my considered view that we have the material and the skills, but these are being constrained by government policies that hamper the development of infrastructure programmes, such as the NDP. Our contracting fraternity completed the complex work for the 2010 World Cup and then construction projects died. Our contractors are now actively pursuing projects outside the country to maintain their business.

Much more can be written on this subject, but I think the CEO has to rethink his ideas fairly radically. We can and do produce excellent engineers. If we cannot provide them with good jobs and career prospects they will seek the international jobs which are available. The CEO acknowledges that all countries are short of the necessary skills. My own experience confirms that South African engineers are sought-after for their skills, work ethic and adaptability. Make it worth their while to stay and not have to compete with the short-term Cuban and other expatriate engineers. I know from experience that importing engineers is a most expensive option and does not produce the skills transfer that everyone expects. That is why the importation of Cuban and other expatriates is short-term, shortsighted and costly.

Robert Blyth
Pr Eng, C Eng, FSAICE, MICE

Drought – time for technically sound decision-making around water

Clearly, much of southern Africa is in the grips of an agricultural drought. In itself this is not alarming. Dry land farming has, and always will be, vulnerable to short-term seasonal droughts and this vulnerability increases when back-to-back drought years occur.

Irrigation farming is cushioned by dam storage that allows them to operate normally for a while – but not indefinitely. The portion of the dam storage assigned to irrigation is typically planned to bridge 5% probability droughts, which can typically be expected every 20 years or so.

Before the dams empty, water restrictions are imposed to reserve enough water to keep permanent crops, such as fruit trees and grape vines, alive through a prolonged drought. Seasonal cash crops will cease to be supplied until improved climatic conditions can justify the planting of a new crop. Typically decisions to impose such water restrictions are taken at the end of the rain season (i.e. May for summer rainfall regions) to give farmers the opportunity to make informed decisions about whether or not to plant for the following season. This is important since farming input costs are a large proportion of gross income. Hence a decision not to plant can substantially reduce the severe economic hardship suffered by irrigation farmers.

In cases where a dam, or system of dams, supplies both irrigation and industrial and domestic demand, different uses are assigned appropriate assurances of supply, typically 98% for domestic and industrial use, rising to 99% to 99.5% for strategic industrial use. In the case of domestic and industrial use progressive water restrictions are imposed as dam storage drops long before dams empty in an attempt to continue to meet minimum water requirements. Hence for the same dam irrigation use will face more severe restrictions that are also applied earlier than for other uses.

Reports are that flows at Victoria Falls are lower than usual and the level in the Kariba Dam lake is threatening to drop below the level of the power station inlets. This, together with events in KwaZulu-Natal and elsewhere raises the prospect of a more spectacular drought developing. While the recent hydrological conditions arising in South Africa are not yet unusual (of the order of a 1:20 year event), their effects have been seriously exacerbated by the long standing failure to implement sufficient

infrastructure to meet growing water demands.

Hazelmere Dam is a case in point, where the need to raise the dam was pointed out by competent engineers several years ago and consistently ignored. Ironically the works required to increase the capacity of the water purification works drawing water from the dam was implemented, but the need to raise the dam to normalise the assurance of supply to the new works was ignored. Instead the water level in Hazelmere Dam was drawn down recklessly.

The resolve to at last raise the dam is welcome and undoubtedly needs to be done as soon as possible so that the extra storage is in place to capture the flood waters when they eventually come. Unfortunately this laudable action will not help us until the current drought is broken. (Lots of additional storage with no water in it will not be much use to us until then.) The problem was made even worse by the failure to impose water restrictions until the dam storage had already dropped to alarmingly low levels. Hence poor management decisions have turned the consequences of what so far is a 1:20 year drought into something with much worse effects (Echoes of what happened recently in the Eastern Cape.)

If the drought continues to develop into a major drought sequence, then the unnecessarily reduced storage level at the beginning will continue to render the consequences of the drought significantly worse than they should have been.

The Hazelmere Dam debacle did not happen overnight. The management decisions that precipitated it were made (more accurately not made) over the course of several years. What makes it even less excusable is that decision makers had the well-publicised example of what happened during the recent Eastern Cape regional drought to focus their thoughts.

During the Eastern Cape's dismal event the panicked implementation of exorbitantly expensive seawater desalination was forced on decision makers, when timely implementation of very much cheaper groundwater resources and the imposition of water restrictions long before the supply dam was nearly empty would have sufficed. Evidently the obvious parallel to their own situation escaped the attention of the decision makers responsible for Hazelmere Dam. In this case it would appear that the

only thing to be learned from history is that people don't learn from history. The most immediate lesson here is that technically ill equipped decision makers have to heed the sound advice of our experienced water engineers. This lesson leads on to the second. Technically challenged managers are not the best people to hold sway over technical decisions. They should be replaced by the technically competent. It's just too iffy to hope that they might listen to their competent engineers, or failing that they might read about what happened elsewhere in the newspapers and see it on TV and might just recognise the danger that they are in.

Water management is not a lottery, it is a science. Their decisions should rather be based on their own competence to recognise what should be axiomatic to any competent water engineer. In a technologically sophisticated society we need more technically competent decision makers at every level of government.

It is of more than academic interest to note that when China's economic reforms began to flourish, many of the top politicians at the helm were engineers. It makes you think, doesn't it?

Dr Chris Herold
SAICE President



Working towards improved irrigation productivity in Africa

Capacity building featured high on the agenda at this year's meeting of the African Regional Working Group (AFRWG) of the International Commission on Irrigation and Drainage (ICID).

The group held its annual meeting in October in Montpellier, France.

Increased agricultural productivity is key to reducing poverty and increasing food security in many countries in Africa. One way of raising productivity is through irrigation both at a large- and small scale. In sub-Saharan Africa, only 4% of cropland is irrigated. But unlike many areas of the world, parts of the continent have large untapped reserves of water, which could be unleashed sustainably with some investment.

It is with the mandate of improving sustainable development in Africa that the AFRWG was established in 1994. The organisation promotes networking among African countries to support integrated river basin development and management, support training and improve information in the irrigation and drainage domain.

The AFRWG represents the national committees on irrigation and drainage of Africa in ICID. The two regional bodies that form part of the AFRWG are the Southern African Regional Association (SARIA) and Association Régionale pour l'Irrigation et le Drainage en Afrique de l'Ouest et du Centre (ARID). Water Research Commission Research Manager, Dr Sylvester Mpandeli, chairs the AFRWG.

South Africa is a member of SARIA. This association has held several workshops in various southern African countries in the last three years, featuring themes such as homestead food gardening, irrigation crop water use, training for extension officers and rainfed crop water use. The next meeting, to be



held in Malawi from 15-18 February 2016, will focus on rural freshwater aquaculture.

During its meeting in France earlier this year, the AFRWG adopted its strategy on capacity building in Africa. This strategy will be officially launched at the 4th African Regional Conference of ICID, to take place in Egypt in April. The main theme for this conference is 'Agricultural land and water management for sustainability under climate variability'.

Others topics to be discussed at the upcoming conference are water use management, food security, research, extension services and capacity development.

During discussions it was agreed by all participants that the strategy for capacity building in Africa is a living document, and that it should be reviewed every three years. It was also agreed that funds should be made available to support short irrigation-related training courses.

Eager participants get training in groundwater modelling

The Water Research Commission, together with UNESCO IHP, and the United States Geological Survey (USGS) hosted a three-day training course on groundwater numerical modelling with specific emphasis on the systems MODFLOW2006 and ModelMuse.

The course is held annually for early career hydro(geo)logists from three countries (South Africa, Botswana and Namibia). The training course is based on theory and hands-on exercise.

Presented by Eve Kuniansky and Richard Winston from the USGS the course forms part of UNESCO's drive to make available open source software under its Hydro Free and FOSS Platform of Experts (HOPE) initiative.

According to the WRC's Dr Shafick Adams, this specific course forms part of a three-part course to train the country participants in using MODFLOW and its related tools.

The ultimate aim is to train the students on an integrated platform called FREEWAT. FREEWAT will be an open source and public domain GIS integrated modelling environment for the simulation of water quantity and quality in surface water and groundwater with an integrated water management and planning module (<http://www.freewat.eu/>).



Comments invited for review of General Authorisations

The Department of Water and Sanitation (DWS) has invited comments for the proposed revision of General Authorisations in the National Water Act (NWA).

According to the department, the General Authorisations have been found to be too restrictive for specifically lower risk activities around rivers and wetlands. This has resulted in many low risk activities having to undergo extended water licensing processes, causing unnecessary delays.

More specifically the following revisions are proposed:

- A Risk Matrix is to be used to determine the level of risk being posed to the resource quality characteristics as defined in the NWA;
- All low risk water uses will now be Generally Authorised irrespective of whether it is located within the extent of a wetland or river or any other watercourse as defined in the NWA;

- Inclusion of maintenance activities for Existing Lawful Use;
- An emergency protocol for emergency situations for Existing Lawful Use;
- Various levels of river management plans (including stormwater management of urban river, Landcare projects, River maintenance and rehabilitation plans); and
- An appendix listing specific activities that are deemed to be low risk activities that are generally authorised.

During the revision process the DWS also embarked on a process of consultation with certain state-owned entities, such as Eskom, SANRAL, SANParks, Telkom, Transnet and Rand Water to draft specific General Authorisations for low-risk activities related to projects of state-owned entities. These state-owned entity General Authorisations are also now subject to comment.

To learn more about the proposed revisions, Visit: http://www.gov.za/sites/www.gov.za/files/39458_gen1180s.pdf. The deadline for comments is 26 January.

Dutch and SA water research institutions partner for water innovation



On 17 November 2015, an agreement was signed between KWR (Watercycle Research Institute, The Netherlands) and the Water Research Commission (WRC) of South Africa at a ceremony held at the Dutch Trade Mission in Johannesburg.

The agreement was signed in the presence of several South African Ministers including the Minister of Water and Sanitation, Ms Nomvula Mokonyane and the Prime Minister of

The Netherlands, Mark Rutte. Dr Wim van Vierssen, KWR CEO, and Mr Dhesigen Naidoo, WRC CEO, sealed the agreement.

KWR is the initiator and coordinator of Watershare, an international collaboration model for research centres focusing on applied research in the urban water cycle. The newly-forged partnership with KWR grants the WRC membership to the Watershare programme. Watershare is a family of

trusted publicly-financed institutes sharing knowledge and experiences in the global water sector.

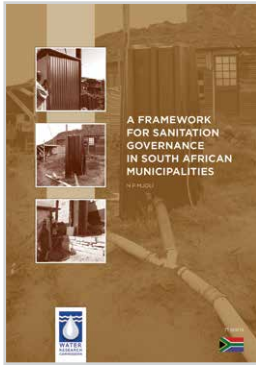
“Both these knowledge institutions will from now on conduct joint research applying different tools from the Watershare platform”, said Van Vierssen during the ceremony. This agreement comes after many years of WRC and KWR working together. The WRC becomes the fifteenth official member of Watershare.

The tools are designed for areas like water quality and health, sustainability, water technology, asset design and management, and water systems. KWR will therefore assist the WRC in extending its understanding on specific topics included in the Watershare suite.

Naidoo said, “Through this collaboration, the WRC is in a position to better serve its end-user clients such as water companies, utilities, municipalities and water boards – so that these, in turn, can effectively meet the water needs of the people in South Africa”.



New from the WRC



Report No. TT 629/15

A framework for sanitation governance in South African municipalities (NP Mjoli)

The framework for sanitation governance in South African municipalities was developed in response to the problem of poor sanitation governance which was identified by several studies. Poor sanitation governance was identified as a stumbling block to

the achievement of universal access to basic sanitation services for all South African households. The development of the framework for sanitation governance is based on the capability, accountability and responsiveness governance framework. The framework has been informed by good sanitation practice identified from international governance experience and elements of good sanitation governance identified from five selected case study municipalities.

Report No. KV 338/15

The current state and future priorities of brine research in South Africa: Workshop proceedings (M Claassen & W Masangane)

This report provides a summary and outcomes from the workshop on brine research that was held in 2014 with a variety of stakeholders. The aim of the workshop was to provide a sector perspective of the current state of brine research in South Africa and the gaps that will define the future research portfolio as well as the priorities that the partners can pursue over the next ten years. This should enable the sector to consolidate, focus, support and drive relevant research initiatives with the aim of realising 'real' solutions to current and future brine challenges.

Report No. 2381/P/15

Exploring the issues around rural on-site school sanitation in South Africa (B Louton; DA Still; I Pearson; G Sitholimela; T Mphahlele & E Shaylor)

This document represents a preliminary exploration of school sanitation in South Africa as part of the study titled 'Evaluating the design of existing rural school sanitation infrastructure and developing a model and guidelines for optimal design' which is being conducted by Partners in Development on behalf of the Water Research Commission. The document explores the background and status of school sanitation in South Africa, its legal environment, and looks at best practice for the design and facilities, among others.

Report No. 2131/1/15

Quantifying the fertiliser value of wastewater sludges for agriculture (EH Tesfamariam; JG Annandale; PC de Jager; Z Ogbazghi; ME Malobane & CKA Mbetse)

The overarching aim of this study was to develop a user-friendly sludge application rate advisor computer model that takes into account both the fertiliser value of sludge and crop nutrient requirements. To achieve this objective the study tested existing analytical methods for rapid characterisation of sludge nitrate and phosphate pools; investigated nitrate release from sludge (fertiliser value) across South Africa agro-ecological zones and soil textural classes; and investigated the fate and dynamics of trace metals in sludge amended soils.

Report No. 2305/1/15

South Africa's water research, development and innovation (RDI) roadmap: 2015-2025

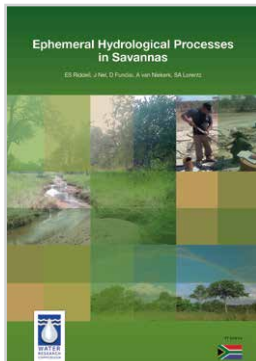
The National water research, development and innovation (RDI) roadmap provides a structured framework to focus the contribution of RDI activity to the implementation of national policy, strategy and planning in water resources management in South Africa. The vision of the roadmap is that South Africa is a leader among middle-income countries in the development and deployment of water management practices and technologies. It competes with leading countries in providing sustainable solutions. The roadmap was developed through an exhaustive, structured process of eliciting staged responses from the professional communities, reviewing the inputs, and assessing their implications. The result of this process is a set of seven plans which over the period 2015-2025 develop out pathways to progress from the 2015 situation to a much improved future state by implementing interventions in research, development, testing, demonstration and deployment of new technologies and know-how, as well as demonstration and deployment of emerging technologies.

Report No. 2115/1/15

Investigation into pollution from on-site dry sanitation systems (S Lorentz; B Wickham & D Still)

The impact of on-site sanitation on water resources has been the subject of much study with regard to conventional septic tanks and soak-aways. However, research of impacts from rural and peri-urban communities using pit latrines has been unconvincing. The objectives of this study were to develop an understanding of the conditions and processes that may lead to migration of pollute from on-site dry sanitation systems to that guidelines may be developed; identify techniques, methods and models used in evaluating groundwater pollution from

on-site sanitation; and to derive the necessary knowledge for input to best practice guidelines for monitoring and minimising the impacts from on-site dry sanitation.



Report No. TT 619/14

Ephemeral hydrological processes in Savannas (ES Riddell, J Nel, D Fundisi, F Jumbi, A van Niekerk & SA Lorentz)

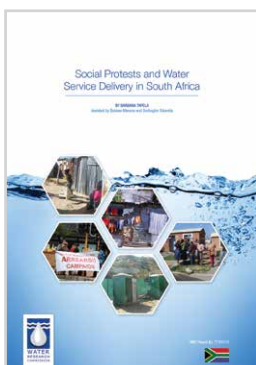
There is a tight coupling of hydrological, geological and ecological processes in the semi-arid setting of the Lowveld savannas of South Africa. In Kruger National Park (KNP) this has resulted in distinct landscape patterns closely organised around

the hierarchical drainage network of seasonal and ephemeral streams which dominate the landscape. Over time, this has led to the establishment of unique soil and vegetation assemblages in the landscape at both the hillslope and catchment scale. The aim of this research project was to quantify the role of hydrological inter-connectedness between hydrological process domains; and determining the spatio-temporal variability of this inter-connectedness in order to understand the hydrological fluxes that drive these savanna systems.

Report No. 2360/1/15

Islamic jurisprudence and conditions for acceptability of reclamation of wastewater for potable use by Muslim users (Al Tayob; H Deedat & AR Patel)

The main objective of this study was to address a set of questions emerging from the protests in Durban regarding municipal plans to supplement existing potable water supply with reclaimed water. The study asked if there was a deeper religious justification to these responses, and what it was. What does Islam say about water purification? More particularly, what do the authoritative teachers in Islam say about water?



Report No. TT 631/15

Social protests and water service delivery in South Africa (B Tapela; B Ntwana & D Sibanda)

This research report presents an outline of research findings on the pathways by which grievances over water services delivery conflate with other factors and develop into violent protest action. The report is based on a survey of the numerous social

protests that journalistic and social media reported from 2004 to 2014. This data was then identified, catalogued and analysed.

Report No. 2164/1/15

Developing methods for converting digitised rivers into a hydrological drainage network (HL Weepener; JJ le Roux; EC van den Berg; DR Tswai; JP Nell)

In this study techniques were investigated to create a South African river network that is repeatable and applicable to all the water catchments in South Africa. The methodology was implemented on two selected catchments and aimed at producing a network that will contain rivers similar to the 1:250 000 scale topographic maps at an accuracy that is equivalent to the 1:50 000 scale.

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New drought portal now open

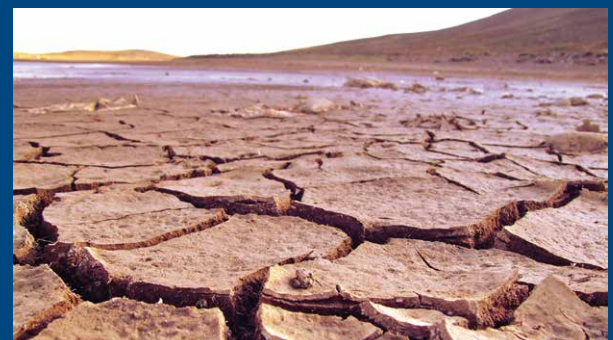
The Water Research Commission (WRC) with sector partners has established an online drought portal to provide water users with helpful information.

The portal, www.droughtsa.org.za, contains the latest news around the drought, as well as tips to save water, and guidance documents to use water more efficiently in various sectors. Various resource tools have also been included from the science behind droughts, to water conservation and water demand management, and water treatment and reuse.

There is also a FAQ (Frequently Asked Questions) section, which answers questions such as What is a drought?, What causes drought?, When did the drought begin?, What does it mean when a province is declared a disaster area?, among others.

According to WRC Group Executive: Impact and Innovation, Dr Mandla Msibi, South Africa has the capability and tools necessary to manage its scarce water resources effectively. The aim of the drought portal is to bring some of this information together in a single space.

All water-related institutions have been invited to contribute their knowledge to the portal.





Drought watch

Cape Town's reuse of effluent takes pressure off dams



In order to save water, the City of Cape Town is reusing over 6% of the effluent that passes through its treatment works, for irrigation and industrial purposes.

The use of treated effluent as a means to save water is viewed by the City as a key component of its strategy to ensure that Cape Town, a water-scarce region, has a secure water supply for the foreseeable future.

The City had aimed to treat and reuse around 4.7% of all effluent, but was in fact able to recycle around 6.3% in

the year to date. Contributing to this performance was higher than usual demand, mainly at wastewater treatment works, with demand from the Bellville, Athlone and Potsdam works contributing most significantly to these figures.

Treated effluent, or recycled water, is not used for drinking water but for irrigation and industrial purposes. "On average, around 3 300 m³ of this water is supplied every day. This water is much cheaper than potable water, and the City of Cape Town actively promotes its use in order to conserve Cape Town's limited potable water supply," explained City Mayoral Committee Member for Utility Services, Councillor Ernest Sonnenberg.

"There are more than 160 treated effluent consumers in the city, including schools, sports clubs, golf courses, farms, factories and commercial developments with large water features. The City also uses this water for irrigating parks and the flower beds along the Cape Town's Integrated Rapid Transport routes."

At present, 13 of the City's wastewater treatment works are equipped to produce treated effluent suitable for reuse, and a 230 km treated effluent pipe network conveys this water to customers. Give the success of this service, the City is looking to expand the treated effluent reticulation network to other areas of Cape Town, with Athlone, Bellville and Macassar being mostly likely to benefit.

"We hope that, going forward, we can continue to increase the percentage of effluent that we are able to reuse. Together with the City's increasingly intensive pipe maintenance and replacement programme, pressure management schemes, and the recent initiative to fix leaky plumbing for indigent customers for free, customers can feel confident that the region's water resources are being managed efficiently and sustainably," concluded Sonnenberg.

Source: City of Cape Town

Consultants warn against overuse of underground resources

As South Africa draws on its groundwater resources careful control must be taken to ensure that these resources are used sustainably.

This is according to Gert Nel, principal hydrogeologist in SRK Consulting's East London office. He notes that the current drought conditions being experienced in many parts of the country are re-focusing attention on the frequent lack of monitoring of groundwater use.

"Underground aquifers are fed by rainwater, so drought will impact on their abstraction capacity. We are also seeing more demand on groundwater as towns expand, and higher levels of service are required," he said.

While South Africa has developed a number of wellfields in recent decades, these are now facing the danger of careless use – this is unless water service providers are provided with better information about the policies and practices around sustainable management and use of groundwater.

"Each of the agencies in this field has their role to play, and consultants and scientists such as SRK are already making valuable technical contributions," said Nel. "We can, however, do more at a number of levels, such as raising awareness at district municipalities, and giving local municipalities practical training and ongoing mentoring."



Nel further emphasised the need to roll-out a scientific learning programme that relates directly to each town or region where it is presented – so that it can be applied immediately in addressing local groundwater challenges. "There are plenty of generic 'groundwater training' resources and documents available, but we need to move beyond the general to the specific, ensuring that role-players engage practically with their issues during these sessions and take back solutions they can implement with the help of mentors."

Southern Africa in for a 'bumpy, dry' ride



Southern Africa is in for a bumpy, dry ride. There is a 50% chance of a drought occurring this summer that could have an impact on the whole region which still bears the effect of last year's drought. Any new drought will have a compounding effect.

So writes Mathieu Rouault, Associate Professor in Oceanography at the University of Cape Town.

During the 2014-15 Southern Hemisphere summer, southern Africa suffered one of the worst-ever droughts. This severely affected the agricultural sector as well as the economies of the countries in the region. In addition, the drought seriously depleted water reserves.

The current drought in the region is as a result of a powerful El Niño event. El Niño is a natural and periodic phenomenon that comes back every three to five years and can last for up to two years. It increases temperatures in the Pacific and Indian Ocean which in turn can cause drought conditions.

During 2015 the Pacific became even warmer leading to one of the strongest El Niño events ever observed. Research shows that eight of the ten strongest droughts in southern Africa since 1900 occurred during the mature phase of El Niño. It has also been noted that El Niño events have led to a severe drought half of the time they occurred.

The effect of El Niño on droughts has been exacerbated over the past 50 years. This has been because continental and oceanic temperatures have risen globally but not uniformly due to the increase in carbon dioxide.

El Niño events leading to droughts in the region have been particularly marked since the late 1970s. Most have occurred between December and March. Recent studies show that El Niño has affected summer rainfall with increased dry spells, reductions in the flux of moisture from the Indian Ocean to the continent, and by shifting large-scale rain-bearing systems to the Indian Ocean.

Over the last century, southern Africa has suffered from dramatic year-on-year changes in climate leading to severe droughts and disturbance in the marine or terrestrial ecosystems. Such variability of climate affects the agricultural industry, water reserves, fisheries and as a result the broader economy. It also affects the flow of water in streams, vegetation and the fluxes of nutrients into the ocean.

It has a particularly detrimental effect on: rural subsistence farmers and fishermen; the health of people in rural areas; and the management of a sustainable natural environment.

During the last decades research projects have shed a great deal of light on how the oceans can influence the climate of

southern Africa. But more research is needed to find out the effects of El Niño.

Two critical questions in particular need to be answered, namely 1) why does El Niño sometimes not lead to drought; and 2) why a weak El Niño can trigger a severe drought while a strong El Niño can trigger a less severe drought.

In addition, more information needs to be gathered on how natural climate events such as El Niño and climate change interact. And there is a serious need to improve our understanding of the impact these large scale variations have on smaller scales. We must also keep in mind that describing the nature of climate variability's impact is essential to being able to anticipate future climate changes and the need to define adaptation strategies.

"Given that El Niño does not result in a drought 100% of the time, it is important to establish what measures should be taken in the case of a risk of drought. This would enable countries to prepare for major disturbances which are increasing in frequency as a result of climate change," says Rouault.

"El Niño could have dramatic consequences for southern Africa. Food shortage, famine, unrest, economic hardship and further decrease of the gross national product. Hopefully the region will not be hit as hard as it was in the 1997-98 El Niño effect. But we shouldn't gamble on that."

It is imperative for countries, and individual citizens, to take preventive measures for what is now known to be a recurring pattern in southern Africa. This includes selling cattle, restricting water, fixing leaks, planting drought resistant crops and getting ready for a drought.

THE CONVERSATION

This article was originally published in The Conversation, Visit: <http://theconversation.com>



Drought watch

South Africa must rise to its water management challenges



South Africa can do much more to manage its inherent water challenges. This is according to Mike Muller, Visiting Adjunct Professor at the University of the Witwatersrand.

According to Prof Muller, a country like South Africa, where rainfall is variable and unpredictable, has to plan for the worst. Specifically, it has to plan to manage the impacts of drought. For cities, present practice is to store enough water to supply the needs of each region during the worst conditions likely to occur in 50 years.

To meet that target for the growing population of Gauteng, the country's economic hub, a new dam must be built. The site has been chosen, the Polihali Dam, identified as Phase 2 of the Lesotho Highlands Water Project.

"As so often in South Africa, the problem is not the plan but the delays in its implementation. According to the original planning, the dam should be completed by 2018. Given slow progress, my understanding is that it is now not possible for it to deliver water before 2024."

"So, for at least six years, there is a risk that the water needs of Gauteng, which contributes more than one-third of the country's GDP, will not be met reliably," noted Prof Muller.

It only took a few days of hot weather in Johannesburg for two things to happen: suburban reservoirs ran dry, and residents panicked. City authorities introduced restrictions on watering gardens and washing cars, and residents reacted as though this had never happened before, which in fact it had.

The extreme weather can serve a useful purpose: it should focus the attention of people and policy makers on the deadline to build the new dam. If no action is taken, policy makers will have only themselves to blame when failure of another vital service disrupts people's lives, and the economy.

Given the electricity shortages in the country and what euphemistically became known as load-shedding, many people have started to assume that long feared water-shedding had begun. The commentators who sought a more strategic view talked about an intense drought and the impacts of climate change. They were wrong.

In fact most of the problems over the past few weeks have occurred in the domain of municipal water supply management.

The suburban challenge for planners has been whether to invest in larger local distribution reservoirs to allow people to water their gardens regardless of how hot the weather gets. In Johannesburg 46% of household water supply is used for swimming pools and watering gardens.

Says Prof Muller: "If they don't want to do this, municipalities have to improve their ability to persuade their citizens to use less water during times of stress. So far, they have singularly failed to do this."

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