



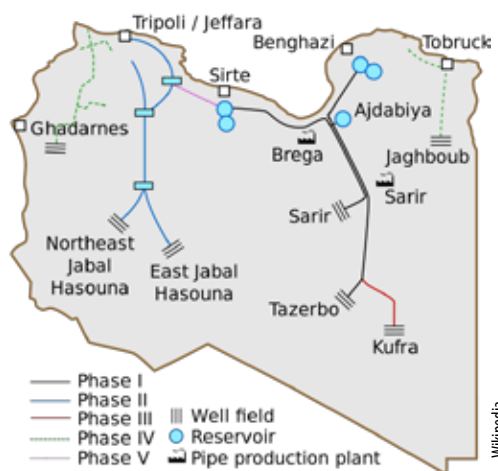
It's a question of infrastructure

Converging the 'discovery' of Africa's groundwater resources, South Africa's infrastructure strategy as part of the New Growth Path and the 100th year anniversary of the national water department.

In April this year the airwaves were abuzz with breaking news from the BBC that scientists at the British Geological Survey had made the great discovery of the vast amounts of water in dry Africa. The article in *Environmental Research Letters* conveys that the mapping of Africa's groundwater resources reveals that the continent has 100 times more water below the surface than on it.

"The century of water management at a national level has been characterised by a global leadership in water infrastructure development."

While this is a valuable contribution to the groundwater resource mapping of Africa – the knowledge is hardly new. We have known for a long while through localised surveys on the continent that there is a very significant water resource in Africa's aquifers and the mother lode sits under the Sahara desert stretching in a large triangle that includes Libya, Chad and Algeria. We also know that many of these aquifers have had very limited recharge and some no recorded recharge at all in modern history – enough to be classified



Schematic drawing of the Great Manmade River project. The diagram illustrates the more than 2 500 km of pipe-lines that would transport the water from the desert aquifer to the large Libyan cities.

as fossil aquifers. Even so, given the dire state of water availability on the surface many argue that this resource should be tapped into.

So how do we get water out from deep underground thousands of kilometres into the desert to where we can usefully use it? It's a question of infrastructure. Libya, under a leader best remembered for other matters, managed to

attain this feat in the early part of this century with the Great Man Made River project that pumped out water in the deep desert (the Nubian Sandstone Aquifer System) and piped the water some 2 850 km to be used in three of Libya's largest cities (Tripoli, Benghazi and Sirte).

While the GMMR project represents a high investment infrastructure development

option, it talks to scale of investment required to harvest the water resources from some of Africa's large aquifers. For many others, smaller scale infrastructure interventions are possible.

We engage this matter at a time when South Africa has announced its intention of supporting the national economic growth effort through a National Infrastructure Programme as part of The New Economic Growth Path. The core of the programme is a portfolio of 17 Strategic Infrastructure Projects (SIPs), the majority of which are either highly water sensitive or in some cases e.g. the Umzimvubu SIP – water centred. An important question in this domain is whether water will be a SIP constraint or can we through research and development facilitate the modality of water as an enabler of development.

We ask this question while South Africa celebrates the centenary of the National Department of Water Affairs which began its genesis as the Department of Irrigation as part of the Union of South Africa government in 1912. The century of water management at a national level has been characterised by a global leadership in water infrastructure development. Dam construction, especially large dams in difficult hydrological environments is an area that has global recognition. The area where South Africa is an undisputed world leader is that of inter-basin transfers. The Lesotho Highlands multiple dam scheme together



Segments of the massive concrete pipes that were laid to form the man-made river.

with the Trans-Caledon Tunnel transfer is such an example. This mega-scheme has been discussed at length in many international forums and has been instrumental in informing the design of larger schemes elsewhere in the world. We have a strong water infrastructure development history and a recently launched book by a WRC staffer Lani van Vuuren titled *In the Footsteps of Giants – Exploring the History of South Africa's Large Dams* offers an invaluable

“We must once again look to the possibilities of the Government's National Infrastructure Programme to provide the opportunities we require.”

contribution to this narrative. Box 1 also illustrates some examples from a larger portfolio of water infrastructure related projects that the WRC has completed or started.

In June we focused on Youth Month and the several challenges we must as a nation overcome to ensure a sustainable and water secure future. We must once again look to the possibilities of the Government's National Infrastructure Programme to provide the opportunities we require, not only to provide jobs for our unemployed youth – and this is important enough, but also to be able to use the programme to re-inject funds and impetus into training, education and research opportunities to ensure a highly capacitated and enabled skilled workforce of tomorrow that begins with developing the South African youth of today.

Some examples of infrastructure research and development related projects in the WRC portfolio

- **Water Resources 2012** – It is well known that South Africa is a water scarce country – our total mean annual runoff only equals around 50% of the water flowing in the Zambezi River. National water resources assessments have become the blueprint on which South Africa's bulk water infrastructure is based. Having been involved in the country's water resources assessments for more than two decades, the WRC is also funding the latest study, WR2012. The assessment includes an update of all hydrological data, further enhancement to existing hydrological models, revised groundwater data and a monthly time series of present day flow, among others. For the first time WR2012 is also creating a publicly-accessible, Web-based and interactive reporting system to continually quantify both the surface and groundwater resources of South Africa.
- **Dam safety** – South Africa's dam safety record compares favourably with that of developed countries. In the last 25 years not a single Category II or III (high risk) dam for which there had been a licence to construct has failed in South Africa. The WRC has worked closely with the South African National Committee on Large Dams (SANCOLD) to continuously update and improve on guideline documents related to dam safety. Latest outcomes from this cooperation include the guidelines for the determination of freeboard for dams, a review of the SANCOLD guidelines on dam safety in relation to floods, as well as the development of new methods to link the empirical frequency of flood volume exceeding flood peak magnitude.
- **Optimising the transport of water** – The geographical mismatch of the water demand centres and available water resources in South Africa necessitates the transport of water over long distances and high elevation differences. High energy costs and the increasing demand require that the water transfer infrastructure should function optimally. The aims of this study were, among others, to quantify the factors that influence the friction loss in pipelines; establish the relationship between water quality, operating conditions and the hydraulic performance of different liner systems and pipe materials; and develop selection criteria for liner systems and pipe material.
- **Climate change and dam yield** – Most of South Africa's catchments are controlled, either directly or indirectly, by dams. The supply capability of these dams is mostly assessed by means of yield analysis. Yield analysis methodology has been adapted to account for the possible relative changes in reservoir yield under various climate change outcomes. The new methodology was applied to three South African reservoirs, i.e. the Berg River Dam, Midmar Dam in the Mgeni River and Grootdraai Dam in the upper Vaal River in order to test the methodology in climatically diverse areas with expected varying climate change impacts.
- **Steeling pipelines against corrosion** – Steel bulk water pipes are used extensively in South Africa and need to be protected against corrosion, hence the need for internal linings and external coatings. In pressure pipes there are many problems associated with the use of grouted-viscous-elastic linings at joints, bends and fittings. A current WRC study aims, through laboratory trials and investigations, to provide solutions to this unresolved problem experienced by water suppliers, which costs them large sums of money due to failures.



Drier winters could be end for Cape fynbos, UCT researcher warns

Geological evidence from as far as 1 800 years ago indicates that as the planet warms due to build-ups of heat-trapping greenhouse gases, winter rainfall in the Cape is likely to become scarcer as well.

This is the conclusion of an international team, which includes Prof Michael Meadows of the Department of Environmental and Geographical Science at the University of Cape Town, after studying West Coast sediment cores and ice-core data from Antarctica.

Meadows added that drier conditions and the increased risk of fires could put fynbos at risk of extinction as a result of the projected climate change.

The team obtained sediment cores from Verlorenvlei, an elongated former estuary at Eland's Bay along the West Coast, and used evidence contained in them to reconstruct the history of lake level fluctuations over the past 1 800 years that, in turn, illustrate past rainfall regimes in the region. Their work – funded by the National Science Foundation in the US – has been published in the journal, *Climate of the Past*.

What they found supports an unsettling conclusion that sophisticated climate models have been suggesting for the future of the Cape. As the planet warms, winter rainfall is to become scarcer, primarily because of shifts in the meandering belt of westerly winds that

circles Antarctica and brings rainstorms to the region in the winter months.

According to Prof Meadows, the unique, diverse fynbos flora of the Cape could be severely affected. "These plants are tough, as they are already used to dry conditions. But further aridity could make fires more frequent, which could damage the soils and make it even harder for the native plants to survive here. Unfortunately, this is their only native habitat, so such a change might eventually threaten their very existence."

The team's research shows that rainfall increased dramatically at Verlorenvlei during a natural cool period observed globally and known as the Little Age Ice – roughly 700 to 200 years ago. This association of higher rainfall with cooling is consistent with an anticipated link between future temperatures and the position of the westerlies, in which models suggest that global warming can have the opposite effect on local rainfall and essentially drive it away from the African mainland.

"A poleward retreat of the austral westerlies would have serious societal and ecological consequences for the winter rainfall region of South Africa," noted American researcher and lead author of the paper, Curt Stager. "The same also appears to be true for the semi-arid winter rainfall regions of South America and Australia-New Zealand."

Source: University of Cape Town



WRC Research Manager appointed President of Young Water Professionals

The Water Institute of Southern Africa-International Water Association Young Water Professionals (YWP) have a new President.

Water Research Commission Research Manager, Dr Inga Jacobs, was elected President of the YWP, which is now entering its fourth year in South Africa. The organisation features more than 800 members, with provincial chapters in the Western Cape, KwaZulu-Natal, Gauteng as well as in Zimbabwe and Mozambique. Plans are underway to launch the Mpumalanga and Free State chapters this year.

It is widely recognised that capacity building and sustainable knowledge transfer are critical concerns for several sectors in South Africa, including the water sector. The loss of intellectual assets is a major threat to effective water management. The repercussions for the sector include high staff turnover and loss of skills and institutional memory.

Young water professionals are faced with the three-fold challenge of developing their skills; finding mentors to help them to do so; as well as grappling with the added responsibility of re-learning knowledge that could have been retained through sustainable knowledge transfer policies and programmes. Being part of a formal organisation, such as the YWP, could relieve many of these challenges.

Talking about the benefits of the YWP to young water professionals, Dr Jacobs said: "Young people have found the programme immensely supportive in career development, networking, and technical skills training. More importantly, it provides a supportive network of individuals who are going through the same challenges young people face when developing their careers. This might



include coping as a female professional in a male-dominated sector, or finding a mentor. Even young professionals in other sectors have joined as this kind of support is not available to them in their respective sectors."

The support for the YWP can be seen in its impressive conference attendance record – 300 participants attended the First Young Water Professionals regional conference held in 2009, with a further 440 delegates attending last year's conference. A number of former YWPs now hold leadership positions within parent bodies, WISA and the IWA.

"Given this incredible track record, it is my hope that we move from a period of establishment and growth to a period of consolidation of the programme through partnerships," Dr Jacobs tells *the Water Wheel*. The YWP is already working with the Department of Water Affairs to provide support to the Africa Youth Summit, taking place in July. "We will host several workshops and activities to share survival tips by young professionals on what to expect from a career in the water sector and to highlight the numerous opportunities," adds Dr Jacobs.

For more information about the YWP, Visit: <http://www.sa-ywp.org.za>

New leader for Stellenbosch centre investigating invasive species

Prof Dave Richardson has taken up the reins as head of the Department of Science & Technology/ National Research Foundation Centre of Excellence for Invasion Biology (CIB) at Stellenbosch University.

This follows the resignation of founding Director, Prof Steven Crown, who is to pursue his academic career further in Australia.

"The Centre has been extremely lucky to have had two A-rated researchers working side by side for the past few years, and this has helped us to make an internal appointment of extremely high calibre," noted Prof Eugene Cloete, Dean of the Faculty of Science and a member of the CIB Board.

Prof Richardson has been the CIB's Deputy Director: Science Strategy since 2005 and has, along with Prof Crown, played a leading role in establishing the Centre's reputation as an internationally recognised and most prolific research entity. The Centre also aims to deliver the science and research required to reduce the introduction rate and impact of invasive species.

Prof Richardson, a prolific author and invasive tree specialist, will receive the Herschel Medal from the Royal Society of South Africa in September, which honours his multidisciplinary contribution to science through his internationally recognised work on the ecology and management of invasive species.

Although plants are his primary focus, he has also recently helped to develop risk-assessment protocols for introduced reptiles and amphibians. He also publishes, lectures and consults widely on issues such as invasive species in commercial forestry and agroforestry, the risks associated with using introduced plants in the production of biofuels, and managed relocation.

No water restrictions in KZN for now, says Water Affairs

Water restrictions have been averted in the KwaZulu-Natal coastal metropolitan thanks to a good summer rainfall season, reports the Department of Water Affairs (DWA).

A System Operation Committee, established to monitor the need for water restrictions in the area, concluded that the very short-term water supply situation is not at risk at present, but that it will have to be monitored carefully as even a moderate drought may require water restrictions to manage this very stressed system until augmentation plans are implemented.

At its fourth meeting held earlier this year, the Strategy Steering Committee (SSC) for the Implementation and Maintenance of the Reconciliation Strategy for the KwaZulu-Natal Coastal Metropolitan Area Water Supply System, reviewed and discussed the progress on the interventions recommended in the Strategy to ensure enough water for the area.

Water conservation and water demand management (WC/WDM) has been identified as the first line of defence to

deal with water shortages in the area. The current WC/WDM initiatives of the eThekweni, iLembe, Ugu and Msunduzi municipalities have already resulted in a significant saving of water in the KwaZulu-Natal coastal metropolitan area.

"WC/WDM, however, is only effective if it is maintained. Municipalities reported concern about funding available for water demand management initiatives. It was also highlighted that the implementation of WC/WDM measures is to a large degree dependent on a concerted team effort from all parties involved and especially the communities supported by the relevant city councils. Target savings in water losses can only be achieved through buy-in and support from all stakeholders," the department said in a statement.

The building of the Spring Grove Dam, although subject to day-to-day operational challenges, is progressing well and scheduled to deliver its first water by April 2013. Likewise, investigations by Umgeni Water on the planned Lower Thukela Bulk Water Supply scheme to bring additional

water from the Thukela River to the North Coast Area is well advanced and on track.

It was also reported at the meeting that recent technical issues related to the raising of Hazelmere Dam have come to light that could influence it as a water supply option. Since the development of the initial Reconciliation Strategy, the dam design team has identified geo-technical issues related to the stability of the raised Hazelmere Dam. This has resulted in an increase in the capital cost to raise the dam wall and an increase in the construction time. This makes the raising of Hazelmere Dam economically less attractive and brings it closer to the more costly schemes, like increasing the capacity of the Lower Thukela Bulk Water Supply Scheme, the re-use of water and desalination of sea water. A process is underway to assess the situation, and depending on the outcome this may impact on the viability of the dam raising option. Developments with regard to this will be reported upon as soon as there is more clarity on the situation.



SANCID 2012 Symposium

South African National Committee on Irrigation and Drainage



GENERAL INFORMATION

Date 20-23 November 2012

Theme: IRRIGATION IN A CHANGING ENVIRONMENT

PROGRAMME AND KEYNOTE SPEAKERS

Local and international experts will be presenting their work on critical irrigation and drainage issues under the following sub-themes:

- Sub-theme 1** Humans at the forefront of watershed management
- Sub-theme 2** Climate change and irrigation: Adaptation and resilience
- Sub-theme 3** Impact of irrigation on natural resources and ecology and impact of the natural environment on irrigation
- Sub-theme 4** Design and management responses to economic challenges
- Special Session** Coping with change: Farmers' perspectives

THE VENUE

The beautiful Alpine Heath Resort is tucked away in the majestic Northern Drakensberg, KwaZulu-Natal. A first class conference venue and luxury accommodation in a relaxing setting will provide the ideal platform to share knowledge, discuss ideas and network.

TECHNICAL TOUR

We will be visiting the Drakensberg Pumped Storage Scheme, a joint venture between Eskom and the Department of Water Affairs which transfers water from the Thukela River to the Sterkfontein Dam. Four reversible turbines situated 156 meters below ground level generate 1000 MW of electricity for the Eskom grid. Delegates will also learn about the functioning of different Eskom power stations.

ABSTRACT SUBMISSION

Submit your 600 word abstracts to SANCID@ufs.ac.za by 31 July 2012.

REGISTRATION FEES

Full registration

Early-bird registration fee R 5 500-00 (before 31 July 2012)

Late registration fee R 6 500-00 (before 1 November 2012)

For further information regarding the **Symposium programme** contact **Michael van der Laan**
(Chairman of the Organising Committee)
E-mail: michael.vanderlaan@sugar.org.za Tel: 076 793 3597

For any additional information regarding **Symposium arrangements (registration and accommodation)**
please contact **Lalique Smit** Tel: (051) 436 8145, Fax: (051) 086 275 2869
or E-mail: congress@internext.co.za

Financial support for Cradle research



The Cradle of Humankind World Heritage Site Trust has disbursed its

first set of funds for scientific research projects.

A total of R77 803 has been awarded to three researchers conducting research in the Cradle of Humankind World Heritage Site. One of the researchers benefiting from funds is Simone van Tonder, who was awarded R27 803 to conduct further research into the various amphipod species that are found in the Cradle. A student at the University of Johannesburg, Van Tonder proposes to look at cave and groundwater ecology focusing on the distribution and ecological needs of two different types of amphipods or crustaceans that live in the Cradle.

In turn, Michiel Olivier de Kock and Prof Jan Kramers were awarded R50 000 to conduct research into uranium-thorium-helium geochronology and palaeomagnetic studies in selected fossil-bearing cave sites in the Cradle. Their research will look at major changes in the earth's systems over time and economically important mineral deposits in the fossil-bearing caves in the site.

"The work of these researchers is incredibly valuable, and is adding to our understanding of the fossil bearing caves in Gauteng's only World Heritage Site," commented Cradle of Humankind CEO, Dawn Robertson.

eThekweni turns tough on illegal service users

The eThekweni Municipality is taking a tough stance against residents who continue to use water services illegally.

More than R1,2-million has been recovered to date, with four residents recently being convicted in the Durban, Chatsworth and Umlazi magistrates courts as well as the Durban municipal court for using water and electricity illegally. One of the convictions involved a Kenville resident who owed

the municipality over R26 000 for water, electricity and rates. The resident pleaded guilty and, in addition to being fined R500, was ordered to pay all the money due to the municipality.

According to eThekweni Water and Sanitation Head, Neil Macleod, consumers are encouraged to come forward and rectify matters if they are illegally connected to water, before the municipality catches them out. At the time of writing there were 12 cases in different courts

across the municipality involving the illegal use of water. Eight cases were on the court roll and four warrants of arrest had been issued in cases where people failed to appear in court.

Some residents of eThekweni continue intentionally to connect water illegally, disregarding the legal implications they could face. Water leaks and illegal water connections are currently costing the municipality around R100-million a year.

Mining applications not true to sustainable development, says NGO

BirdLife South Africa has expressed its increasing concern of what it deems the 'unsustainable use of our country's natural resources'.

In a statement, the organisation notes that, while the increase in mining applications in certain parts of the country may be good news for some sectors of the South African economy, it is questioning the government's commitment to sustainable development as expressed through international obligations. "With South Africa's biodiversity, and ultimately the people of South Africa's future at stake, we need to put pressure on government to ensure that the negotiating

position presented by the South African delegation at the Rio+20 meeting is not a façade," the organisation said. "We cannot pretend to be concerned about the environment, and profess to be attending to our environmental commitments on one hand, but on the other allow the destruction and degradation of our natural resources."

BirdLife appealed to government to start giving true meaning to the notion of 'sustainable development' by giving equal recognition to food production, water security, and the conservation of our cultural and natural heritage, especially when assessing development

applications, more specifically, mining applications.

"The organisation notes with grave concern the increase in mining applications in the Mpumalanga and Limpopo provinces, and more specifically the earmarking by government of the Waterberg and Soutpansberg regions for mining. These provinces and regions remain critically important from biodiversity, water and food security perspectives, and they also support a variety of threatened and endemic bird species and a number of important bird areas."

Source: BirdLife Africa

Water by numbers

23 000 – The estimated number of registered engineers in South Africa, according to the Presidential Infrastructure Coordinating Commission. Of these, around 5 500 are working in the public sector, including State-owned companies, such as Transnet and Eskom.

9 – The total number of catchment management agencies that will now be established in South Africa, down from 19. According to the Department of Water Affairs (DWA), the water management area boundaries still needed to be formally amended through the second edition of the National Water Resources Strategy.

R150 000 – The estimated amount spent on replacing stolen toilet flush handles and taps each year by Helen Joseph Hospital in Gauteng, News24 reports.

4 – The number of years that the City of Cape Town has received Blue Drop awards for its water treatment plants – as long as the DWA incentive scheme has been running. The City scored an average 98,14% for its water treatment plants during the last round of assessments, made public in May.

800 – The maximum number of unemployed school leavers and graduates which will be placed in 'biodiversity jobs' by the South African National Biodiversity Institute (SANBI) after the Institute's project to catalyse access to employment and job creation in ecosystem management received funding of R300-million from the Development Bank of Southern Africa.

94,7% – The percentage of South Africa's population that have access to at least basic water supply. Another 710 000 households still need to be served, according to Water & Environmental Affairs Minister, Edna Molewa, who said that the inadequate maintenance of infrastructure – especially at municipal level – remains DWA's biggest challenge.