



Fluid Thoughts



WRC CEO, Dhesigen Naidoo

Water and the energy crisis – Impact and solutions

South Africa, like many parts of the world, is in the throes of a very difficult electricity shortage. The impact on our daily lives of now regular load shedding and concomitant disruptions of equipment, machinery and appliances that comprise our toolboxes for functionality at home and at work is high, and frequently tests even the most developed sense of humour.

At a structural level, the water business and our ability to deliver quality water services is highly energy dependent. This is illustrated in Figure 1. To summarise, energy is the critical enabler at every touch-point in the water delivery chain. This begins with energy driven abstraction, either pumping water for irrigation, domestic or industrial purposes from either surface or groundwater to transporting the water to the point of treatment or direct use. This continues with energy powered water treatment for use, and eventually for wastewater treatment post-use. More recently, and more frequently, energy is being used in freshwater production from brackish or sea water through desalination. Energy is the critical input factor that powers water delivery for all uses and in all environments.

A shortage of power has the net effect of compromising the entire water services value chain for the period of its absence. We have seen this having a major impact in South Gauteng recently with the compromise of two major pumps due to an electrical outage triggered by cable theft. The intermittent supply of the energy service also has other potential

challenges to both the pumping machinery that have been designed for continuous, uninterrupted operation without unplanned shutdowns, and the corresponding startup surges. In addition, we have to examine the impact of interrupted flow in our pipelines and the impact of the introduction of air pockets to both the flow regimes and the corrosion of the piping infrastructure.

"A shortage of power has the net effect of compromising the entire water services value chain for the period of its absence."

Water is also a major player in the electricity value chain (Figure 1). It has the character of a generator in the form of hydroelectricity and wave power. It is also the critical growth additive in the production of biofuels, and biogas is an important by-product of wastewater treatment. It functions as an energy carrier in steam turbines and functions as a hydraulic tool to unleash energy sources like in the hydraulic fracturing or fracking of shale gas. There is last but by no means least the function of cooling energy generators. The relation between water and energy is an intimate one with the highest level of co-dependency.

In this vein, it is clear to see that water can be a major player in alleviating the energy crisis. Water is a major water use and there is a positive correlation

between the amount of water used and its energy demand. An upscaling of our water conservation and demand management (WC/WDM) interventions will have the impact of a lower water consumption and a corresponding decrease in energy demand. The Water Research Commission has in its research portfolio developed a multitude of effective WC/WDM measures and interventions that will realise this impact.

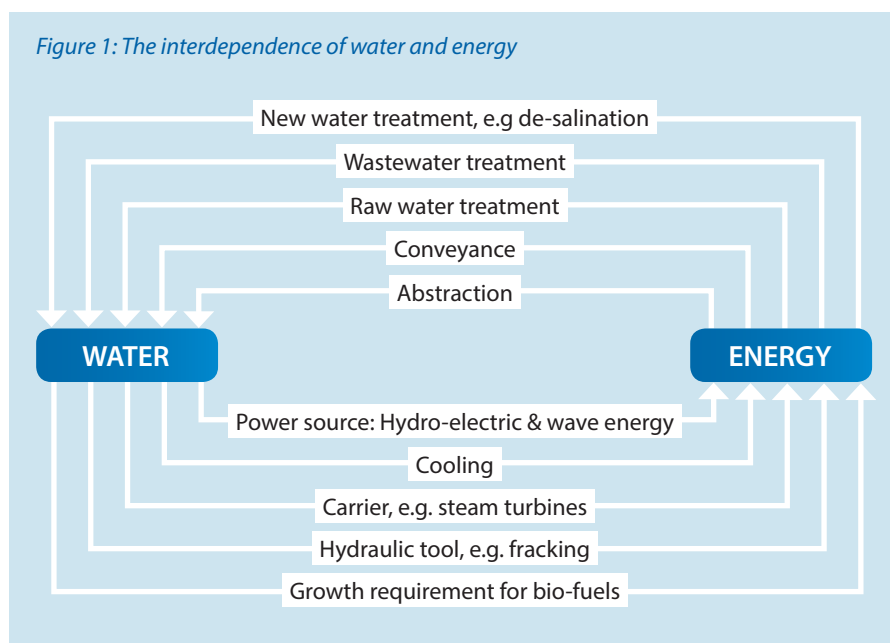
In addition The WRC has published a compendium of case studies of successful WC/WDM interventions that have been used successfully on the ground. These include technical and technological solutions, financial interventions, institutional measures and behavioral changes. An example is the implementation of intelligent pressure regulation in Sebokeng/Evaton which not only achieved a water saving of 33%, but a complementary energy saving of 14 million kWh/year and a Greenhouse Gas emissions reduction of 12 000 t.

This has been complemented with a compilation of best practice in efficient energy use in the water sector. In a country where the current energy demand envelope for wastewater treatment is 200-1800 kWh/MI and the reticulation energy use is anywhere between 0 and 350 kWh/MI depending on the situation; the opportunity for greater energy efficiency is large. South Africa's our non-revenue water sits at around 37%, with 25% being in the water leaks domain, the potential for water savings and the related energy saving, therefore, is substantial.

In addition, we are seeing promising results emerging in the WRC portfolio with regard to new micro- and pico-hydroelectricity options utilising the potential energy stored in the water reservoirs in our towns and cities. The WRC teams are working with our partners to get this technology operational in our towns and cities at scale. This may have the potential of water providing a major component of its own reticulation energy needs in the future.

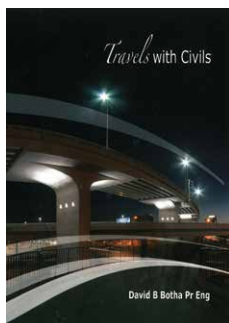
Water conservation and water demand management together with appropriate investments in water based power generation can become a cornerstone of South Africa's future energy security for the water sector and beyond.

Figure 1: The interdependence of water and energy



BOOK REVIEWS:

Do you have a new water sector-related book for the Water Wheel to review? Send a copy to The Editor, The Water Wheel, P/Bag X03, Gezina, 0031.

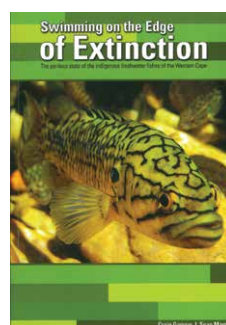


Taking South African engineering excellence on the road

Travels with Civils by David B Botha, is the latest publication by the South African Institution of Civil Engineering (SAICE). This colourful publication showcases what engineers have made possible in 110 years of civil engineering excellence in South

Africa. Featuring numerous South African landmarks and engineering projects in each province (over 170 in total), the book bears testimony to the ingenuity of civil engineering professionals and celebrates the work and contributions of the South African civil engineering profession. Worth mentioning are the maps and GPS coordinates included with each infrastructure entry, which makes this publication a valuable companion for the local and international engineering-minded tourist. As an added bonus the publication features a free digital copy of the Water Research Commission publication, *In the Footsteps of Giants: Exploring the history of South Africa's large dams*, authored by Water Wheel Editor, Lani van Vuuren.

To order a copy of this book, contact the SAICE Bookshop at Tel: (011) 805-5947; Email: angelene@saice.org.za; or Visit: <http://saice.org.za/book-store/travels-with-civils>



Pointing out the perilous state of our precious indigenous freshwater fish

Swimming on the Edge of Extinction – The Perilous State of the Indigenous Fishes of the Western Cape by Craig Garrow and Sean Marr covers all currently recognised freshwater fish species that are indigenous to the Western Cape. Each species account is

illustrated with exceptional photographs of fish in their natural environment together with descriptions of the distribution, biology, status and threats to the species. The book contains descriptions of major river catchments of the Western Cape, each illustrated with maps and photographs of important and picturesque mountain stream habitats. Easy-to-follow chapters summarise the range of threats to the indigenous freshwater fishes of the Western Cape and provide strategies to halt and reverse their decline. Its message is simple but powerful and, the book is bound to interest conservationists, biologists, ecologists, freshwater fisherman and all those who value the beautiful natural environment of the Western Cape. The book will hopefully motivate amateurs, professionals and the person in the street to take action and contribute towards conserving the remaining freshwater fish populations of the province. *Swimming on the Edge* is published by NISC.

To order a copy of this book, Visit: <http://www.nisc.co.za/products/49/books/swimming-on-the-edge-of-extinction-the-perilous-state-of-the-indigenous-freshwater-fish-of-the-western-cape>.

The book is also available from www.kalahari.com.



Diary

Residuals and biosolids: June 7-10

The Water Environment Federation, together with the International Water Association, is hosting a conference on Residuals and Biosolids in Washington, USA. Visit: www.residualsbiosolids-WEFIWA.org

Aquatic science: June 28 to 2 July

The Southern African Society of Aquatic Scientists will be holding its annual conference at the Champagne Sports Resort, in the Drakensberg, with the theme 'Water resource research, policy and people'. Enquiries: Petrie Vogel (Conference Secretariat); Tel: +27 (0)12 346-0687; Fax: +27 (0)12 346-2929; Email: petrie@savetcon.co.za.

Large dams: July 13-20

The 25th Congress of the International Commission on Large Dams will take place in Stavanger, Norway. Visit: www.icoldnorway2015.org

World water: August 23-28

The annual World Water Week will take place in Stockholm, Sweden, as usual. Visit: www.worldwaterweek.org

Social science: September 13-16

The World Social Science Forum will be held in Durban. A broad range of topics will be discussed under the theme of 'transforming global relations for a just world'. Visit: www.ssf2015.org

Large dams: September 1-3

The South African National Committee on Large Dams (SANCOLD) is hosting its annual conference in Cape Town with the theme 'Dam safety, maintenance and rehabilitation of dams in southern Africa'. Apart from the technical presentations, the conference also includes the SANCOLD Young Engineer's Forum as well as technical site visits to the Clanwilliam and Bulshoek dams, as well as the Table Mountain Dams. Enquiries: Nom Buthelezi (Conference Secretariat) at Tel: +27 (0)11 676-3417; Email: secretariat@sancold2015.org.za or Visit: www.sancold.org.za

Groundwater: September 21-23

The 14th Groundwater Conference will be held at Muldersdrift with the theme 'From theory to action'. This conference aims to highlight the issue of improving the uptake of existing knowledge

and experiences of groundwater in South Africa to assist in solving environmental and societal problems. Email: info@gwd.org.za or Visit: www.gwd.org.za

Municipal engineering: October 28-30

The annual conference of the Institute of Municipal Engineering in Southern Africa will take place at the Grand West Hotel and Casino, in Cape Town. Visit: www.imesa.org.za

Young Water Professionals: November 16-18

The theme for the 4th YWP South African biennial conference, which will be held in Pretoria, is 'Stop talking, start doing'. Conference topics include domestic and municipal water and sanitation; drinking water and bulk water supply; industrial and mine-water; environment water; and capacity building and training. Enquiries: Jaco Seaman (Conference organiser), Tel: +27 (0)11 805-3537; Email: events@wisa.org.za; Visit: www.ywp-za.org/

Large personal historical collection digitally archived at NWU

The North West University's (NWU's) South African Water History Archival Repository (SAWHAR) has reached an enormous milestone with the completion of the Will Alexander Archive in a digital format.

Prof Alexander, for many years a senior engineer at the then Department of Water Affairs and later Professor at the University of Pretoria in 2012 donated to SAWHAR some of his personal papers and documents related to work he had done at the department, along with some academic writings.

The Will Alexander Project archival project started in February 2014, when Willem Lemmer, who had just completed his BA studies at NWU's Potchefstroom campus, was appointed to compile an inventory of the collection. Willem worked under the supervision of Celesté Reynolds, the NWU (Potchefstroom) archivist.

In September, Willem relocated to Vanderbijlpark with a contract to undertake dedicated archival work for SAWHAR. Subsequently, two students, Nadine Smit and Lucky Malekutu, joined the SAWHAR team on a part-time basis. By the end of November

2014, the group had managed to complete more than 22 000 text page scans and 471 photographs of the Alexander Collection. The material is linked to the digital format.

Checking, re-checking and quality assurance took up much of the time in the creation of the digital archive. The Alexander Project is the second and thus far the most comprehensive digital archive to be completed by SAWHAR.

In 2013, Marietjie Joubert compiled the archive of the Standing Committee on Water Supply and Sanitation (SCOWSAS). The documents tell the story of the committee that started operations in the early 1990s and prepared the way for the first policy guidelines to be issued by then Department of Water Affairs and Forestry after South Africa's transition to a multiracial democracy in 1994. The SCOWSAS archive was donated to NWU by social science researcher, Victor Munnik.

SAWHAR is now permanently based in the new library at the Vaal Triangle Campus of NWU. The library was officially opened in 2014.

South Africa welcomes Indian Ocean Rim countries in historic workshop



The Indian Ocean Rim Association (IORA) Water and Sanitation Technology Working Group met for the first time in a workshop held in Gauteng earlier this year.

The WRC played host to representatives from countries such as Oman, France, Tanzania, Bangladesh, Yemen, Indonesia and Australia. Among others, IORA aims to formulate and implement projects for economic cooperation relating to trade facilitation, promotion and liberalisation; promotion of foreign investment and tourism; scientific and technology exchanges; as well as the development of infrastructure and human resources.

The South African workshop discussed a framework for researcher exchanges between member countries, particularly in the water research and development domain. Further it explored opportunities for support and networking in engagements to promote cooperation in water resource management in the member countries.

Support for research and innovation can boost job creation – Naledi Pandor

South Africa's efforts to grow the economy and create jobs through research and innovation topped the agenda at the first Innovation Bridge technology showcase and matchmaking event, held in Pretoria in February.

The first-of-its-kind two-day technology matchmaking event provided an opportunity for local and international technology-based companies, entrepreneurs and financiers to scout for technology solutions and investment opportunities. The event was driven by the Department of Science and Technology (DST) with its partners, the Technology Innovation Agency, the National Intellectual Property

Management Office (NIPMO) and the Southern African Research and Innovation Management Association (SARIMA).

During the discussion, the Minister of Science and Technology, Naledi Pandor, said that increasing the number of researchers and enhancing research and innovation skills and outputs could contribute positively to improving South Africa's economy and job creation efforts. "Knowledge is the currency of the global economy. If South Africa wants to continue to compete in the twenty-first century, we must support research and innovation that will generate growth and jobs, now and in the future."

The Innovation Bridge was expected to serve as a key platform to close the gap between research and development (R&D) and the market, contribute to economic competitiveness, and stimulate increased investment in R&D through the creation of an enabling environment for technology exploitation and entrepreneurial partnerships. The inaugural event included policy dialogues, plenary discussions, technology exhibitions and demonstrations with up to 75 technologies from more than 30 publicly funded R&D organisations, including the Water Research Commission.

Source: DST

Engineering institution inaugurates its youngest president ever

The South African Institution of Civil Engineering (SAICE) inaugurated its 2015 President, Malcolm Pautz, at a prestige event in February. Pautz is the youngest ever president since the institution's establishment in 1903.

In his address, Pautz challenged Generation Y engineers to be bold, to have courage, to never be afraid of taking initiative, and to be involved, while judging themselves on self-integrity and accountability. To engineers stemming from the traditionalists and baby boomer eras, the challenge is to listen to the young engineers, to guide and mentor them, and to identify future leaders who will have the task to make the National Development Plan as well as the post 2015 sustainable development goals a reality.

"I have a dream that one day all civil engineers will be judged not by their inheritance, but by their skill and competence, and by the value they create for society. You, the young engineer, need to rise up and ensure that transformation is met on a balanced basis and without hindering economic and social development within the confines of our resources."

- Malcolm Pautz



New grant aims to open access to SA biodiversity knowledge

The Biodiversity Heritage Library Africa (BHL), led by the South African National

Biodiversity Institute, has received a US\$150 000 grant from the JRS Biodiversity Foundation to enable it to make biodiversity data more accessible across sub-Saharan Africa.

"JRS is proud to support projects that express our mission of enhancing biodiversity knowledge," said JRS Biodiversity Foundation Executive Director, Don Doering. "Online resources for historical and current environmental information can powerfully link scientists to other stakeholders in the quest for sustainable development."

The support is expected to make a treasure trove of historical studies of Africa's biodiversity available to researchers, educators and the public. BHL is a consortium of natural history and botanical libraries that cooperate to digitise the legacy literature of biodiversity held in their collections, and to make that literature available for open access. Though much of the core biodiversity literature from Africa exists in non-African institutions, rich and unique collections of materials reside in the national institutions and universities on the continent.

This project will grow BHL through the collaboration, assessment and digitisation of African collections and by creating a sustainable network of institutions and countries to increase access to biodiversity materials held in sub-Saharan African institutions.

Tackling the lack of sanitation head-on

The Water Research Commission (WRC) has partnered with the Department of Science and Technology (DST) and the Bill and Melinda Gates Foundation to tackle South Africa's sanitation backlog through the use of technological innovations.

The partnership has resulted in the creation of the South African Sanitation Technology Demonstration Programme (SASTEP), which will see innovative, new-generation sanitation technologies developed under the Gates Foundation 'Re-Invent the Toilet' Challenge demonstrated in South Africa.

Under the programme, several district municipalities and schools in critical need of sanitation intervention in the Eastern Cape will host the next generation of toilet systems. These off-grid technologies offer the same convenience as full flush toilets but with

less sludge management challenges associated with on-site dry toilets.

Some of the toilets have included plans for menstrual management as part of the design. The Loughborough toilet, for example, can handle and sanitise nappies and menstrual pads through its pressurised cooking treatment unit

Last year a workshop was held in the Eastern Cape with funders and technology developers. This included site visits to potential demonstration sites. The conditions of the schools provided an indication of the challenges generally faced by rural schools in South Africa with regards to sanitation, and what sanitation services and initiatives had been achieved with the support of the local municipality. These included the piloting of WRC-funded low flush toilets as well as toilet blocks assembled from pre-fabricated materials.



Sanitation technology developers fielding questions at the workshop

The workshop ended in Pretoria, where the SASTEP was launched publicly, and stakeholders from across the country gathered to engage with the technology developers.

Through this programme and others, the WRC aims to provide technological sanitation innovations that allow for appropriate and sustainable solutions to the country's sanitation challenge.

Workshop confirms that smallholder irrigators require support

The Network on Irrigation Research and Extension for Smallholder Agriculture (NIRESA) took its annual workshop to the Nkomazi Irrigation Scheme late last year. The meeting was attended by around 100 participants from several provinces, including Limpopo, Mpumalanga, and North West.

NIRESA was founded in 1996 to facilitate the exchange of ideas and practices pertaining to smallholder irrigation in South Africa among researchers and advisory agencies operating in different disciplines of agriculture. According to Water Research Commission Research Manager, Dr Sylvester Mpandeli, the organisation aims to build a shared understanding of the priority areas for research and extension and of the activities that are necessary to effectively address the considerable challenges that face smallholder irrigation.

"This is a very good platform for scientists, extension officers and students to exchange ideas, network and also strengthen irrigation activities across the country," notes Dr Mpandeli.

Delegates learnt much about their visit to the Nkomazi Irrigation Scheme, particularly how the farmers struggled

with their main weir which was damaged by floods in 1994. Since then efforts to fix this infrastructure have been disappointing.

The farmers are getting much assistance from TSgro Company especially in terms of capacity building in the form of training smallholder farmers on leadership issues, through the organisation of information days and farm management, among others, highlighting the need for support for such farmers.

The farmers were also being assisted with a range of other issues, from developing their business plans and getting financial and technical support to assistance with bookkeeping and year-end audits.

