



2014

Twenty years of water research in a democratic South Africa

We herald in 2014, our twentieth anniversary of a free and democratic South Africa, with mixed feelings at the WRC.

We do for the first time for most of us without the Father of our Nation, and arguably one of the greatest human beings in human history, Tata Nelson Mandela, no longer with us. The sadness that continues to tug our heartstrings are however overwhelmed by the will he has stimulated in all of us to continue his life's work of vectoring our endeavours so that the net impact is to expand the frontiers of human dignity.

In those 20 years since 1994, the world has become a remarkably different place. The 1990s were characterised by a unipolar, US-led post-cold war world and a dramatically weakened Russian Federation. The only tangible economic threat to the US's fortunes was a steadily strengthening Euro on the back of a galvanised expanding European Union. There were speeches in UN platforms and other multilateral arenas of the possibility of the African Century characterising the first post-millennial hundred years, but they were generally accepted as part of an aspirational rhetoric of one of

the world's forgotten regions.

The 2000s heralded dramatic shifts in the global political economy. The characterisations included:

- A global vulnerability to much more sophisticated terror attacks on the back of an increasing brittle roadmap for the Middle East.
- A global economic slowdown stimulated by tsunami of unsecured debt causing in the US initially, but eventually finding sympathetic, superimposing ripples in Europe and elsewhere.
- The significant rise of economies in the South, in particular China, India and Brazil leading both an economic growth wave and a concomitant shift in the global economic balance.
- Africa has emerged as the continent with the strongest average growth rate, albeit from a lower baseline, but continues to show the promise of sustainability in the growth even while the global recovery remains lukewarm at best.

South Africa has, in this time, been through a rollercoaster ride of divided experiences. The black euphoria of liberation in 1994 combined with the very cautious optimism among white folk was a cocktail that characterised the start of our fledgling democracy. Over time

we experienced the galvanising of the South African 'rain-bow'

nation' under the stewardship of Tata, former President Mandela.

In this time there were a series of factors that re-shaped the South African science and technology landscape. The first was the desire to craft a trajectory away from a predominantly resourced-based economy into a knowledge-based economy with significant diversification. The response to this objective was robust with the development of the Science and Technology White Paper following a comprehensive Research and Technology Foresight initiative. This culminated in the 2002 National R&D Strategy, which significantly reorganised and aligned the national science and technology landscape, brought substantive private and public investment into R&D and injected an important optimism into South African science.

The second development was the end of the Apartheid induced isolation. This has had a profound impact in many spheres, the most prominent being the rise of South Africa as a global player in the political and sports domains. We have also quietly made enormous strides in the science and technology arena. We see this as prominent in many ways – the hosting of the world's largest radio-telescope the Square Kilometre Array, the location of the International Centre for Genetic Engineering and Biotechnology in our country and South Africa's acknowledged contributions to big science like

the Intergovernmental Panel on Climate Change.

On the research productivity front, A Pouris in his *South African Journal of Science* article 'Science in South Africa: the dawn of a renaissance' observed that between 2000 and 2010 SA's ranking in terms of ISI paper production rose from 35th to 33rd. This was the impact of moving from 3 617 papers published in 2000 to 7 468 papers in 2010. The South African water science community has performed with merit, with South Africa's ranking in water sciences rising to a high of 18th in the world in 2013 while contributing a phenomenal 1.61% of the global share of papers.

This sets a remarkable foundation to go forward. The WRC has developed a 2014 programme that will highlight the achievements of this water R&D community (including all stakeholders) over these 20 years of democracy, create platforms for a very candid critique of our collective performance to date, and of course set the stage to finetune our design going forward. This design will engage the concept of futures planning for water sciences, better mechanisms to ensure the use of scientific knowledge in planning and decision-making at all levels, and, elevating water sciences impact on socio-economic development. This will be our best tribute to the spirit of Madiba as we enable *Amandla Olwazi Kubantu* ('the power of knowledge to the people')!





Letters to the Editor

Reënwater wel lewensvatbaar vir huishoudings

In die *Water Wheel* van September/Okttober 2013 (volume 12 no 5) verskyn 'n artikel 'Rainwater harvest from tanks – Useful yes, but can you drink it?' waarin geskryf word oor die gebruik van reënwater vir huishoudelike gebruik.

Dit is 'n interessante artikel gebaseer op navorsing deur 'n span vanaf Stellenbosch Universiteit by die Kleinmond behuisingskema. Dit is ook veral interessant om te let op die terugvoer van die gebruik van reënwater deur die plaaslike inwoners. Tog skep dit 'n persepsie dat die gebruik van reënwater nie werklik lewensvatbaar is nie.

Ek is woonagtig op Cannon Rocks in die Oos Kaap. Beide Cannon Rocks en Boknesstrand kry hul munisipale water van ondergrondse bronne te Cannon Rocks. Die soutgehalte van die ondergrondse water word nadelig beïnvloed deur veral droogtes. Tans word die water vanaf die boorgate verwerk deur 'n tru-osmose proses.

Voor die inwerkingstelling van die tru-osmose werke, was die water direk gelewer aan beide dorpie vir huishoudelike gebruik. Weens die hoë soutgehalte van die water het die inwoners van beide Cannon Rocks en Boknesstrand hoofsaaklik gebruik gemaak van reënwater. Die gebruik van reënwater vir huishoudelike gebruik is steeds van toepassing by die inwoners.

Ons persoonlike huishouding, soos verreweg die meerderheid van die inwoners, word voorsien deur reënwater ten spyte van die gesuiwerde water deur die tru-osmose werke. Ek is bewus van enkele inwoners wat reeds vir etlike jare al hul munisipale watertoevoer kraan glad nie oopdraai nie. Die gemiddelde reënwater opgaarvermoë van huishoudings in Cannon Rocks en Boknesstrand wissel van 1 500 ℓ tot 2 000 ℓ.

Die persepsie wat die artikel by 'n leser laat, naamlik dat die gebruik van reënwater vir algehele huishoudelike gebruik, nie lewensvatbaar is nie, is na my mening dus nie korrek nie.

Bert Venter, Cannon Rocks

Water diary

Municipal water

January 23-24

The Water Institute of the University of Pretoria (UP) is hosting a knowledge-sharing workshop on the water resources of the City of Tshwane. The purpose of the workshop is to, among others, supply a detailed overview of the water resources of the municipality to a multidisciplinary audience, to showcase the status quo of UP-related water research pertaining to the metro, and to generate awareness and interest in the water resources of the municipality, with the aim of promoting cooperation in the protection and safe utilisation of these fundamental resources. *Enquiries: Matthys Dippenaar, Tel: (012) 420-3117; Email: madip@up.ac.za; Visit: www.up.ac.za/waterup.*

Water treatment

February 10-12

Stellenbosch University is offering a three-day course on water and wastewater treatment, with an introduction to re-use. The course will also look at the application of the theory in practise as well as legislation and operational aspects which should be considered. Presenters are drawn from government, universities, and consulting engineering companies. *Enquiries: Merentia Meyer, Tel: (021) 808-4352; Fax: (021) 808-4351; Email: merentia@sun.ac.za; Visit: www.eng.sun.ac.za*

Gender and water

February 19-21

A conference on Gender, Water & Development will be held at the ICC East London with the theme 'Gender, water and development – The untapped connection'. The conference is hosted by the Water Research Commission, together with the Department of Water Affairs, the African Ministers' Council on Water, the Women in Water Partnership and the Southern African Development Community. *Enquiries: Conference Secretariat, Glaudin Kruger, Tel: (028) 316-2905; Email: Kruger@kruger-associates.com; Visit: www.global-water-conference.com*

Water loss

March 30 – April 2

The International Water Association Water (IWA) Loss 2014 Conference will be held in Vienna, Austria. This is the sixth event in a series of IWA water loss reduction speciality conferences, following on a successful conference held in the Philippines in 2012. *Enquiries: Conference Secretariat, Email: 2014committee@iwa-waterloss.org; Visit: www.iwa-waterloss.org/2014/cms/*

Civil engineering

April 6-8

The South African Institution of Civil Engineering (SAICE) with its industry partners is hosting the first Civilisation Congress at Emperors Palace, Johannesburg. "Civilisation is a new era for engineering professionals, motivating engineers of all disciplines to conduct business differently. It is also where engineers play the role of history makers, bringing about transformation, diversity, leadership and evolution in our local and global society and the betterment of the quality of life through collaboration between communities and government," SAICE says. *Enquiries: Liza Monteiro (Conference secretariat), Tel: (011) 465-0334; Email: liza@confco.co.za; Visit: http://civilisationcongress.com*

Water, energy & climate

May 21-23

The IWA Water, Energy and Climate Conference 2014 will take place in Mexico City, Mexico with the theme 'Solutions for Future Water Security'. The conference is seen as an opportunity to bring together knowledge from across the globe to share experiences and information, enable collaboration and build new partnerships, discussion of cutting edge solutions to the world's water and energy issues, while also addressing approaches to sustainable and effective adaptation throughout the water sector.

Water innovation

May 25-29

The Water Institute of Southern Africa Biennial Conference & Exhibition will be held in Nelspruit. *Enquiries: Jaco Seaman; Tel: (011) 805-3537; Fax: (011) 315-1258; Email: events@wisa.org.za; Visit: www.wisa.org.za*

Aquatic science

June 22-26

The 2014 conference of the Southern African Society of Aquatic Scientists will be held in Thaba Nchu, Free State. *Enquiries: Petrie Vogel; Tel: (012) 346-0687; Fax: (012) 346-2929; Email: petrie@savetcon.co.za; or Visit: www.savetcon.co.za to register.*

Social Science

July 2015

The third World Social Science Forum is set to take place in Durban. The forum is a global event of the International Social Science Council that brings together researchers and stakeholders in international social science cooperation to address topical global issues and future priorities for international social science. The theme for this event is 'Transforming global relations for a just world'. *Visit: www.codesria.org/spip.php?article1674*

National recognition for Water Administration System

Water efficiency system, the Water Administration System (WAS), has been recognised by the Department of Water Affairs during its annual Water Conservation and Water Demand Management (WC/WDM) Sector Awards held in Gauteng earlier this year.

The system, developed by Dr Nico Benadé (pictured) with funding from the Water Research Commission (WRC) to assist irrigation schemes with efficient water management, was awarded the second place in the Agriculture category. Interestingly, the winner in this category was the Lower Olifants River Water User Association, which has successfully implemented WAS to achieve its WC/WDM targets.

WAS is a uniquely a South African integrated management tool for irrigation schemes that delivers water on demand through rivers, canal networks and pipelines. WAS is used for water distribution management and for the calculation of dam and canal operating procedures for a given downstream water demand.

Twelve years of research went into the development of the WAS program, with its main aim to minimise water losses on irrigation schemes. Field measurements have indicated water savings between 10% to 20% on implementing the water release module of the WAS program alone.

The program is currently used by all major irrigation schemes in South Africa, totalling about 148 411 ha. This includes 9 991 abstraction points, with a total water allocation of 1 206.5 million m³.



“Effective water loss reduction can only be achieved through a comprehensive management system such as WAS,” notes Dr Benadé. “All of the irrigation schemes using WAS have reported water savings. At the Loskop, Oranje Riet and Lower Olifants irrigation schemes, for example, the water-supply losses in the canal system have been reduced over a number of years to 20% per year. In general, water losses of 20% and below are considered extremely well for irrigation schemes”, he notes.

Dr Gerhard Backeberg, Executive Manager for Water Utilisation in Agriculture at WRC comments: “Over the last 15 years the implementation of WAS on irrigation schemes has practically proven that real water savings through water loss control are achievable. The higher the losses the bigger the opportunities are for savings.”

To read more about the impact of the WAS program read the report, *Research impact assessment of the Water Administration System (WRC Report No. TT 447/09)* available from Publications (Email: orders@wrc.org.za) or electronically from www.wrc.org.za.

Prominent experienced and young engineers awarded at SANCOLD conference

Both prominent experienced and young engineers were recognised at this year’s conference of the South African National Committee on Large Dams (SANCOLD), held at Thaba’Nchu from 5 to 7 November, 2013.

More than 230 delegates attended this year’s conference, which had the theme ‘Technology for Water and Water Energy in southern Africa’, including attendees from Kenya, Lesotho, Namibia and Swaziland.

The highlight of the conference was the presentation of the SANCOLD Award to two prominent dam engineers. The SANCOLD Award is made to prominent person(s) to acknowledge their exceptional contributions to the Committee and/or the dam industry in South Africa.

The first Award went to Dr Chris Oosthuizen (top photograph), a Specialist Engineer in Dam Safety Surveillance and Rehabilitation at the Department of Water Affairs (DWA). Dr Oosthuizen has been the Approved Professional Person for more than 150 DWA dams since 1986, and has been appointed as the dam safety expert for two arch dams in Switzerland since 2000. He is also involved in the monitoring of the dams of the Lesotho Highlands Water Project.

The second recipient of the SANCOLD Award was Mr Willie Croucamp (middle), which has 44 years of service with DWA. He has headed the Dam Safety Office since its inception to 2003. Mr Croucamp promoted the development of clear guidelines for use by Approved Professional Engineers in the execution of tasks defined in the legislation. He

also officiated as assessor of the judicial enquiry on the deaths following the failure of two tailings dams in the late 1990s.

Further to the Award, SANCOLD has been encouraging the participation of young engineers in the organisation. As an incentive a prize was awarded to the best paper prepared and presented by a young engineer. This year’s recipient was Mfundo Vezi (bottom), a student at the Department of Civil Engineering at the University of Cape Town. He received the award for his paper on ‘Dynamic modelling of arch dams in the ambient state’.



Wetland society recognition for WRC

The South African Wetland Society has recognised the Water Research Commission (WRC) through its annual National Wetlands Awards in the ‘wetland education and skills development’ category for the funding and publication of the *WET-Management Series*.

The awards, sponsored by Mondi and held in October, recognises the outstanding contributions and

achievements of those doing wetland work while showcasing successful or innovative work by the wetland sector to the public. Other recipients included Craig Cowden and Doug Woods in the ‘wetland stewardship’ category for successful wetland rehabilitation projects; Dr Heather Malan in the ‘wetland science and research’ category for a range of wetland research projects

and related scientific publications. In addition, a special national award was bestowed on Deputy Minister of Water & Environmental Affairs, Rejoice Mabudafhasi for her efforts in furthering wetland conservation at the highest political levels.

The *WET-Management Series* of wetland rehabilitation tools were developed as part of a comprehensive

nine-year research programme on wetland management initiated by the WRC and a range of partners in 2003. The programme examined wetland rehabilitation, wetland health and integrity as well as the sustainable use of wetlands. The series comprises a roadmap, two background documents, eight tools and an evaluation of the success of six individual projects.

New dam on the cards for KZN Hibiscus Coast

A new bulk water development scheme is being planned to relieve water-supply challenges in the Hibiscus Coast of KwaZulu-Natal. The area includes holiday towns such as Port Shepstone, Margate and Hibberdene.

Feasibility studies have been completed for the Ncwabeni off-channel storage dam to be constructed in a tributary of the Umzimkhulu River, with final design and tender completion expected by the end of this year. The dam will augment current supply from the Umzimkhulu Regional Water Supply Scheme, where water is abstracted directly from the river at St Helen's Rock and treated at the Bhoohoyi Water Treatment Works near Port Shepstone. From there the water is distributed to end users, mainly for domestic water-supply purposes.

According to Mari Trümpelmann from consulting engineering firm Aecom SA, the current river flow cannot meet requirements during dry periods, and there is currently no provision for the ecological Reserve. She was speaking at the 2013 conference of the South African

National Committee on Large Dams, held at Thaba Nchu in the Free State. "Reconciliation studies undertaken over the last decade have confirmed that provision has to be made to maintain the Umzimkhulu River's current good ecological condition as well as to augment the non-regular water supply to Port Shepstone and surrounds."

The current run-of-river yield of the Umzimkhulu River at St Helen's Rock is about 18.3 million m³/a without consideration of the ecological Reserve. This is already less than the coastal area's current water requirement of 18.5 million m³/a. To compound the challenge, the regional water-supply scheme's supply area needs to be expanded to include areas that currently do not have an acceptable level of water supply or services. Increased water conservation/water demand management will have to be implemented to reduce the short-term deficit until the dam can deliver water in around 2018.

After various site studies, a site on the Ncwabeni River was settled upon. The off-channel dam was selected to

maintain the ecological integrity of the Umzimkhulu River, which is currently one of the few remaining free-flowing rivers in South Africa. "Water from the proposed dam will augment the Umzimkhulu Regional Water Supply Scheme by around 30 million m³/s, and meet the growing water requirements up to 2040," said Trümpelmann.

To achieve this yield a dam with a gross storage capacity of 15.5 million m³ is required. The proposed concrete-faced rockfill dam will be 47 m high, with a side-channel spillway. In addition, a low-level diversion weir is planned to be

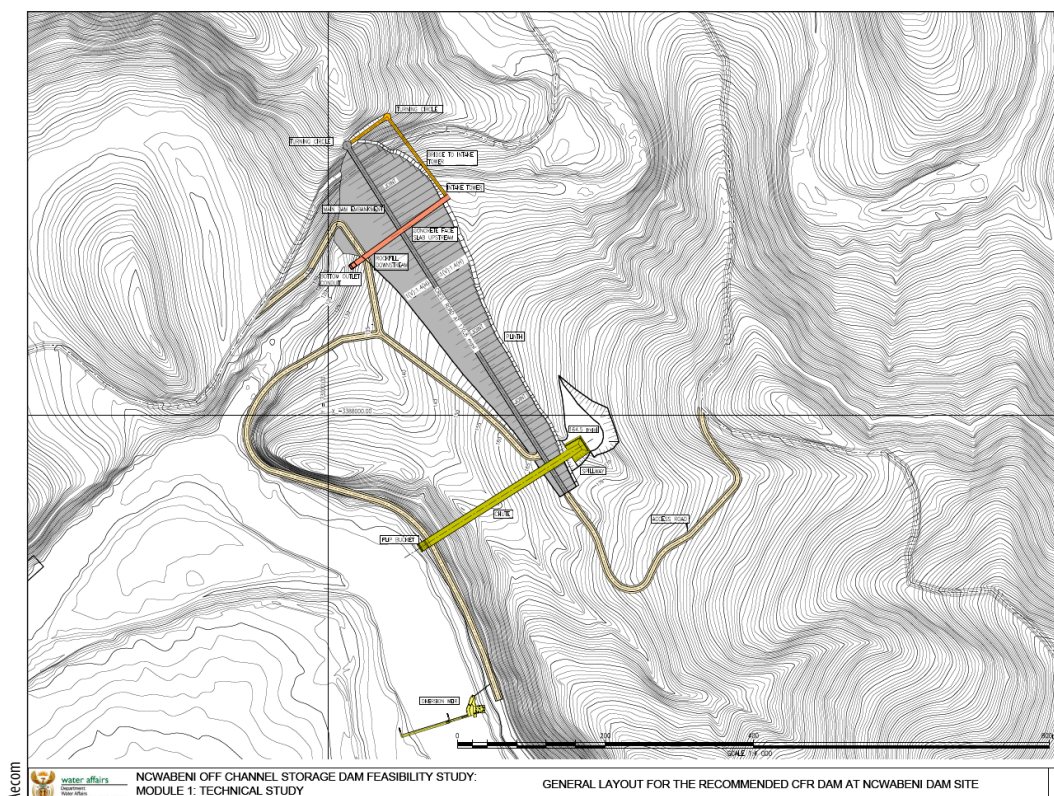
constructed on the Umzimkhulu River to divert water to the abstraction works from where water will be pumped to fill the dam in the summer months when the flows are greater than the sum of the requirements of the regional water-supply scheme, lawful downstream users and the ecological Reserve. To minimise ecological disruptions to the Umzimkhulu River, two fishways have been proposed.

Institutional arrangements and financial arrangements for the project are still being finalised. It is hoped to start construction of the new infrastructure by mid-2015.

Characteristics of the proposed Ncwabeni off-channel storage dam

Component	Characteristics
Dam type	Concrete-faced rockfill
Dam height	47 m
Storage capacity (gross)	15.5 million m ³
Spillway type	Side-channel with chute
Outlet	Intake tower with conduit through embankment
Abstraction works pumping rate	0.75 m ³ /s

Source: Aecom



The general layout of the proposed Ncwabeni off-channel storage dam.

Scientists strike gold in leaves

Eucalyptus trees in the Kalgoorlie region of Western Australia are drawing up gold particles from the earth via their root system and depositing it their leaves and branches.

Scientists from CSIRO made the discovery and have published their findings in the journal *Nature Communications*. "The eucalyptus acts as a hydraulic pump – its roots extend tens of metres into the ground and draw up water containing the gold. As the gold is likely to be toxic to the plant, it is moved to the leaves and branches where it can be released or shed to the ground," explained CSIRO geochemist, Dr Mel Lintern.

The discovery is unlikely to start an old-time gold rush as the 'nuggets' are about one-fifth the diameter of a human hair. However, it could provide a golden opportunity for mineral exploration, as the leaves or soil underneath the trees could indicate gold ore deposits buried up to tens of metres underground and under sediments that are up to 60 million years old.

"The leaves could be used in combination with other tools as a more cost effective and environmentally friendly exploration technique," said Dr Lintern. "By sampling and analysing vegetation for traces of minerals, we may get an idea of what's happening below the surface without the need to drill. It's a more targeted way of searching for minerals that reduces costs and impact on the environment. Eucalyptus trees are so common that this technique could be widely applied across Australia. It could also be used to find other metals such as zinc and copper."

Using CSIRO's Maia detector for x-ray elemental imaging at the Australian Synchrotron, the research team was able to locate and see the gold in the leaves. The Synchrotron produced images depicting the gold, which would otherwise have been untraceable.

Open windows and wash hands to help stop spread of flu, study shows

Families which more frequently ventilate living areas and wash their hands often are less likely to spread flu among one another, according to a study published by Tulane University School of Public Health and Tropical Medicine.

Flu viruses, such as the dreaded H1N1 or swine flu, are easily transferred through close contact, and contaminated hands can serve as vehicles of transmission, explained study leader Sun Wenjie. The study focused on living conditions and behaviour that can influence the spread of flu among members of a household. The researchers compared

rates of flu transmission within 54 case households, in which there was a self-quarantined index patient (the first case identified within the group) as well as a secondary case, to disease transmission in 108 control households, each with a self-quarantined first patient and another family member in close contact.

Household density plays a significant role in spreading flu, concluded the researchers. Compared to close contacts living in a single room, the risk of infection of those sharing a room with the index patient was 3.29 times greater, according to the study.



New UNESCO water centre opens in Sweden

The first centre of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) focusing on transboundary water cooperation has been established in Sweden.

The centre will be run by the Stockholm International Water Institute (SIWI) in collaboration with Uppsala University and the University of Gothenburg. This is the 18th UNESCO centre focusing on

water-related issues.

"The global population is growing. By 2050 we expect to be nine billion people. However, we are unable to increase the quantity of water resources available to us, noted SIWI CEO, Torgny Holmgren. "Consequently, it is important to ensure we create good cooperation mechanisms around water for the future, and especially in relation to transboundary waters."

Water by numbers

906 – The number of wetlands that have been rehabilitated by Working for Wetlands since 2002. The programme has invested R530-million to secure the health of more than 70 000 ha of wetland area, in the process providing 12 848 employment opportunities.

1818 – The number of arrests made by the Green Scorpions in the last financial year ending March 2013, according to a report released by the Department of Environmental Affairs late last year. The unit managed 70 convictions, with 993 admission of guilt fines paid.

100 – The average number of pupils that have to share a single toilet at over half the high schools in Tembisa, according to non-governmental organisation (NGO) Equal Education. *Mail & Guardian* reports that the NGO audited 11 of the 14 schools in the Johannesburg township, finding that in some schools there were no functioning toilets at all on some days.

270 – The number of full flush toilets installed in the township of Riemvasmaak in Lotus River, according to the City of Cape Town. This is in addition to the approximate 90 toilets that were installed in the area the previous financial year.

20 000 – The estimated number of farmers affected by the current drought in parts of the North West and Northern Cape provinces, parts of the Free State and Limpopo. According to *Beeld* newspaper the drought is one of the worst in South African history.

17% – The water supply deficit South Africa could face in 2030, according to the current supply-demand curve, the Department of Water Affairs reports. The department has launched a 'No Drop' assessment tool to municipalities to reduce water demand and water losses.

New from the WRC

Report No. 1788/1/12

Manual for the rapid ecological Reserve determination of inland wetlands (Version 2.0) (MW Rountree, HL Malan & BC Weston)

This manual provides the technical information (or references to the appropriate methods, where published) for the Rapid level of Reserve determination for wetlands of all types (excluding lakes).

Report No. 1802/1/13

Interaction between aquaculture and water quality in on-farm irrigation dams (K Salie; A Landsdell; N du Buisson; B Snyman; K Holm & L de Wet)

This study served as a second phase of investigations into the impact of fish farming on the water ecology of small farm dams. It was commissioned as a follow-up to the first phase of research in which the fitness-for-use of irrigation dams and canal systems for floating net cage aquaculture and the fitness-for-use of fish farming effluent for irrigation was evaluated. Both these investigations had a positive outcome in relation to the envisaged utilisation of farm dams for fish farming. The second phase encompassed continuing the monitoring and evaluation of a larger sample of Western Cape dams.

Report No. TT 558/13

Alternative technology for stormwater management: The South African guidelines for sustainable drainage systems (N Armitage; M Vice; L Fisher-Jeffes, K Winter; A Spiegel & J Dunstan)

Stormwater management in the urban areas of South Africa has, and continues to predominantly focus on collecting runoff and channelling it to the nearest watercourse. This means that stormwater drainage currently prioritises quantity (flow) management with little or no emphasis on the preservation of the environment. The result has been a significant impact on the environment through resulting erosion, siltation and pollution.

An alternative approach is to consider stormwater as part of the urban water cycle, a strategy increasingly known as water sensitive urban design (WSUD), with the stormwater management component known as sustainable drainage systems. This publication provides guidelines for the implementation of WSUD for both retrofit and greenfield scenarios. Also available as part of this series: *Alternative technology for stormwater management: Sustainable drainage systems – report and South African case studies (Report No. 1826/1/13)*.

Report No. KV 318/13

Quantifying the impact of WRC-funded research in irrigation scheduling (JB Stevens & PS van Heerden)

The development, improvement and promotion of irrigation scheduling tools over the last four decades through WRC-funded research efforts have been impressive, but this report also highlights challenges to research and development that could have a profound effect on the priorities of WRC research policies and practice in future. This research highlights that the research knowledge will only lead to useful outcomes if emphasis is placed on development, and therefore the innovation process has to be purposefully managed with expertise, time, efforts and funds budget for both research and knowledge brokering.

Report No. 2025/1/13

Structural health monitoring of arch dams using dynamic and static measurements (P Moyo & C Oosthuizen)

The key objective of this project was to develop a holistic approach to structural safety assessment of concrete arch dams, while developing high level manpower in the field of dam safety. Two methodologies, the ambient vibration method (AVM) and the Westergaard method, which is the most commonly adopted approach for dynamic analysis of dams, were tested to

establish their applicability in finite element model updating of arch dams based on ambient vibration testing. A significant finding is that the Westergaard method cannot be directly applied to dams with divergent and/or skewed reservoirs. Additionally, the effect of seasonal temperature variations on arch dams was modelled and the results show that it is critical to include temperature effects for dynamic analysis of arch dams. However once the initial thermal stresses have been introduced, the influence of seasonal temperature variations on dynamic characteristics is negligible.

Report No. 1927/1/13

Identifying relationships between soil processes and biodiversity to improve restoration of riparian ecotones invaded by exotic acacias (S Jacobs; M Naude; E Slabbert; O Kambaj; M Fourie; K Esler; K Jacobs; B Mantlana; A Rozanov & D Cowan)

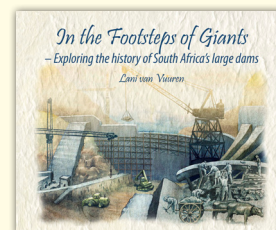
Little information is available on the impact of invasive *Acacia* species in fynbos riparian ecotones on ecosystem function as it pertains to nutrient cycling and soil processes, some of which are central to riparian ecosystem services. The main objective of this project was to investigate the impact of invasive *Acacia mearnsii* on nitrogen, carbon and phosphorous stocks and cycling, as well as its impact on the soil bacterial and fungal community structure within fynbos riparian ecotones and nearby upland areas.

Report No. 1697/1/13

An investigation into the effects of atmospheric deposition on surface water quality in the eastern regions of South Africa (S Lorentz; J Blight; N Snyman; C Bester; L Titshall; O Idowu; M Scholes; C Herold; Y Scorgie; G Kornelius)

The main aim of this preliminary work was to determine if emissions from fossil fuel burning on the Mpumalanga Highveld are likely to increase salinisation of surface water and degrade soil resources.

The investigation left researchers with little doubt that the surface water quality in the Mpumalanga Highveld and adjacent areas is decreasing significantly, however, it is less certain that acid gases are the primary cause of this degradation, it was concluded.



Book on dam history still available

The WRC still has a limited number of copies available of its coffee table book, *In the Footsteps of Giants – Exploring the History of South Africa's large dams*. Featuring 340 glossy pages filled with colour photographs and stories of the country's most iconic water resource development projects, the book takes the reader on a journey through the history of South Africa's largest dams, starting with the traditional attitudes and indigenous knowledge around water resources prior to European settlement and ending with a glimpse into the future of dam building in the country. *Footsteps* explores the reasoning behind the construction of the country's massive water storage structures, the laws that guided their development, and the people and institutions that made them possible. Woven in between are the tales behind some of the country's most iconic dams and dam engineers. This is the first time that such a publication has been on offer for a wider audience in South Africa.

The book is available from the WRC at a price of R150.

To order any of these reports, contact Publications at Tel: (012) 330-0340; Fax (012) 331-2565; E-mail: orders@wrc.org.za or Visit: www.wrc.org.za