

WRC welcomes new chief



In October the Water Research Commission welcomed its new CEO, Dhesigen Naidoo.

Naidoo joins the Commission from the University of Pretoria, where he was employed as Director: Research and Innovation Support. Here he was involved in managing the overall research portfolio

of the university, providing strategic direction and support to the various facilities, schools and centres. He has also worked for the departments of science & technology, environmental affairs and water affairs.

Naidoo holds a B.Sc degree in Chemistry and Biochemistry and a B.Sc Honours from the University of KwaZulu-Natal. He then completed his Masters Degree in Medicine at the University of Cape Town. He also holds a Post Graduate Diploma in Health Management from the latter institution.

Welcoming the new CEO into the WRC fold, Chairperson Prof Janine Adams said: "Change is never easy, but we know the excellent staff and teamwork at the WRC will provide the new CEO with the required support. The Board looks forward to future great achievements. Through strong leadership we know that the Commission will grow as the water research and knowledge hub of South Africa."

Project reduces brine effluent for power station

VWS South Africa is currently completing a R60-million project aimed at reducing the amount of unexploited brine water produced at Eskom's Tutuka Power Station, in Mpumalanga.

The company's Actiflo ballast clarification solution is being used as the main cog in the brine treatment process for the first time in South African industrial water treatment. At present, 3 Mℓ/day, generated by the power station and New Denmark Colliery, are disposed of using unsustainable methods. The new treatment plant will reduce this quantity into lined evaporation ponds to 0,6 Mℓ/day.

Brine water is high in total dissolved solids, including organics, calcium and sulphates, making it prone to scaling and fouling membrane systems downstream. To prevent this, the following range of wastewater treatment processes is being provided: the flocculated



solids in the brine will be coagulated inside the Actiflo maturation tank with the addition of Actisand for ballasted floc formation. The next step involves the Actiflow where water, flowing under gravity into the clarification system, is allowed to settle; separating and collecting heavier particles.

Collected sludge will be processed in a vertical thickening unit to ensure that solids are reasonably dry, while still fluid enough to be pumped. The clarified water flows under gravity to another unit where it will be coagulated again. The addition of lime, soda ash, magnesium chloride and sludge recycle streams will reduce the scaling potential of the water. Then, the softened water will then be passed through three carbon filters, further reducing the water's organic content.

Following these steps the water will be treated using ultrafiltration with non-oxidising biocide, after which reverse osmosis (RO) units will complete final polishing. The brine produced by the RO plant is the final effluent to be disposed of in lined evaporation ponds. The permeate generated by this plant will be used in the Tutuka power station's cooling towers, ensuring minimal waste generation.

According to VWS project manager Julius Pistorius, the result is that overall recovery of water is greater than 75%. "This will reduce expenses associated with evaporation brine treatment and the power station's raw water intake."

Construction should be completed by the end of the year.

Local government asset registers still lacking – Treasury

There are still local governments in South Africa who have no idea about the age and state of their assets or even what and where these assets are located.

This is according to the 2011 *Local Government Budgets and Expenditure Review*, released by Treasury earlier this year. According to the review, this lack of knowledge makes it impossible to determine the investment needs required. As a result most municipalities have not paid sufficient attention to the maintenance of their existing infrastructure.

The persistent underspending on repairs and maintenance is probably the most serious misalignment in municipal budgets, according to the report. "Medium to long-term consequences of underspending on repairs and maintenance include deteriorating reliability and quality of services, more expensive crisis maintenance, increased cost of future maintenance, reducing the useful life of assets, increased distribution losses,

reduced revenue and rising tariffs over the medium term," it stated.

Municipalities generally allocate about 5% to 12% of their annual operating budgets for repairs and maintenance. However, these are budgeted figures, with no information currently available on the actual repairs and maintenance spend by local governments.

Municipalities budgeted to spend R32-billion on water and sanitation in 2010/11, compared to R8,4-billion spent in 2006/7. The cost of extending the network infrastructure to outlying communities was described as being neither cost effective nor sustainable, which pointed to the need to explore alternative service delivery options.

Other factors influencing the efficient provision of water services were non-revenue water, uncertainties over the impact of climate change and the skills shortage. "The number of engineers in local government per 100 000 people has

decreased from 20 in 1992 to 3 in 2010 – a ratio clearly indicative of a crisis, the report said.

In general, the report cautioned local governments to pay more attention to all aspects of the revenue management value chain. These include the integrity of billing information, accuracy of billing systems and the ability to collect revenues. The majority of municipalities have collection rates below 80%, undermining their ability to deliver optimum services.

Unnecessary spending on non-priority items also undermined local government budgets. "International experience with government cost-saving initiatives indicates that savings of as much as 15% can be realised over time. This suggests that by eliminating non-priority spending, municipalities on aggregate could have saved up to R27-billion on their 2009/10 budgets, which is more than the total equitable share for local government in that year," the report pointed out.

Towns face major challenge to improve water supply

Most of South Africa's current water supply problems and restrictions could be avoided by proper management of existing schemes.

This is according to research presented at the International Groundwater Conference held at the CSIR International Convention Centre in Pretoria earlier this year. According to Dr Kornelius Riemann, principal hydrogeologist at consulting firm Umvoto Africa, at least 34 million m³/year of water are lost between the water resource and the end-user in the Western Cape alone, excluding Cape Town and surrounds. "More than 10 million m³ of this (enough to supply the water requirements of towns like George and Stellenbosch) could be saved through effective water conservation and water demand management measures."

These findings are based on research by Umvoto Africa in the Western and Eastern Cape, as part of the All Towns Study of the Department of Water Affairs. This is a nationwide programme started in 2008 to map and develop water reconciliation strategies for all metropolitan areas, as well as towns, villages and clusters of villages.

Research shows that many communities rely on untreated raw water from rivers, springs or boreholes. Many are

contaminated due to poor land management and source protection. "The smaller stand-alone water supply and treatment schemes may achieve the required drinking water standard, but often lack the required water quality management to ensure continuously good drinking water quality," said Riemann.

The situation for the wastewater treatment plants is often bleaker, with many works not complying with effluent water quality standards. In most cases, the poor condition of water treatment plants, and wastewater treatment plants, can be attributed to neglect of the works from an operation and maintenance perspective.

Often, the best and most cost-effective solution lies in the refurbishment and proper maintenance of existing infrastructure, noted Riemann. "This is mainly found with groundwater schemes, where boreholes are dismantled or pumps broken, and the municipalities then complain about the 'unreliability' of groundwater."

Importantly, any infrastructure development projects and/or repair measures have to be combined with skills development and training on all levels within the municipal structure to ensure that the local schemes are operated efficiently and reliably.

DWA finally ready to curb Vaal water theft

Nearly five years after large-scale water theft was unearthed in the Vaal River system the Department of Water Affairs (DWA) is finally ready to lay down the law.

During water quantity and quality investigations in the Vaal River system published in 2007 it was found that as much as 244 million m³/year of water is being used illegally – particularly by farmers along the Liebenbergsvlei River which serves as the conduit for the transfer of water from Lesotho. This is over 15% of the total volume of water used in the Vaal River system, and has added significantly to current deficits.

In September, DWA issued a stern warning to illegal water users, saying in a statement that it was now clamping down on transgressors. The department aims to address 92% of unlawful water use in the Vaal River system by March next year.

In addition, government's quest for renewable energy sources could prove to be beneficial to the Vaal River system – a water transfer scheme planned to augment the Crocodile (West) River system and the coal-fired power stations near Lephalale in Limpopo from the Vaal system has been postponed. This will reduce the water requirements in the system; however, to

Water diary

NANOTECHNOLOGY
NOVEMBER 27-DECEMBER 2

The Second South African Nanoscience and Nanotechnology Summer School is being organised by the Department of Science & Technology in association with the Nelson Mandela Metropolitan University. The theme is 'Nanoscience characterisation techniques'. *Enquiries: Thereza Botha; Tel: (012) 807-0869; Fax: 086 549 0184; Email: thereza@technoscene.co.za or Visit: www.sananoschool.co.za*

YOUNG WATER PROFESSIONALS
DECEMBER 11-13

The First East Africa Young Water Professionals Conference will take place in Kampala, Uganda, with the theme 'Water for tomorrow: A collective responsibility'. *Visit: <http://mail.nwsc.co.ug/eaywp/>*

WATER IN AFRICA
FEBRUARY 20-23

The 16th Africa Water and Sanitation Congress will be held in Marrakech, Morocco, with the theme 'Collaborative mechanisms and innovations for sustainable development of the water and sanitation sector in Africa'. *Email: contact@afwa-hq.org or Visit: http://www.afwa-hq.org/siteweb/index.php?option=com_content&view=article&id=169%3Amarakech-2012&catid=53%3Acongres&Itemid=111&lang=en*

WATER LOSS
FEBRUARY 26-29

Water Loss 2012 will be held in Manila, Philippines. The conference is intended to present and discuss latest developments, strategies, techniques and applications of international best practices in non-revenue water management. The Conference is the sixth event in a series of IWA water loss reduction speciality conference. *Email: 2012committee@iwa-waterloss.org or Visit: www.iwa-waterloss.org/2012*

WORLD WATER
MARCH 12-17

The 6th World Water Forum will take place in Marseille, France, with the theme 'Time for Solutions'. *Email: secretariat@worldwaterforum.org or Visit: www.worldwaterforum6.org*

have sufficient water up to 2050, key strategies must also be successfully implemented.

In addition to cracking down on illegal water users, DWA has set water conservation (WC) and water demand management (WDM) targets for all metros and municipalities within the Vaal River system which collectively amounts to a target of 15%. Workshops between the Gauteng departments of local government and housing and the various municipalities have been held to facilitate the financial prioritisation by the municipal chief financial officers to prioritise budget allocations for the WC/WDM activities.

Various management interventions are also being implemented to address water quality issues, such as eutrophication, salinisation and microbial pollution.



Leg up for SADC transboundary aquifers

With up to 168 million of southern Africa's people relying on groundwater supplies, a present Southern African Development Community (SADC) project hopes to place the management of transboundary aquifers higher on the regional agenda. Lani van Vuuren reports.

Within southern Africa it is estimated that at least 37% of the population relies on formal or improved groundwater supplies, while another 40% rely on unimproved resources (such as hand-dug wells and springs). This makes groundwater an extremely important resource in the region, especially in drought-prone areas.

Groundwater systems are by their very nature transboundary, and there are about 20 of these cross-border aquifers in southern Africa. According to Gereon Hunger of the Department of Water Affairs & Forestry, Namibia, while the transboundary nature of these systems has been recognised for a long time, it is only recently that steps have been taken to grow the region's knowledge of transboundary aquifers and so improve their management and sustainable development.

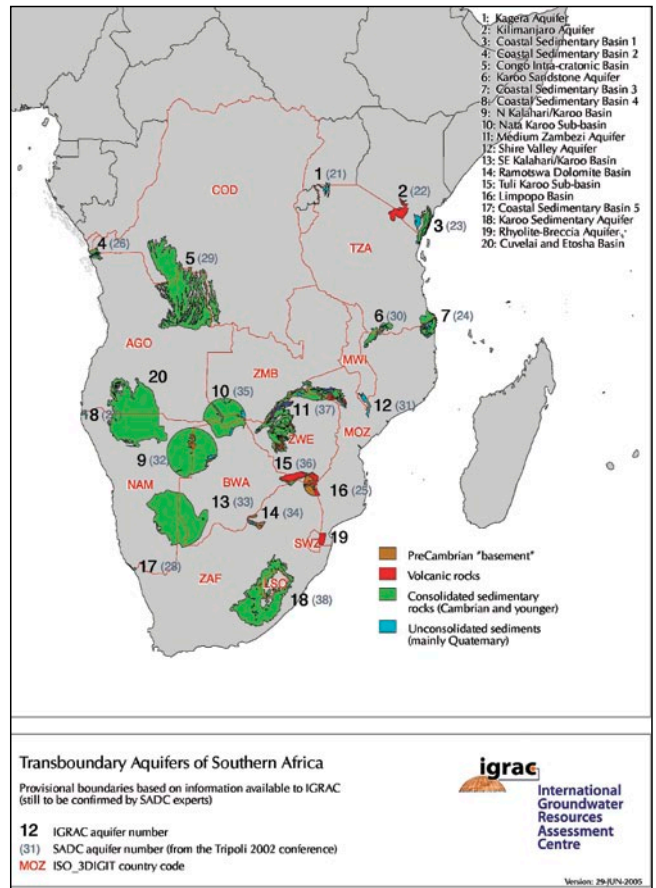
"While the Revised SADC Protocol on Shared Watercourse Systems [which came into force in 2003] has resulted in the successful creation of a number of river basin organisations, it has not yet lead to the creation of effective mechanisms to address the challenge of transboundary aquifer management," he said, speaking at the International Groundwater Conference held in Pretoria earlier this year. "Spatial variation, the groundwater rights of stakeholders within each basin state, water quality degradation, water conservation and the potential of conflict, in particular because of the unseen and little understood nature of groundwater, are some of the issues that need to be resolved."

In order to address some of these issues, a new SADC-wide groundwater management project was launched earlier this year. The project, supported by a number of national and international organisations, is aimed at strengthening the institutional and policy frameworks governing transboundary aquifers in the region; to protect the integrity of groundwater systems and ensure the sustainability and protection of groundwater dependent ecosystems, among others.

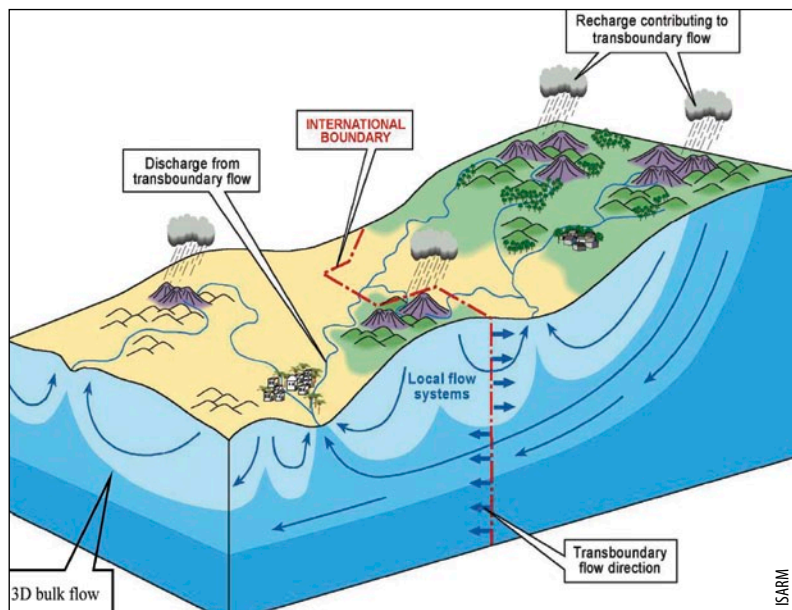
A need was identified to develop and apply transboundary aquifer management principles on a pilot basis, and to date two aquifers have been selected for this purpose. The first is the Stampriet Kalahari-Karoo aquifer shared between Namibia, South Africa and Botswana and the other the Ramotswa Dolomite aquifer shared between South Africa and Botswana. "These aquifers have entirely different characteristics. This was done purposefully to ensure that a full range of different management needs and challenges are addressed," noted Hunger. The Stampriet system is mainly used for commercial irrigation purposes in Namibia, with the main applications being pastoral farming and domestic use in Botswana, and game and stock watering in South Africa. The Ramotswa aquifer, on the other hand, is mainly used for bulk water supply in South Africa and Botswana. This aquifer is highly vulnerable and currently in a state of deterioration, mainly as a result of pollution.

A transboundary diagnostic analysis will be undertaken in each transboundary aquifer, followed by the development of a strategic action programme in order to reach an informed consensus on the factors affecting their integrity at the national and cross-border level, explained Hunger. It is hoped that through this process the commitment of the countries sharing the resources will be attained to implement priority actions. It is envisioned that eventually this process will facilitate the establishment of a cooperative process for the integration of groundwater resources management into organisational frameworks for the respective river basin organisations already in existence in the region.

As populations grow and areas develop groundwater is bound to play an even more important role in regional water supply in future. It is hoped that this new project will go a long way towards the sustainable management of the resources.



Transboundary aquifers of southern Africa



A typical transboundary aquifer

New from the WRC

Report No: 1838/1/11

Incorporating uncertainty in water resources simulation and assessment tools in South Africa (DA Hughes; E Kapangaziwiri; SJL Mallory; T Wagener & J Smithers)

The main objective of the project was to contribute to the incorporation of uncertainty assessments in water resource decision making in South Africa, thereby quantifying the risks associated with specific decisions about planned future water resource developments. The main output of the project has been the development of a framework for uncertainty assessments in water resources availability analyses within South Africa.

Report No: 1658/1/11

Evaluation of a South African clinoptilolite for the removal of ammonia-nitrogen from secondary sewage effluent for pollution control (JJ Schoeman; EL Sekgwela & D Hallis)

Ammonia-nitrogen discharges into the water environment accelerate eutrophication of rivers and dams and dissolved oxygen depletion in receiving waters. Ammonia-nitrogen can be removed from wastewaters by selective ion-exchange using clinoptilolite, biological nitrification and denitrification, liming the pH to 11 followed by air (or stream) stripping, breakpoint chlorination followed by treatment with activated carbon and treatment in algae ponds. The main aim of this investigation was to develop process design criteria and costs for the implementation of a South African clinoptilolite for ammonia-nitrogen removal from secondary effluents for pollution control.

Report No: 1846/1/11

Optimised monitoring of groundwater-surface water-atmospheric parameters for enhanced decision-making at local scale (N Jovanovic; S Israel; C Petersen; RDH Bugan; G Tredoux; WP de Clerq; T Vermeulen; R Rose; J Conrad & M Demlie)

Advances have been made in recent years

in developing networks and databases for monitoring water systems in South Africa, in particular groundwater and atmospheric variables, with the ultimate aim of facilitating integrated water resources management at a catchment scale. However, these monitoring systems need to be consolidated and integrated among various components of catchment systems: groundwater, surface water, soil and vadose zone and atmospheric monitoring. The main aim of this project was the development of an integrated framework for optimised monitoring of water resources that will account for the different components of catchment systems and their interactions.

Report No: 1796/1/10

Deriving conservation targets for rivers (NA Rivers-Moore)

Freshwater ecosystems are the most threatened ecosystems globally, experiencing the fastest loss of biodiversity and the greatest number of species extinctions. The last appraisal of South African freshwater ecosystems estimates that over 80% of the country's river ecosystems are threatened. One tool available to conservationists to staunch the current rate of loss to freshwater biodiversity and ecosystems is systematic conservation planning, which provides a structured approach in identifying biologically significant areas for conservation action. A necessary component of conservation planning is to set targets for how much of each biodiversity feature (i.e. element of biodiversity which can be quantified and spatially represented) needs to be protected, and additionally for rivers, to maintain connection between different biodiversity patches. This study proposes a new direction for setting river targets, based on established measures of species diversity. The aim of this research was to develop a scientific methodology, equivalent to the species-area curve used for terrestrial systems, to set conservation targets for river lengths.

Report No: 1693/1/10

Hydrogeology of basement aquifers in the Limpopo Province (KT Witthüser; M Holland, TG Rossouw; E Rambau; AJ Bumby; KJ Petzer; I Dennis; H Beekman; JL van Rooy; M Dippenaar and M de Wit)

Archaean basement lithologies are distributed extensively in Africa and also underlie large parts of the semi-arid Limpopo Province. Groundwater is the only dependable source of water for many users in this province. A socio-economic study showed that water supply is chronically short in many rural areas and that households often pay exorbitant prices for water in informal local water markets. The importance of the basement aquifers in the province in meeting water demand makes it important to identify high-yielding hydrogeological zones that can be targeted for water supply. Due to the intrinsic low primary permeability and porosity of basement lithologies, the biggest challenge is to understand the factors that determine the secondary permeability and storativity of these aquifers. The focus of this study was therefore to systematically analyse regional factors that may influence borehole yields and aquifer transmissivities.

Report No: 1781/1/10

Lightweight moveable superstructures for VIP toilets (EP Kearsley)

In South Africa there are still many households without access to basic infrastructure such as water and sanitation and, in many areas, onsite dry sanitation systems in the form of ventilated improved pit (VIP) latrines will continue to be an appropriate technology choice. However, many of these systems will require rehabilitation or replacement when the pit reaches its capacity of design life. However, current standard construction techniques and materials make the superstructure very heavy to move to a new site or even to allow access for desludging. Superstructures are also

difficult to dismantle and reuse the material to build a new structure. In many cases it is not possible for the average household to relocate the superstructure, resulting in overflow of raw sewage. The aim of this project was to develop an affordable moveable superstructure for a VIP toilet that can be used in rural communities. A moveable lightweight superstructure system made from high-strength fibre-reinforced concrete was developed. This system consists of a base slab, wallpanels, a roof and a door and the system can be provided to communities in package or it can be manufactured by the communities themselves in controlled environments. The other reports in the series are: *Lightweight Toilet Superstructures: Manufacturing Guide (TT 483/10)* and *Lightweight Toilet Superstructures: Installation and Assembly Guide (TT 484/10)*.

Report No: KV 274/11

The effect of formaldehyde use in sanitation (PA Crous & J Haarhoff)

Besides its multiple other uses in industry, formaldehyde is used as an additive to inhibit the biodegradation within chemical toilets. This raises an obvious question about its effects on the receiving wastewater treatment facilities which accept the contents. A desktop study was consequently commissioned by the WRC and conducted at the University of Johannesburg. Among others, the study summarised the main chemical and toxicological properties of formaldehyde which may be of environmental concern; reviewed international and South African legislation, regulations and standards on the use of formaldehyde in portable toilets; established the prevalence of formaldehyde-based chemicals used in temporary chemical toilets; assessed the impacts of these chemicals and advised on the need and direction of more detailed investigation of tighter regulation of these chemicals.

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