

## SA Weather Service turns ten

The South African Weather Service (SAWS) has celebrated its tenth year as a government parastatal.

According to SAWS CEO, Dr Linda Makuleni, since its inauguration in July 2001, the SAWS has distinguished itself as an authoritative voice for weather, and a custodian of climate information in South Africa. SAWS' technical development is characterised, among others, by the first African lightning detection system with the ability to accurately pin-point lightning strikes within a 600 m radius. The organisation has also recently upgraded its countrywide radar network with 12 Doppler radars enabling it to provide much improved information on severe weather events on a shorter timescale than before.

SAWS has also been commended for its customer service, and has received, over the past three years, an overall rating of 84% from its customers, moving from being just a weather and climate information provider to an organisation which values its clients and customers by providing value-added services and products, noted Dr Makuleni.

The SAWS also places high value on its partnerships with neighbouring

organisations. "Weather knows no boundaries, which is why we have played a leading role in the establishment of the Meteorological Association of Southern Africa (MASA)," said Dr Makuleni. MASA has the goal of promoting international cooperation amongst national weather services in the SADC region in order to contribute to socio-economic development of the region.

Moreover, the SAWS celebrated its recent accreditation as a World Meteorological Organisation Regional Training Centre. It is hoped that this accreditation will, in future, address a great need by providing training facilities to meteorological scientists from South Africa, the African continent and beyond. This accreditation also ties in well with the organisation's partnerships with local universities, such as its 41-year relationship with the University of Pretoria. Since its inception, the SAWS has trained 53 forecasters, 42 researchers and 66 observers, all of whom have been employed by the organisation.

Seen in the photograph are former CEO Donny Madison, Board Member Dr Thembakazi Mali, current CEO Dr Linda Makuleni and former CEO Jerry Lengoasa.



## Crocodile West system planning on track – DWA



Significant progress is being made towards ensuring that future requirements in the Crocodile West River system are met, the Department of Water Affairs reports.

Characterised by the sprawling urban and industrial areas of northern Johannesburg and Pretoria, extensive irrigation downstream of Hartbeespoort Dam and large mining developments north of the Magaliesberg, the catchment is one of the most developed in the country making specific management strategies crucial.

As such, at the recent Strategy Steering Committee meeting of the department on the Crocodile West River system key scenarios were evaluated of future water requirements, supply and availability. These had to take into account growth in water requirements due to anticipated developments around the coal reserves close to Lephalale.

A number of initiatives have already been implemented by the Department of Water Affairs and local authorities. This includes the Mokolo-Crocodile Water Augmentation Project where construction of phase 1 (to start this year) will see the augmentation of supply from the Mokolo

Dam through a parallel pipeline from the dam to the Steenbokpan area. Delivery of water is expected in 2013. In addition, water conservation and demand management activities have been undertaken by municipalities in the river system. These include addressing losses through replacement of leak-prone pipelines, leak detection, pressure reduction, rezoning and the improvement of reservoir integrity.

The department will also be engaging with water users to set up a system operating forum with the specific purpose of establishing operating rules for all the significant dams in the system. One of the objectives of the forum will be evaluating and selecting appropriate drought management rules as part of preparedness planning and efficient distribution of the available water.

Despite the challenges, important work is also being carried out to improve the water quality in the Crocodile West River system. The Department of Water Affairs continues to implement the Harties Metse A Me project, to improve among others the water quality in the Hartbeespoort Dam.

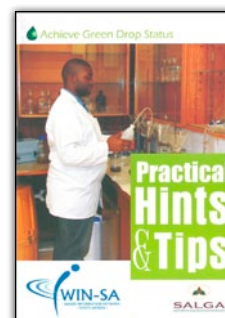
## Green Drop: now get practical tips

The Water Information Network – South Africa (WIN-SA), together with the South African Local Government Association have developed a handy brochure of hints and tips for municipalities wanting to obtain Green Drop status for their wastewater treatment plants.

The brochure captures the experiences of smaller municipalities who are effectively managing their wastewater treatment plants. The objective of the brochure is to encourage municipalities to consider these practical and innovative suggestions that could assist them to

run their own wastewater business more effectively.

To obtain a copy of the practical hints and tips guide or to make further suggestions, contact Ditshego Magoro at Email: [info@win-sa.org.za](mailto:info@win-sa.org.za) or William Moraka at Email: [wmoraka@salga.org.za](mailto:wmoraka@salga.org.za)



## New study eliminates grey areas of household wastewater use



While greywater – the untreated household effluent from baths, showers, basins and laundry – can be a helpful supplement to conventional water resources in household and urban food gardens, its safety for use has been called into question.

A recently published study funded by the Water Research Commission (WRC) and undertaken by the University of KwaZulu-Natal, aimed to answer some of the questions as to the benefits and risks associated with the use of greywater.

More than half of indoor household water use is normally used for non-toilet uses. This percentage represents a large

fraction of household wastewater which can potentially be intercepted and used for beneficial uses. Active promotion of greywater use for irrigation in gardens and small-scale agriculture has the potential, not only to maximise use of limited water supplies, but also to improve food security in low-income settlements. However, before this practice can be promoted the legal status of greywater use for irrigation needs to be clarified and guidance needs to be formulated for users so that small-scale irrigation use of greywater is performed in such a way that it is safe for humans, plants and the environment.

Two products were generated by the WRC study in order to help guide the wise use of greywater: a user-friendly guide and a supporting technical document capturing the scientific information on which the guide is based. It is envisaged that the outcomes of this project will provide municipalities, non-governmental organisations, and householders with greater certainty about how to minimise the health risks and optimise the benefits

associated with the use of greywater.

Some of the issues addressed in the publications pertain to human health, which could be threatened in the process of using greywater for food production. Greywater usually contains significant numbers of microorganisms, which are capable of causing disease. In addition to containing substances which are beneficial to plants (mainly nitrogen and phosphorus), greywater also contains substances that can reduce plant growth or crop yield if present at sufficiently high concentrations, such as salts, sodium and boron.

The biggest challenge lies with non-sewered informal settlements in South Africa where there are limited waterborne services and drainage. In these areas greywater often merges with toilet water and other effluent flows thus creating a toxic mix of contaminated water that poses a danger to human and environmental health. Although the per capita volume of greywater disposed of on the ground in the vicinity of shack dwellings is generally low, greywater

runoff often carries solid and liquid waste contaminants that collect in ponds and are frequently discharged via stormwater systems into wetlands and rivers.

According to WRC Director: Water Utilisation in Agriculture, Dr Gerhard Backeberg, current legislation pertaining to disposal and use of water and waste falls short as a definition of greywater as a separate wastewater stream is lacking. "Clarity is needed for the future by explicit definition of greywater and the beneficial uses to which it may be put. The existing legislation does not specifically exclude use of greywater for irrigation, but there are inconsistencies which arise from the absence of a clear definition of greywater as a subset of domestic wastewater. These issues need to be resolved to clarify the legal position of use of greywater for irrigation.

To download the reports, *Sustainable use of greywater in agriculture and gardens in South Africa – Technical report (Report No: 1639/1/11)* or *Guideline (Report No: TT460/10)* Visit: [www.wrc.org.za](http://www.wrc.org.za).

## SA must attract more women to science – Minister

South Africa must support its women scientists. This is according to Science Minister, Naledi Pandor.

South Africa's policy of expanding access to higher education institutions has been successful in attracting first-generation black and female students. By 2008, there were, in fact, more female than male graduates.

Yet women tend to study social sciences, the humanities and the arts. To redress this balance the Department of Education has earmarked university funding to encourage more women to take up the physical and natural sciences, particularly engineering. Still only 3 000 of the estimated 35 000 engineers in South Africa are women (compared to the 6 000 female doctors in the country).

According to Pandor, three obstacles to equality still loom large in South Africa, the first being South African students'

persistent poor maths and science skills – a remnant of the legacy of Bantu Education. The second obstacle is that maths and science subjects are still regarded as inappropriate for girls. "The exclusion of girls start at primary school level, when schoolchildren are shown images that perpetuate gender stereotypes and convey the message that science and technology are not for girls," the minister notes. Education researchers have found that advisors tell girls that maths and science are difficult subjects and that arts and humanities may be better choices.

Finally, evidence from classroom studies of co-education schools points to discrimination by teachers. "It suggests that teachers encourage boys to engage with science by allowing them to ask more questions, while ignoring girls, giving them inadequate replies or criticising them for minor errors," says Pandor.

Pandor believes that it is vital that South Africa, along with other countries, does more to increase women's access to scientific knowledge. "Science and engineering are critical for innovation and economic growth, and for tackling the development challenges that face many of the most vulnerable communities in the world."

Some practical interventions are already in place in South Africa, including the provision of equipment grants and special conference funding, postgraduate grants and research fellowships for women, among others. Highlighting the achievements of women scientists is another way of encouraging and inspiring young women to take up careers in the physical and natural sciences.

"Numerical parity will take many years to achieve. But in the words of Tebello Nyokong, a cancer researcher at Rhodes University: Every little thing you achieve

is better than what you started off with; hence, every achievement calls for a celebration."

Source: [Scidev.net](http://Scidev.net)



## Cape Town lays groundwork for water masterplan



The City of Cape Town has laid the groundwork for a far-reaching masterplan to explore all viable water supply alternatives for the Cape metropole.

Cape Town, its neighbouring municipalities and the agricultural sector in the region are supplied with water from the Western Cape Water System, a system of dams and pipelines owned and operated by the City of Cape Town and the Department of Water Affairs (DWA). The City and the department operate the system co-operatively to ensure that the volume of water in the system is maximised during the hydrological year, to the benefit of all users.

"Dam levels are currently lower than previous years due to a lower than average rainfall over the past year. However, with the recent completion of the Berg River Dam and Supplement Scheme, volumetrically there should be sufficient water in the short to medium term for all water users in the region," noted Phil Mashoko, the City's Director: Water and Sanitation.

According to long-term rainfall records, Cape Town's main catchment dams are not yet reflecting any change in long-term rainfall trends, however, the potential impact of climate change has been factored into strategic water resource planning. "Cape Town is a growing city, with a burgeoning population economy and population. Thanks to the implementation of a long-term water conservation and water demand management strategy, Cape Town's water demand is now 27% less than what it would have been if demand had grown at an unconstrained rate from 2000 onwards," said Mashoko. "Our key focus is to reduce per capita demand in order to ensure that existing resources and

infrastructure are used as cost-effectively as possible. This could also significantly delay the need for expensive new water supply schemes."

The City's water conservation and water demand management initiatives include pressure reduction in the reticulation system, leakage management, pipe replacement, wastage reduction by consumers through education and awareness programmes and substituting the use of potable water for sports field and garden irrigation with treated effluent.

The water and sanitation department of the metro is currently investigating a suite of potential resource schemes. These include greater water re-use, desalination of seawater and a much greater use of groundwater. At the same time, DWA is considering a number of surface water options from rivers to supplement the inflow into the Voëlvelei Dam.

The future implementation of a 100 to 200 Mℓ/day seawater desalination plant on Cape Town's West Coast is also being considered, as this is one of the fastest growing areas where additional water supply will be required. Although the costs of desalination have decreased significantly over the last few years, the process remains energy intensive and also carries a significant environmental impact.

The feasibility study into the use of groundwater from the Table Mountain Group Aquifer is well advanced. This vast deep aquifer extends from Vanrhynsdorp through the Western Cape to Port Elizabeth. Due to the potential environmental impacts of large-scale groundwater abstraction, the City has adopted a precautionary approach. A decision on whether to continue with a pilot phase,

### Water diary

#### MINE WATER OCTOBER 3-4

The WISA Mine-Water Division's Annual Symposium will take place at the CSIR International Convention Centre with the theme 'Sustainable Water 2030: A mining industry perspective'. Visit: [www.wisa.org.za](http://www.wisa.org.za)

#### IRRIGATION & DRAINAGE OCTOBER 15-23

The 21st ICID Congress on Irrigation and Drainage will take place in Tehran, Iran. The conference will be co-located with the 8th International Micro-Irrigation Congress and the 62nd IEC Meeting. Visit: [www.icid11.org](http://www.icid11.org)

#### WETLANDS OCTOBER 18-21

The National Wetlands Indaba will be held at the Didima Resort & Conference Centre, in KwaZulu-Natal. The theme for the conference is 'Wetlands: Back to the Future 2010 – Act Today for a Better Tomorrow'. Visit: <http://www.wetlands.za.net/indaba/>

#### MUNICIPAL ENGINEERING OCTOBER 26-28

The 75th Conference of the Institute of Municipal Engineering of South Africa will be held at Birchwood Hotel and OR Tambo Conference Centre. Visit: <http://conference.imesa.org.za/wp/>

#### LARGE DAMS NOVEMBER 8-10

The South African National Committee on Large Dams Biennial Conference is taking place at the Gallagher Estate Convention Centre, in Midrand, Gauteng. The theme is 'Management and Design of Dams in Africa'.

Conference topics include reservoir management, dam safety and surveillance, hydropower schemes, water resource management, new dams versus desalination schemes, and dam types and construction material. The deadline for registration and payment is 10 October. Enquiries: Rene Burger; Tel: (021) 808-2100; Email: [burger@sun.ac.za](mailto:burger@sun.ac.za) or Visit: [www.sancold.org.za](http://www.sancold.org.za)

#### GROUNDWATER NOVEMBER 14-16

The Africa Groundwater Academy is hosting two highly acclaimed and widely published presenters, Richard Healy of the US Geological Survey and Bridget Scanlen of the Bureau of Economic Geology (University of Texas at Austin) to lead a short course on estimating groundwater recharge. The course will be hosted in Cape Town. Enquiries: Elanda Botes; Tel: 083 982 3537 or Tel: (012) 348 9598; or Email: [africagroundwater@gmail.com](mailto:africagroundwater@gmail.com)

#### ENVIRONMENTAL HEALTH NOVEMBER 24-25

The School of Basic Sciences at North West University is hosting the Second Annual Eco Health Research Forum at Misty Hills Country Hotel, in Muldersdrift, Gauteng. The theme is 'Polluted Environments: Human Action and Human Health – Some Multidisciplinary Perspectives toward Pro-Active Solutions'. Enquiries: Petra Lawson (conference coordinator); Email: 083 231 6538; Fax: 086 541 1173; Email: [conferen-cept@gmail.com](mailto:conferen-cept@gmail.com); Visit: [www.nwu.ac.za/export/sites/default/nwu/vtc/events.html](http://www.nwu.ac.za/export/sites/default/nwu/vtc/events.html)

during which the environmental impact will be fully assessed, was still pending at the time of writing.

"With Cape Town's current demand growth, it is anticipated that the current supply will be sufficient until around 2017, after which a new resource or

supply scheme will be required," said Mashoko. "While six to eight years is a fairly tight timeframe for the implementation of a large water supply scheme, the groundwork is being laid now to ensure that this can be achieved when needed." **Source: City of Cape Town**

## Domestic water filters under scrutiny in new project

Recent media reports over the quality of the country's municipal tap water have some running for the hills while others have gone out to purchase domestic water treatment devices.

In fact, small-scale purification systems have become a burgeoning business in South Africa, but are they really as good as their marketing campaigns make them out to be, and do we need them in the first place? A new WRC-funded project hopes to find answers to these questions.

A dizzying array of products exists for home use. Technologies vary from



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*Doubts over municipal water quality has many people buying home water treatment devices.*

activated carbon filters and reverse osmosis to ion exchange, microfiltration and distillation, to name but a few. Home water treatment devices may use one or a combination of treatment technologies to remove specific contaminants. To date, however, very few independent studies have been published on the capacity of small-scale purification units to remove microorganisms and the majority have only been tested for a single organism or compound and/or a single product.

As a result, the WRC has selected to fund an independent study into these devices. The study is being led by Dr Cathleen Bartie from the National Institute of Occupational Health, with Dr TG Barnard, head of the Water and Health Research Centre at the University of Johannesburg, being the principal researcher on the project.

The study is sourcing a representative number and variety of small-scale water purification units available for domestic use and evaluating and comparing their capacity to remove various contaminants, for example, indicator organisms, enteric protozoans, free living amoebae, amoebae resistant bacteria and viruses from local tap

water. The researchers eventually aim to compile a report and guideline documents to assist users in the selections and use of these devices.

Tests are being conducted under strictly-controlled conditions at the University of Johannesburg where the units are challenged with different combinations of organisms to test the actual removal efficiency of the system. The units are also being challenged with chemicals to evaluate filter capacity to remove these substances. A duplicate of each unit is used as instructed to monitor the efficiency of the unit over time.

Meanwhile a brochure to guide those thinking of purchasing water treatment devices has been published. The brochure includes a flow diagram to guide readers through the decision-making process to help them decide if they need a home treatment device. It also includes a table with a summary of treatment technology available in South Africa.

A crucial message to potential buyers of home water treatment devices is to firstly determine whether they really need it. The 'my water' function on the Department of Water Affairs Blue Drop website ([www.dwa.gov.za/bluedrop](http://www.dwa.gov.za/bluedrop))



*A new brochure guides potential users in the evaluation of home water treatment devices.*

allows near everyone to monitor the tap water quality of their town, suburb or street on a daily basis. Another important thing to remember is that good-quality tap water does not necessarily safeguard homes from disease – other factors can also play a role, including sanitation and hygiene practices and contaminated food, for example.

- To download an electronic version of the brochure Visit: <http://wrcwww/Knowledge%20Hub%20Documents/Research%20Documents/water%20filter%20brochure.pdf>

## Switzerland-SA strengthen science ties

Science & Technology Minister, Naledi Pandor, has signed a joint statement on Swiss-South African science and technology cooperation with the Head of the Swiss Federal Department of Home Affairs, HE Didier Burkhalter.

At present, there are 16 joint research projects under the Swiss-South African Joint Research Programme in the fields of public health and biomedicine, bio- and nanotechnology and human and social sciences. By the end of 2010, 48 Doctorate and post-doc students were involved in collaborative activities between the two countries. Close to 80 young scholars have benefited from more than 50 joint

research programme exchange projects.

The parties have agreed to bring the current phase (2008-2011) of the joint research programme to a conclusion and to prepare in 2012 for the next four-year phase. Both parties also agreed to include a wider network of institutional actors and to explore new possible common research fields such as renewable sources of energy, energy security and clean technology. The programme framework for the second phase will be conceptualised at the next joint committee meeting, which will take place in South Africa in the first half of 2012.

## Over 90% of SA households have access to water

A total of 93% of South African households now have access to at least basic water supply, according to Statistics South Africa (Stats SA).

According to the Water and Sanitation 2002-2010 analysis of the General Household Survey released by Stats SA earlier this year, about four in ten households have access to piped water inside their dwelling. "General access to piped water on site rose steadily, from 27,5% in 2002 to 29,1% in 2010."

Households that accessed wells and springs as main sources of water decreased from 1,4% in 2002 to 0,3% in 2010 with respect to wells, and from

2% in 2002 to 1,6% in 2010 with respect to springs. "Ninety-six percent of formal dwelling units reported to have access to safe water, whether inside the dwelling unit, in the yard, from a neighbour's tap or from a communal standpipe. Only 2,6% of these households still use water from unsafe sources," read the report.

According to Stats SA, the majority of South Africans now enjoy access to safe water supply. There are still provinces with fairly low access, however. The Eastern Cape (74,4%) and KwaZulu-Natal (87,1%) scored lowest in terms of households with access to safe water supply.

**Source: BuaNews**

## When soil forms a shell – the benefit of no-till farming

Even when crop residues are exported from the field, the practice of no-till farming protects soil because it preserves the surface from crust formation.

Planting without ploughing is beneficial practice for several reasons, the main one being soil conservation. If the soil structure as well as other physico-chemical and biological properties of the soil are preserved, it is then assumed that the soil would be more resistant to rainwater erosion.

However, some experts have expressed doubts concerning the benefits of no-till practices being real or obtainable in small-scale farming. This is because, in most instances with small-scale farming, the essential surface cover provided by crop residues left on the ground is absent. Indeed, residues cannot play their part in protecting the soil from raindrop impacts and rain wash when farmers collect them to feed their livestock.

“We have just shown that this cultural practice is beneficial even when the plant residues no longer cover the surface of the soil,” reports Charmaine Mchunu, Masters student from the School of Bioresources Engineering and Environmental Hydrology (BEEH) at the University of KwaZulu-Natal. With BEEH colleagues Prof Graham Jewitt and Prof

Simon Lorentz, along with Dr Alan Manson of the KwaZulu-Natal Department of Agriculture, Environmental Affairs and Rural Development; and Dr Vincent Chaplot of the Institute for Research and Development, she compared the physical, biological and chemical parameters of maize fields under till and no-till for several rainy seasons.

The results are clear: zero tillage reduces soil losses by 68% and organic carbon losses by 52%. The latter is important, since the carbon that escapes from the soil in response to a disturbance (e.g. tillage, rain) will reduce soil fertility, soil water holding capacity and will be added to the atmospheric carbon and thus contribute to the greenhouse effect.

“Rainfall erosivity is actually the number one factor contributing to soil, soil fertility and soil carbon losses that farmers want to minimise. Due to the force and volume of precipitation, the KwaZulu-Natal area, along with many tropical and sub-tropical areas of the world, are at risk,” notes Mchunu.

Plant residues left behind after harvest help to protect the soil against the destructive forces of rainfall. But in the maize fields of the Drakensberg foothills they are reduced to a minimum (less than 10% of the soil surface) and thus are rendered ineffective against



*In-situ sampling of soil crusts by University of KwaZulu-Natal student Charmaine Mchunu and a visiting researcher from the Institute for Research and Development.*

the erosive impact of raindrops.

In this case, what acts to protect the soil? The answer lies in a phenomenon observed long ago by researchers – surface crusts. “Surface crusts are formed by soil aggregates welded together to form a low permeability layer, thus making the crust more resistant to erosion,” explains Chaplot. This study shows that such a shell allows the maintenance of many soil functions, including the storage of atmospheric organic carbon.

The technique of zero tillage therefore promotes soil conservation by preserving the protective crust, and

thus allows the sustainable use of soils. Used since prehistoric times and by many traditional forms of agriculture, this technique now has new impetus as these benefits highlight its role in the mitigation of desertification and global warming.

The BEEH study formed part of a long-standing research effort at Potshini in the foothills of the Drakensberg mountains, which focuses on smallholder systems innovations in agriculture. This particular project has been funded by the Water Research Commission and the provincial Department of Agriculture.

## Special drive to combat water license backlogs

The Department of Water Affairs has launched a special drive to eradicate the current water use license applications backlog.

So-called Project Letsema, run by the Chief Directorate: Regulation, aims to evaluate the water use license applications, some of which are dated as far back as 1998.

Commenting on the progress made by the drive, project leader Portia Makhanya said the initiative has certainly increased the process rate of license applications

in the department. She added that the venture is on target to achieve its goals of strengthening water resource management in the water sector.

Makhanya also confirmed that new applications continue to be received and processed by the department under the backlog eradication project. At the same time, some of the decisions made and communicated to clients on the current project are subjected to queries by water users, entailing reviews.

## Dutch funding boosts East London bucket eradication

East London's bucket eradication programme has received a welcome boost in the form of additional funding of R2,1-million from the city's Dutch sister city, Leiden.

The money will be spent on a five-year sanitation project as part of the Dutch city's long-standing partnership with Buffalo City municipality. “We are happy

that Leiden is assisting us in eradicating sanitation challenges. Sanitation is a priority on our list of things we are doing to better people's lives,” said East London Mayor Zukiswa Ncitha.

An estimated R100-million is required to completely eradicate the sanitation backlog in the metro's constituency.

**Source: BuaNews**

## New from the WRC

### Report No: KV 263/10

*The concept of public trusteeship as embedded in the South African National Water Act, 1998 (E van der Schyff)*

With the promulgation of the National Water Act (NWA) of 1998 South Africans witnessed the birth of a new legal concept in South African natural resources jurisprudence. The concept of public trusteeship that initially emerged in the White Paper on a *National Water Policy for South Africa* was formally entrenched in sections 2 and 3 of the NWA. While the concept of public trusteeship is somewhat romanticised in policy the reality is that increasing competition between various water users and the inability to meet growing demands hamper water reforms aimed at addressing equity and redress issues. This study is aimed at analysing the concept of public trusteeship as it is found in the NWA in order to determine the roles, responsibilities and obligations of all the roleplayers in decentralised water management and governance as well as the legal implications that the concept holds for water governance and water users in order to facilitate the development of the visionary 'doctrine of public trust which is uniquely South African and is designed to fit South Africa's specific circumstances'.

### Report No: KV 273/11

*South African groundwater governance case study (K Pieterse, HE Beekman & M Holland)*

This report presents a case study on groundwater governance in South Africa at national and local levels. The case study forms part of a World Bank economic and sector analysis on the paradox of groundwater governance. At the local level, groundwater governance was studied for four highly productive aquifer systems demonstrating various degrees in the implementation of groundwater governance. These systems included the Botleng Dolomitic Aquifer (Delmas area); Gauteng Dolomites (Steenkoppies and Babsfontein compartments); Houdenbrak Basement Aquifer (Mogwadi-Vivo area);

and the Dinokana-Lobatse Transboundary Dolomite Aquifer.

### Report No: TT 488/11

*A gap analysis of water testing laboratories in South Africa (F Balfour; H Badenhorst & D Trollip)*

There are a limited number of laboratories that undertake water quality testing in South Africa. More significantly, many of these laboratories have capacity limitations. The aims of this project were to, among others, conduct a survey of the status, capacity and geographic location of all available laboratories that would be able to conduct the necessary testing on water and wastewater samples in South Africa; identify bottlenecks which hamper functioning and establishing of laboratories; and use the information gathered to develop strategies to address the needs of water quality assessment in South Africa.

### Report No: 1819/1/10

*Strategic assessment of household on-site water as supplementary resource to potable municipal supply – Current trends and future needs (HE Jacobs; T Wright; C Loubser; JA du Plessis & J Kock)*

Water resource managers, water demand managers and water infrastructure planners alike are faced with an acute lack of knowledge regarding on-site household water use as additional water source to potable water supply. The most common on-site household water sources of this nature include groundwater abstraction, rainwater harvesting and greywater reuse. The nature and extent of household water sources application by individual water users in residential areas impacts on all infrastructure elements of the water supply and waste cycle.

Application of a household water source creates an apparent load reduction on piped reticulation systems, treatment works and on water resources. Unfortunately, these extra sources of water are often neglected during urban and resources planning exercises. A critical question is addressed by this research. The main aims of this research project

were to strategically assess the status quo of household water sources; conceptually describe an end-use model incorporating household water sources and assess the theoretical impact of household water sources on the average annual daily water demand; and identify trends and future research needs, among others.

### Report No: KV 254/10

*The influence of irrigation on groundwater at the Vaalharts irrigation scheme – Preliminary assessment (PMJ Verwey; PD Vermeulen & GJ van Tonder)*

The first farmers in the Vaalharts irrigation scheme received their plots in 1938. Today there are 1 200 plots varying in size from 25 to 75 ha, covering a total area of 35 302 ha. Water logging and salinisation problems have been experienced in the area. The quality of the groundwater is deteriorating as can be seen in samples and on site measurements. Therefore several studies have been carried out to explain the apparent macro-scale salt accumulation.

### Report No: KV 264/10

*Investigating the behavioural drivers of stakeholder engagement and volunteerism in the South African water arena (S Blignaut & AG Choles)*

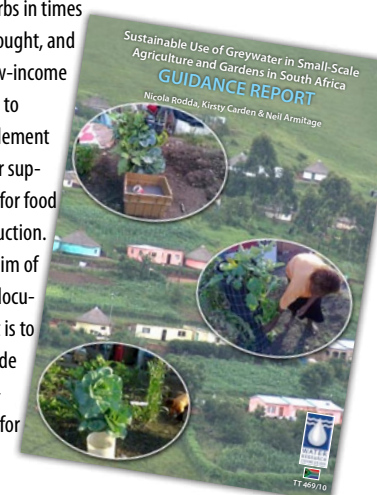
Integrated water resource management (IWRM) is an inherently complex task, especially in South Africa with its

diversity of cultures and socio-economic groupings. The multitude of factors, drivers, personas, agendas and technical challenges that influence and direct the way in which IWRM is conducted leaves many communities that encounter water resource challenges in a precarious position. The reality in South Africa and elsewhere is that public-private partnerships and shifts towards adaptive management and stakeholder engagements are pivotal in ensuring effective IWRM. This study aimed to investigate the drivers of engagement and volunteerism in a community facing an IWRM challenge, with a view to generating an understanding of how volunteerism and engagement levels may be improved.

### Report No: TT 469/10

*Sustainable use of greywater in small-scale agriculture and gardens in South Africa: Guidance report (N Rodda; K Carden and N Armitage)*

Limited supplies of freshwater are a concern worldwide and especially in South Africa where annual rainfall falls well below the world average. Reuse of greywater offers one means of relieving pressure on freshwater supplies. It is established practice in a significant minority of households, especially in low income settlements where water is difficult to obtain and families are under financial pressure to reduce use of all resources. Use of greywater specifically for irrigation is practiced to a lesser extent than for other household uses, but does occur in middle and higher income suburbs in times of drought, and in low-income areas to supplement water supplies for food production. The aim of this document is to provide guidance for

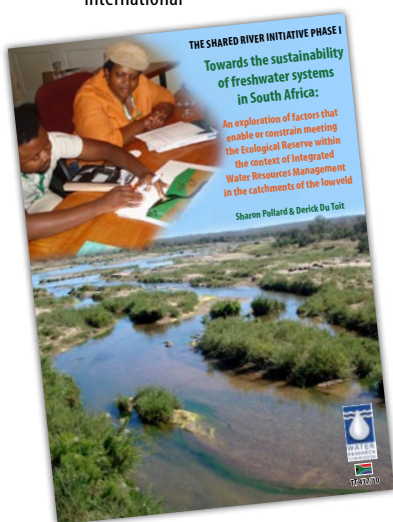


the sustainable use of greywater in small-scale agriculture and gardens in rural villages, peri-urban and urban areas of South Africa. The technical report of the study is also available (**Report No: 1639/1/10**)

#### Report No: TT 477/10

*The Shared Rivers Initiative Phase 1 – Towards the sustainability of freshwater systems in South Africa: An exploration of factors that enable or constrain meeting the Ecological Reserve within the context of Integrated Resources Management in the catchments of the Lowveld (S Pollard & D du Toit)*

The Olifants River ceased flowing in 2005 prompting widespread concern and calls for an integrated focus on all of the easterly-flowing rivers of the lowveld of South Africa. Assertions were that despite the enabling legislative frameworks for water reform and environmental flows in 1998, the integrity of most of these rivers has not improved, or continues to degrade both in terms of quality and quantity. Given that all the rivers form part of transboundary, international



systems, the implications were of wider significance than South Africa alone. In response, the Shared Rivers Initiative, an action-research programme funded by the WRC was initiated in 2007. The work reported in this document concerns itself with exploring the progress towards meeting the commitment to sustainability of these lowveld rivers as set out in the National Water Act.

#### Report No: KV 268/11

*Investigation of sulphide oxidation kinetics and impact of reactor design during passive treatment of mine-water (RP van Hille & N Mooruth)*

The integrated managed passive (IMPI) process was developed by Pulles Howard & De Lange in association with Rhodes University. It is a semi-passive process, requiring minimal maintenance. The process incorporates a series of degrading packed bed reactors to reduce the sulphate and sulphide oxidation reactors to convert the sulphide to elemental sulphur. The technology has been implemented at a demonstration scale at BHP Billiton's Middelburg coal mine. The work described in this report was commissioned to provide fundamental information that could be used to enhance process efficiency.

#### Report No: TT 485/11

*Cleaner Production: A guidance document for the mining industry in South Africa (SJ Barclay; G Trusler; H von Blottnitz; CA Buckley; B Kothuis & C Janisch)*

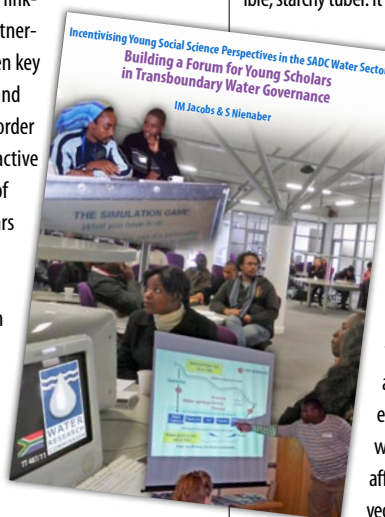
This Cleaner Production guidance document has been prepared under a WRC project investigating the introduction of cleaner production technologies to the South African mining sector. This project was conducted from 2004 to 2008, and investigated the use of cleaner production tools such as quick scan assessments, lifecycle assessments, and cleaner production forums to encourage and motivate the mining industry to implement cleaner production in order to reduce their environmental impact and increase profitability. The aim of the guidance document is to assist the mining industry and its regulators, in determining the benefits of implementing cleaner production and the methodology involved. Case studies and examples are incorporated to demonstrate how cleaner production has been implemented successfully in mining companies, both locally and internationally, and checklists are used to guide the user through each stage of the cleaner production process.

#### Report No: TT 487/11

*Incentivising young social science perspectives in the SADC water sector: Building a forum for young scholars in transboundary water governance (JM Jacobs & S Nienaber)*

This report documents the progress of a one-year WRC-funded consultancy awarded to the CSIR during 2010-2011.

The project aimed to establish and build collaborative linkages and partnerships between key institutions and networks in order to create an active community of young scholars interested in transdisciplinary research collaboration and information exchange on the topic of trans-



boundary water governance. The YSF project therefore focused its attention on southern African water issues and their governance implications around specific themes, with the explicit goal of producing an agenda for future research. This report examines the degree to which it achieved these objectives.

#### Report No: 1735/1/10

*Refinement of the decision support system for metalliferous mine residue disposal facilities (N Bezuidenhout and B Randell)*

This project aimed to refine an earlier decision support system (DSS) developed for mine residue disposal facilities developed with WRC funding. Among others, this project aimed to develop a performance demonstration protocol (i.e. guidance that can be used to demonstrate the acceptability of a particular technique, technology or approach); align the DSS to current legislation; and undertake specialist studies of specific knowledge gaps identified during the development of the first order DSS in order to better understand the aspects and to provide better guidance in the DSS for users.

#### Report No: KV 260/10

*The impact of Madumbe (Colocasia esculenta) cultivation on the evaporation of a Cyperus latifolius marsh in KwaZulu-Natal (C Everson and M Mengistu)*

The madumbe is an important food plant

in the hot regions of the world. Known by a number of different names (idumbe, taro, cocyam and dasheen) they are grown mainly for the underground, easily digestible, starchy tuber. It is one of the most

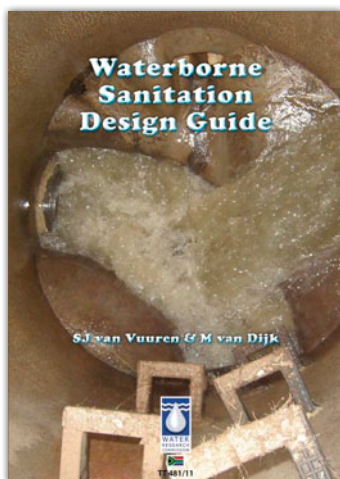
widely grown traditional crops in Mpumalanga and KwaZulu-Natal, as well as in areas of the Eastern Cape and Limpopo provinces. A key component of the water budget of a wetland is the loss of water to the atmosphere (so-called evapotranspiration), which may be strongly affected by the particular vegetation growing in the wetland. *Cyperus*

*latifolius* marsh is one of the wetland vegetation types occurring most extensively in KwaZulu-Natal, the Pondoland region of the Eastern Cape and in Mpumalanga and Limpopo. Madumbes have a high tolerance to water logging and are often cultivated in *C. latifolius* marshes. In a first for South Africa, this study investigated the evapotranspiration of *C. latifolius* and madumbe areas, together with monitoring of the water table in the wetland.

#### Report No: 1553/1/11

*The introduction of cleaner production technologies in the South African mining industry: A summary report (G Trusler and S Mzoboshe)*

The mining industry has played a major role in the development of South Africa and has the capacity to do so for many more years. Despite its role in the economy the mining industry is also the largest producer of solid waste in the country and a major contributor to water quality degradation in many of South Africa's important catchments. The overall objective of this project was to introduce cleaner production technologies in the mining industry. Among others, the project aimed to conduct a scoping level situation analysis of the mining industry to identify the present level of cleaner production activities; identify existing water-related threats that could be alleviated by cleaner



production technologies; and introduce the concept of waste minimisation clubs to the mining sector.

#### Report No: 1839/1/10

*Towards the development of IWRM implementation indicators in South Africa (S Braid & A Görgens)*

This document reports the findings of a solicited project to conduct a comprehensive literature review of both international literature and selected national legislation and policy in terms of how integrated water resource management (IWRM) has been conceived and applied; develop indicators for assessing how IWRM will impact on the lives of women and the poor and apply these indicators to South African case studies; and build research capacity locally and internationally on approaches to implement and monitor IWRM.

#### Report No: TT 481/11

*Waterborne sanitation design guide (SJ van Vuuren and M van Dijk)*

Historical records include many references to engineering feats undertaken by ancient civilisations to collect and convey water. In South Africa, the first waterborne sanitation system, with sewers, was used in the Great Karoo town of Matjiesfontein, founded in 1884 by the Scot, James Douglas Logan. The first flushing toilet was installed in his home. The sanitary sewer system is a

major capital investment made by a community. The system's function is only vaguely recognised by the public due to its underground installation, except for the manhole covers or when the system doesn't function properly. Sanitation systems are essential to protect public health and welfare in all development areas. Every community produces wastewater of domestic, commercial and industrial origin. However, the proper planning and construction of these sanitation systems alone does not provide a guarantee that the general health of the population will improve. A holistic approach to healthcare is required, with the provision of suitable sanitation being just one of the necessary components thereof. In order to develop a guide for the design and operation of waterborne sanitation for South Africa a good understanding of the existing waterborne sanitation standards and specifications is required. A number of local authorities were visited and data gathered in order to determine the various standards applicable throughout South Africa. Information has been synthesised from a wide variety of sources and tailored to South African conditions. The guide provides a complete overview of all waterborne sanitation systems used in South Africa.

#### Report No: TT 482/11

*Waterborne sanitation operation and maintenance guide (SJ van Vuuren and M van Dijk)*

The function of a waterborne sanitation system is to collect and convey wastewater in a hygienic manner. Operation and maintenance of this sewer system means making sure that all its components are kept in good operating conditions. Planners, designers, the construction team and the administrators have a joint duty in providing an efficient system. The aim of this guide is to highlight the procedures, practices and policies in the operation and maintenance of waterborne sanitation systems. To provide further classification and background information, photographs, videos, software and

additional literature were included on the accompanying DVD, *SewerAid*.

#### Report No: 1628/1/11

*Prediction of how different management options will affect drainage water quality and quantity in the Mpumalanga coal mines up to 2080 (TJ Coleman; B Usher; D Vermeulen; N Scholtz and S Lorentz)*

The Witbank and Middelburg Dam catchments are extensively mined. The water quality has deteriorated in the catchment. The water sources of the catchment are further threatened by the future decants that are expected from the mines post closure. The mines will be closing over the next 20 years. Thereafter the mine workings will fill and start decanting. Among others, this study aimed to evaluate the available management options that can be used to reduce mine drainage and/or improve its quality on the Mpumalanga coalfield; compile the currently available information and acquire additional information as required to model the long-term water quality and quantity emanating from the mines in the coalfield; and establish an integrated modelling suite that simulates the change in the coalfield as affected by different management options.

#### Report No: 1808/1/11

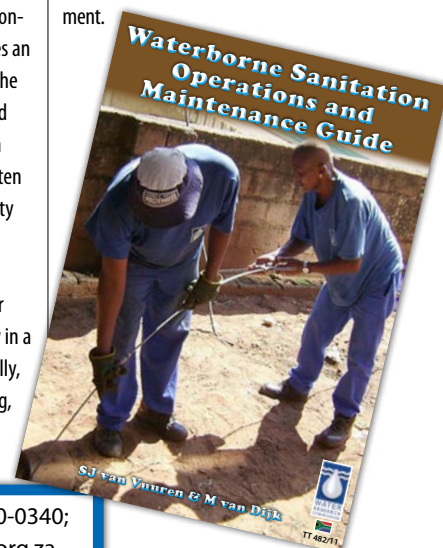
*Definition of process zones and connectivity in catchment scale NPS processes (S Lorentz; J Miller; P Lechler; G Mackin; M Lord; J Kollongei; J Pretorius; K Ngeleka; N Zondi & J le Roux)*

Successful prediction of agricultural non-point source pollution (NSP-P) requires an understanding and quantification of the sources and pathways of sediment and nutrients in the landscape and stream network. The migration of NSP-P is often dominated by controls and connectivity features in the catchment, and so this work aims at observation, description and quantification of the processes for water, sediment and nutrient delivery in a research catchment, or more specifically, the Mkabela catchment near Wartburg, KwaZulu-Natal.

#### Report No: 1871/1/11

*Investigating the mechanism and processes used in setting water service tariffs (P Hosking; K Jacoby; G Sharp & J Hosking)*

Water is an indispensable natural resource – vitally necessary to sustain life, the environment, food production, a key element in maintaining hygiene and a sustainable and environmentally attractive option for electrical power generation. Prosperity in South Africa depends, among other things, on the sound management of water, but with expanded aspirations and political commitments, municipalities and central government in South Africa have found themselves in a challenging situation with respect to the provision of water services for the last decade. The municipalities depend heavily on central government assistance to meet their mandate to provide water services to the local communities they serve. Water service tariffs are associated with the supply of potable water and with the managing and sanitising of the used (waste) water. The primary aim of this study was to estimate the customer valuations of municipal water services provided within the context of a water tariff setting framework. Among others, the investigations were required to determine service options for alternative combinations of water services provided in three municipalities in the Eastern Cape; assess the marginal value of water service delivered to customers, by use of the choice experiment method; and draw conclusions about the tariff-service connection in the light of the results of the choice experiment.



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