

THE WATER WHEEL

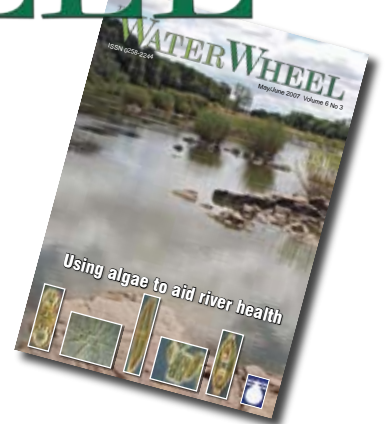
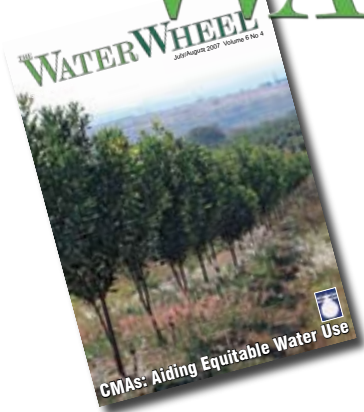
ISSN 0258-2244

November/December 2007 Volume 6 No 6

**Tracing the
history of
Cape rivers**



THE WATER WHEEL



Subscription

- Request
- Renewal
- Address change

Contact Details

Name:

Company:

Designation:

Postal Address:

.....

Tel:

Fax:

E-mail:

What would you like to read more about in *the Water Wheel*?

.....

.....

Would you be willing to pay for *the Water Wheel*?

The Water Wheel

Tel: +27 (0) 12 330-0340

Fax: +27 (0) 12 331-2565

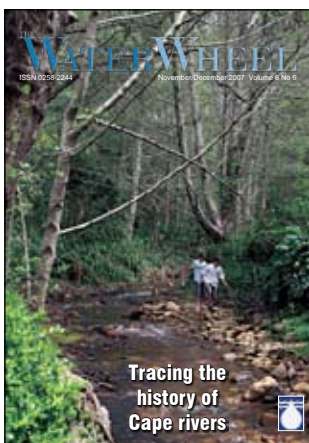
E-mail: laniv@wrc.org.za / www.wrc.org.za

Physical address: Marumati Building, C/o Frederika & 18th Ave, Rietfontein, Pretoria

Postal address: Private Bag X03, Gezina, 0031



LETTERS	4
UPFRONT	5
WATER RESOURCES MANAGEMENT	12
Tracing Van Riebeeck's footsteps	
SMALLHOLDER IRRIGATION	16
Mapping the rocky road to smallholder vitality	
COMMUNITY HEALTH	20
Household wastewater still a grey area	
CAPACITY BUILDING	23
Signing a shot in the arm for skills training	
WASTEWATER TREATMENT	24
Guides help sludge change from appalling to appealing	
BASIC SERVICES	26
New tools to assess health impacts of taps & toilets	
WATER KIDZ	28
Sanitation – Weapon against death and disease	
THE LAST WORD	30
Exhibition attracts big business	



Cover: The Water Research Commission is funding a project on the history of Cape Town's rivers. See page 12.

THE WATER WHEEL is a two-monthly magazine on water and water research published by the South African Water Research Commission (WRC), a statutory organisation established in 1971 by Act of Parliament. Subscription is free. Material in this publication does not necessarily reflect the considered opinions of the members of the WRC, and may be copied with acknowledgement of source.

Editorial offices:

Water Research Commission, Private Bag X03, Gezina, 0031, Republic of South Africa.
Tel (012) 330-9031. Fax (012) 331-2565.

WRC Internet address: <http://www.wrc.org.za>

Editor: Lani van Vuuren, E-mail: laniv@wrc.org.za; **Editorial Secretary:** Rina Human, E-mail: rinah@wrc.org.za;

Layout: Drinie van Rensburg, E-mail: drinie@wrc.org.za



SA Housing and the Rural Challenge

The article in the July/August edition of *the Water Wheel* about the SA Housing efforts refers (*SA's housing efforts not enough*, Upfront section).

I feel that the UN expert Mr Miloon Kothari is a little out of line in criticising the South African efforts in the housing field. I think all will accept that we can and must do a whole lot more. It is however unacceptable to damn the country with faint praise for its efforts. We have an enormous shortage of skills and administrative experience which is holding development back. It is also unacceptable not to put the South African situation in a world context.

I have just returned from a visit to London and was privileged to see the brilliant exhibition on urbanisation at the Tate Modern in the City of London. The statistics and the scale of the problems on a world-wide basis make the South African situation appear almost insignificant by comparison. The challenges facing China, India and some of the South American countries are monumental.

The developmental challenges that have to be met will stretch the abilities of most governments. The issue that no one

seems to be confronting realistically is rural development and the best means to reverse the drift to the cities. Add to this the challenges of population growth that are only spoken of in hushed tones, if at all, and the problems become more intractable but not insoluble.

We in South Africa still have a chance to meet the challenges with an even chance of success but it will require clear thinking, adapting rural social structures and mores to a more modern ethos and the intelligent investment of development funds to uplift rural agriculture and facilities. Oddly enough there are many areas where the basic water supply requirements are already in place and all it needs is expansion, education and maintenance training. It can be done but there needs to be less talk and more doing.

Robert Blyth, Newlands

Clarity on 'alien' diatoms

This is in response to the letter of Ben Dekker (*Diatoms can be alien too*) in the July 2007 edition of *the Water Wheel*. Unfortunately my remark "...diatoms cannot be re-located to a new river or propagated as part of captive breeding programmes" has been

misconstrued and taken out of context.

I would like to elaborate on this comment. It should most certainly not have been taken to mean that certain diatom species cannot be invasive or "alien". In our scant experience it would appear that certain diatom species have a distribution limited to certain specific areas, this may be because of a combination of unique geological and climatic conditions. An example of this is the very distinctive diatom species *Navicula areolata*, described over 50 years ago from the slightly acidic, nutrient and electrolyte poor streams of the Magaliesburg. This diatom still lives in these streams but despite intensive investigations by authors such as B.J. Cholnoky has never been found to occur outside of its type locality.

It is well documented that when a water resource is even slightly polluted, this pollution will override geological and climatic influences and cause diatom (and other algal) communities which may be composed of many hundreds of species, to change. Tolerant diatom species (which are usually cosmopolitan) become dominant and (possibly) endemic species are lost, they cannot be simply placed into another system as their unique requirements may not be met. We often have little or no knowledge of the specific requirements of diatom species (in terms of micro and macro-nutrients) and thus they cannot easily be cultured in the laboratory.

However, my main point in making this statement was to stress that we need to conserve aquatic (as well as terrestrial) ecosystems as a WHOLE, once you have destroyed or impacted a unique stream you have irrevocably changed the species composition of the micro-flora.

Dr Jonathan Taylor, Potchefstroom



Letters must be addressed to The Editor and can be faxed to (012) 331-2565 or E-mailed to laniv@wrc.org.za. Letters are published at the editor's discretion, and may be edited for length. Letters are strictly the opinion of the author(s) only and do not necessarily reflect the considered opinions of the members of *the Water Wheel* or the WRC.

Inept management threatening good target progress

South Africa's significant progress towards water and sanitation infrastructure delivery is being threatened by the lack of effective and sustainable management.

This is according to former Department of Water Affairs & Forestry DG Jabu Sindane. Speaking at the Water Management Excellence Conference held in Sandton earlier this year, he said that while the country's infrastructure development was well developed compared to the rest of Africa, indications were that already the water services backlog was being impacted negatively by project failures and comebacks. "This is reflected in the backlog figures where poor management and service delivery represents up to 40% of the total backlog in some provinces."

Sindane added that a recent audit initiated by the department on the functionality of completed water services projects revealed that a major portion of projects did not comply with minimum delivery standards. This concern not only applied to access to basic services, but was also reflected in poor service quality and customer care, in poor drinking water quality, high water losses, ineffective wastewater management with associated environmental impacts, interruptions and inadequate asset management, with associated financial losses.

Highlighting achievements by the sector to improve the situation, such as recent interventions in the Free State which has seen a dramatic improvement in drinking water quality, Sindane noted that there was a need to bring back ownership and pride within



the public services sector with the focus on service excellence.

This has to be accompanied by the adoption of a business management approach. "This is quite a deviation from the typical engineering approach that focuses mainly on technical solutions. It is crucial for water services authorities to realise that the service they are offering communities is a non-stop never-ending business which requires ongoing planning, management, service delivery, and appropriate governance."

This placed more emphasis on the role and purpose of the Water Sector Development Plans as well as business planning in the sector. "I do think that there is an opportunity for improvement and that we have to place a higher priority on sustainable management," concluded Sindane.

Water system investment to save millions

The eThekweni metropolitan municipality could save about R64-million a year in water that is currently being lost through leaking pipes once its latest project to replace the city's ageing water system is completed.

The R550-million project, which kicked off earlier this year, will see the removal of many of the city's concealed water mains and pipes which have reached the end of their lifecycle. According to project executive Alan Kee, the project will also put systems in place

that "would be strong, flexible, long lasting and would mean less water interruptions." At present, water leaks account for about 8% of the city's water use.

The first phase of the project involves the revitalisation of the water systems in the KwaMashu, Phoenix, Chatsworth, Mobeni and eMoyeni Grange districts. Special opportunities have been created for small, medium and micro enterprises to benefit from the project.

WATER BY NUMBERS

- **160** – The number of large dams owned by the Department of Water Affairs & Forestry which do not comply with modern safety standards, according to Minister of Water Affairs & Forestry Lindiwe Hendricks. The department owns a total of 294 dams.
- **2** – The number of taps being shared by 189 households in Mabopane's bloc EW, according to a report by *Pretoria News*.
- **83** – The number of years ago that water in Lake Victoria was at its current low level. At the time of writing water levels were at 1 133,4 m above sea level. This is the lowest since 1923, when the lake dropped to 1 123,9 m.
- **790 000 ha** – The land treated for invasive alien plants by the Working for Water programme during 2006/07.
- **88** – The reported number of dams Iran wishes to start constructing in the next 12 months. Another 176 dam projects are being studied to develop the surface water resources of the country, according to international magazine, *International Water Power and Dam Construction*.
- **285 m** – The height of the Grande Dixence Dam, on the Dixence River in Switzerland, the highest concrete dam in the world, according to the Guinness World of Records. The dam, completed in 1961, has a crest length of 700 m, and was constructed using about 6 million m³ of concrete.
- **150 billion litres** – The annual capacity of the desalination plant to be built outside Melbourne, Australia. The multibillion Dollar plant, expected to be Australia's largest, could start producing water by 2011.
- **R22-million** – The monies lost by the City of Cape Town due to the theft of non-ferrous metals contained in items such as water meters, taps and manhole covers.
- **3,69** – The size of the average South African household, down from 4,48 ten years ago, according to research conducted by the University of South Africa.



War over water 'unlikely'

Transboundary rivers shared by two or more countries are more likely to be catalysts for peace than the causes of conflict. This is according to Dr Jaroslav Tir, Associate Professor from the Department of International Affairs at the University of Georgia, in the US. Speaking at a seminar hosted by the Human Sciences Research Council in Pretoria, he said that the common belief that future wars would be fought over water appeared to be exaggerated.

"Much of the extant literature has focused on the conflict-generating potential of transboundary river use disputes, predicting international-level armed confrontations and even the so-called water wars. In contrast, research of past interstate disputes has shown that at most water has been a strategic goal in military campaigns. Water has never been the root cause of a war between two countries."

Instead there are many more examples of countries brokering deals to share international rivers equitably. Even hostile states have shown to more often than not seek

cooperative, peaceful solutions to their disagreements over the uses of common rivers. Dr Tir's research has focused on identifying the major determinants of whether riparian countries will enter into river-managing treaties. His investigations into about 140 river treaties signed between 1948 and 2000 indicated that security concerns have little bearing on river cooperation. In comparison, economic interdependence increases the chances for formalised river cooperation. Perhaps most importantly, water scarcity, rather than increasing the potential for conflict, boosts the chances that water treaties will be signed. "The scarcer the resource, the more likely countries are to collectively investigate ways in which to share the resource equitably," said Dr Tir.

Dr Tir also found that the role of upstream/downstream river flow had been exaggerated, as this allegedly important cooperation-inhibiting factor was not significant in any of his analyses. His findings sound a cautiously optimistic note regarding the future of river relations in Africa.

R222-m bulk sewer completed

The largest bulk sewer pipeline to be constructed by the City of Cape Town in the last decade is now officially in use.

The Delft sewer system was commissioned two years ago at a cost of R222-million. The new 15.5-km pipeline starts on the boundary of Delft and Cape Town International Airport, and discharges into the municipality's wastewater treatment works (WWTW) at Zandvliet, near Khayelitsha. Besides serving the 22 000 houses in the N2 Gateway housing

project, the bulk sewer will ultimately provide capacity for 2.2 million residents in the Zandvliet WWTW catchment area, which includes Mfuleni, Blue Downs and Eerste River.

The project was executed by a consortium comprising Sobambisana Community Development, Asla, Power Construction, Kwezi V3, Bergstan, and Chand Environmental Management. To handle a peak flowrate of more than 4 600 l/s, the diameter of the pipeline varies from 600 mm to almost 2 000 mm.

Desalination market on the up

The growing demand for potable and industry-quality water as well as high quantities of available salt and brackish water are leading to an upsurge in the desalination market in Southern and East Africa as well as the Indian Ocean Islands.

This is according to market research by global growth consulting company Frost & Sullivan. "Each of these water markets has substantial coastlines and in some cases groundwater supply, which is why these countries have and are considering desalination technology," reported research analyst David Winter. "Some industrial end users have installed their own desalination plants to ensure adequate process water supply, while municipalities have also turned to this technology."

The company noted that despite a reduction in membrane costs, desalination remained an expensive water supply option. However, it believed that growth opportunities existed for companies that could overcome the financial restraints. "The water supply issues present in these markets have reached a point where end users need to solve their potable water issues and desalination may be able to provide the answer."

WATER ON THE WEB

www.unesco.org/water/wwap/wwdr/index.shtml

This is the official website of the UNESCO World Water Assessment Programme, which focuses on assessing the developing situation as regards freshwater throughout the world. The primary output of the programme is the World Water Development Report, which is published every three years.

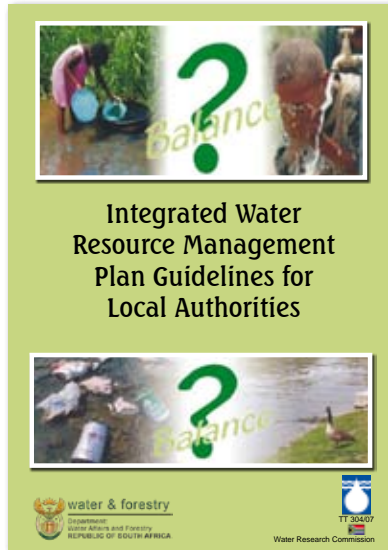
www.water-pollution.org.uk

While aimed at a British audience, this is still a very educational website, especially for learners and educators. The site contains useful, easy-to-read information about the sources of water pollution and how they can be treated.

Guideline helps municipalities find the balance

The Water Research Commission has published a new guideline to assist municipalities in establishing integrated water resource management (IWRM) plans.

By developing these plans local authorities could be one step closer in striking the right balance between social and economic infrastructure development and preserving economic integrity. The *IWRM Plan Guideline for Local Authorities* assists local authorities to meet present challenges, such as the lack of financial and human resources, while aligning themselves with their water management area's catchment management strategy and applying for the necessary water use authorisations. In instances where a catchment management strategy has not yet been developed, it is envisaged that the IWRM plan will provide valuable input into the development of such a strategy.



Waterwise farming

The Western Cape Department of Agriculture launched its waterwise and biodiversity campaign earlier this year.

The campaign was kicked off with an information session with students from the Cape Institute for Agricultural Training: Elsenburg. "The protection and optimal use of agricultural water is one of the top priorities of the department," reports department head Joyene Isaacs. "the waterwise and biodiversity campaign is one of our key deliverables to promote the efficient use of our province's agricultural resources."

The department is extending existing projects, such as the promotion of efficient water use by commercial and emerging farmers. It is also focusing on the protection of water resources from pollution with animal waste by providing planning and design services for animal husbandry. The campaign will run to the end of the year.

Looking for Excellent Performance?



SUPER D JACUZZI.

Producing excellent performance, Denorco's range of Jacuzzi and Super D centrifugal pumps offers affordability and high efficiency from borehole applications to irrigation and mine de-watering.

- Technically superior construction
- Locally manufactured, high quality
- Reliable and durable

For trusted brands, excellent service and advice, contact us for an engineered pumping solution.



13 Engwena Road, Sebenza, Edenvale, 1610, South Africa Tel: +27 11 609-4150
Customer Care: +27 11 723-6617 info@denorco.com www.denorco.com

Branches: Bloemfontein: +27 51 434-1565, Cape Town: +27 21 949-5458, Durban: +27 31 700-4160,
Depot - Port Elizabeth: +27 41 487-2866, Export Division: +27 11 609-4150

Orbit Pumps Botswana (Pty) Ltd: +267 397-4926



Golf courses the new wildlife refuge?

The development of more water guzzling golf courses, especially in water scarce areas, has received increasing criticism.

Now researchers from the US, believe that, if managed properly, these centres for human recreation could also be important wildlife sanctuaries. Prof Ray Semlitsch of the University of Missouri-Columbia and his colleagues have several recommendations to improve golf course habitats for especially amphibian populations. This includes

buffering aquatic habitats from chemical runoff, surrounding wetland areas with 150 m to 300 m of forest or natural grassland, and creating a diversity of pond types that mimic natural wetlands.

"There are more than 17 000 golf courses in the US, and about 70% of that land is not used for playing," said Prof Semlitsch. "These managed green spaces are not surrogates for protected land and ecosystems, but can include suitable habitat for species native to the area."

Guidelines to reusing water available

Volume One of the new World Health Organisation guidelines for the safe use of wastewater, excreta and greywater is now available.

This volume focuses on policy and regulatory aspects. It provides guidance on policy formulation, harmonisation and mainstreaming, on regulatory mechanisms and on establishing institutional links between the various interested sectors and parties. It also presents an overview of the nature and scope of options for protecting public health.

To download, go to www.who.int/water_sanitation_health/wastewater/gsuweg1/en/index.html

Fog help crops thrive in Chile

Chilean scientists have germinated the seeds of two important Andean crops using water collected from fog on a hilltop in the semi-arid coastal region of La Serena, in northern Chile.

According to SciDev.Net, they also recorded fog and dew frequency, and found that fog is three times more abundant than previously reported. The group hail from the Centre of Advanced Studies in Arid Zones at Chile's University of La Serena.

The researchers captured fog with metre-long nylon nets attached by a hose to pots sown with quinoa and chañar seeds. Fog passes through the mesh of the net and deposits droplets that drip down into the pots. Connecting the pots directly to the mesh allows for direct irrigation – and means less intervention is necessary.

Climate change goes underground

Scientists with CSIRO in Australia and the US Department of Agriculture's Agricultural Research Service (ARS) have taken climate change research underground.

WATER DIARY

WATER & SANITATION NOVEMBER 20-23

The WISA Water & Sanitation Conference will be held at the Zambezi Sun Hotel, at the Victoria Falls in Zambia. Conference themes include mitigating extreme events, integrated water quality, managing transboundary water resources, and meeting the UN Millennium Development Goals. *Enquiries: Taryn van Rooyen (Conference Secretariat); Tel: (011) 463-5085; Fax: (011) 463-3265; E-mail: conference@soafrica.com*

BIOFILM JANUARY 8-10

The (International Water Association (IWA) Biofilm Technologies Conference will take place in Singapore. Conference discussions will cover biofilm-based technologies and reactors, biofilm processes, microbiology,

biofouling and biocorrosion. *Enquiries: Marianne Yee (Conference Secretariat); Tel: +65 6339 8687; Fax: +65 6339 9536; E-mail: biofilm2008@orient-explorer.com; Visit: www.biofilmtechnologies.com*

SMALL WATER SYSTEMS FEBRUARY 6-9

The 8th Specialised Conference on Small Water and Wastewater Systems will take place in Coimbatore, Tamil Nadu, India. The event is being organised by the IWA, together with the Centre for Water and Environmental Studies of the Kumaraguru College of Technology, India, and the Laboratory for Environmental Biotechnology of the National Institute of Agronomic Research, France. *Enquiries: Organising Secretary, E-mail: small2008org@kct.ac.in; Visit: www.kct.ac.in/small2008*

While much research has been undertaken worldwide to unravel the climate change phenomenon, little is still known about how soil, subsurface waters, and groundwater are responding to climate change. The US-Australian team used simulated interactions between soil and plants. They generated daily weather patterns that match historical records and predicted climates with double the carbon dioxide using a general circulation model of the atmosphere. The daily weather that resulted was entered into a soil-water-vegetation model that represented soil absorbed water, water flow, and storage in soil, surface evaporation, plant uptake, transpiration of water, and deep drainage below the roots of trees and grasses that becomes groundwater recharge.

The simulation models reportedly showed that changes in the temperatures and rainfall affected growth rates and leaf size of plants which impacts groundwater recharge. In some areas, the vegetation response to climate change would cause the average recharge to decrease, however, in other areas, recharge to groundwater would more than double.



Drug use bust with sewage chemicals

A new screening test developed in the US seeks out evidence of illicit drug abuse in drug residues and metabolites excreted in urine and flushed towards municipal sewage treatment plants.

According to developers at the Oregon State University, the approach could provide a fast, reliable and inexpensive way to track

trends in drug use at local, regional or state levels while preserving the anonymity of individuals. Preliminary tests conducted in ten US cities show the method can simultaneously quantify methamphetamine and metabolites of cocaine and marijuana as well as legal drugs such as methadone, oxycodone, and ephedrine.

Satellites used to predict floods and drought

The European Space Agency (ESA) has produced maps of soil moisture levels in southern Africa to help countries predict droughts and floods.

The agency's ENVISAT satellite measures soil moisture levels by emitting radar waves and measuring the energy bounced back by the soil, SciDev.Net reports. High levels of soil moisture can lead to flooding and erosion, and low levels cause crops to wilt and die. The maps have been produced as part of the SHARE project (Soil Moisture for Hydrometeorological Applications in the Southern African Development Community).

The SHARE project is part of ESA's TIGER initiative, which aims to assist African countries in managing water-related problems by using satellite data.

Annett Bartsch, project coordinator at Vienna University of Technology, Austria, explained how the maps are used. "Areas of saturated upper soil can be identified. These areas are those at risk of flooding. The maps can also help predict droughts by looking at past trends in soil moisture."

The maps have reportedly been published online and are available to governmental and independent organisations free of charge.

WATER DIARY (continued)

WATER & SANITATION FEBRUARY 25-29

The 14th African Water Association Congress will be held in Cotonou, Benin. The main theme centres around partnerships and good governance for achieving the UN Millennium Development Goals in the water and sanitation sector in Africa.

Enquiries – E-mail: susher.uade@aviso.ci; or kfofana.uade@aviso.ci; Visit: www.uade.org

SERVICE DELIVERY MARCH 19-20

WISA is hosting a conference on Innovative Service Delivery Solutions (Franchising for the Water Sector) at Helderfontein Estates, Gauteng. Enquiries: Taryn van Rooyen, Tel: (011) 463-5085; E-mail: conference@soafrica.com or Deon Nel at E-mail: deon@biwater.co.za

NEW WATER WEB RESOURCE

The US Academy of Sciences has launched a new web resource, aimed at solving some of the world's drinking water problems.

SciDev.Net reports that the 'Safe Drinking Water Is Essential' initiative, launched earlier this year, aims to help international decision-makers improve drinking water sup-

plies in their countries by providing reliable scientific information. Funded by the Global Health and Education Foundation, the web resource provides information on how clean water can be protected and the different types of contamination and available treatments.

To access the resource go to www.drinking-water.org

Mine-water clean-up goes organic

A locally-developed organic technology is offering a solution to South Africa's enormous polluted mine-water challenge.

SupaZorb, a patented natural, organic hydrocarbon and chemical absorbent, was originally developed to remediate oil spills. Mixed from Casuarina needles and pine bark, the material is now proving its efficiency in the removal of heavy metals and salts from acid mine drainage. This is achieved through ion exchange, microbiological metabolism and organic reactions.

Traditional mine-water cleaning methods use chemicals which, in addition to being expensive, could be hazardous to the environment. "SupaZorb is the only non-chemical treatment of AMD in the world," reports Dr Olaf Pollmann of the School of Science & Development and North West University, who has been researching the product. "It uses no chemical ingredients – only those processes provided by nature."

A series of steps are used to clean the polluted mine-water. First, the organic material intended to clean the water is moistened to open the plant cells in preparation for the



process. After a few days the mine-water is run through the different bags filled with bark and needles. The precipitation is then visible on top of the bags.

Following successful laboratory tests,

the product has been tested in field conditions using polluted mine-water from a Randfontein gold mine. A test bed of cascades filled with different materials was used. The first cascade was filled with SupaZorb, the second with pine bark only and the third with Casuarina only – both mixed with sand by 50% of weight. Finally, the water passed cascade of dolomite.

The SupaZorb has proven to be most efficient, reports Dr Pollmann. The first phase, which saw the treatment of 6 000 m³/day of water indicated a saving of more than 60% on the amount and cost of chemicals traditionally used to clean the water. The pH of the water was raised from 2.8 to 7.8 while more than 90% of the heavy metals were removed.

At the time of writing, plans were being finalised to use the treated water to irrigate 20 ha of lucerne. Dr Pollmann reports that, following the positive results achieved during field trials, there has been an increase of interest in the use of this product for AMD treatment.

'Greener' water plant for chemical firm

Chemical manufacture company Chemical Initiatives is completing a new water treatment plant at its Amanzimtoti site, in KwaZulu-Natal.

The demineralisation plant, designed and constructed by VWS Envig, replaces the existing 25-year-old treatment facility, which serves in the manufacture of sulphuric acid. According to VWS Envig project manager: Engineered Systems Gareth Kearns, one of the main requirements of the new plant is to minimise the impact on the environment. "The existing plant with its aged technology is producing

200 m³ of effluent a day. The new plant, comprising new technology and advanced processes, will cut that amount dramatically to a mere 40 m³/day, yielding both environmental and cost benefits."

The plant will be completed before the end of the year. "The new water treatment plant will have a capacity of 32 m³/hour of high-quality water for use in several processes, but mainly as boiler feed water," explained Kearns. "The water will undergo sand filtration to remove solids, carbon filtration to remove organic particles, and degasifying to remove carbon dioxide. The

water will also flow through cation and anion removal vessels."

Part of the plant will be pre-assembled at the contractor's factory in Isando, Gauteng, however, the majority of the construction and installation will take place on-site. A raw water tank is also being supplied.

"As part of the commissioning process, we will be training operators in both plant operation and maintenance aspects. Once the new plant is ready, Chemical Initiatives will literally change over from the old plant to the new, thus ensuring no downtime," concluded Kearns.

Innovative Debt Relief Earns Durban International Award

The eThekweni Metropolitan Municipality's water and sanitation department has received international recognition for its debt relief programme.



eThekweni Metropolitan Municipality has signed on more than 28 750 customers to its Customer Debt Relief Programme.

The municipality won the United Nations (UN) Public Service Award in the category of Improving Transparency and the Delivery of Services. This award is considered the most prestigious international recognition of excellence in public service. It rewards the creative achievements and contributions of public service institutions to a more effective and responsive public administration in countries worldwide.

According to Guido Bertucci, Director: Division of Public Administration & Development Management at the UN Department of Economic and Social Affairs, the municipality's outstanding

achievement has demonstrated excellence in serving the public interest. "I am sure (this programme) has made a significant contribution to the improvement of public administration in South Africa. It should be an inspiration and encouragement for others working for the public service."

Developed by eThekweni's head of water and sanitation Neil Macleod, the Customer Debt Relief Programme addresses the high levels of non-payment of some customers while, at the same time, providing debt relief to the poor and destitute of Durban and surrounds. Since 2005, the water debts of the city's poor have been written off provided they sign up for a programme and honour their future debts.

Those who qualify must comply with conditions designed to encourage a culture of payment. Customers in poorer areas who are in arrears for more than 90 days are targeted by the programme. This includes pensioner-headed households, child-headed households, and those living in houses valued less than R100 000.

Customers' debt is gradually written off over 50 months provided that they make regular payments of their current account. In contrast to the conventional blanket debt write-off approach, this credit programme rewards good payment behaviour, reported eThekweni spokesperson Teddy Gounden. If customers default on their monthly payments, their debt is reinstated.


Customer service agents visit customers in their homes to explain the programme, identify reasons for high bills and explains the consequences of non-payment. The key reasons for high bills

include leaks, high consumption behaviour, consistent non-payment and rental business activities. Customers are assisted to address these issues before applying for debt relief, for example, chronic leaks are attended to by the municipality for a nominal fee. Destitute customers are further assisted through social workers.

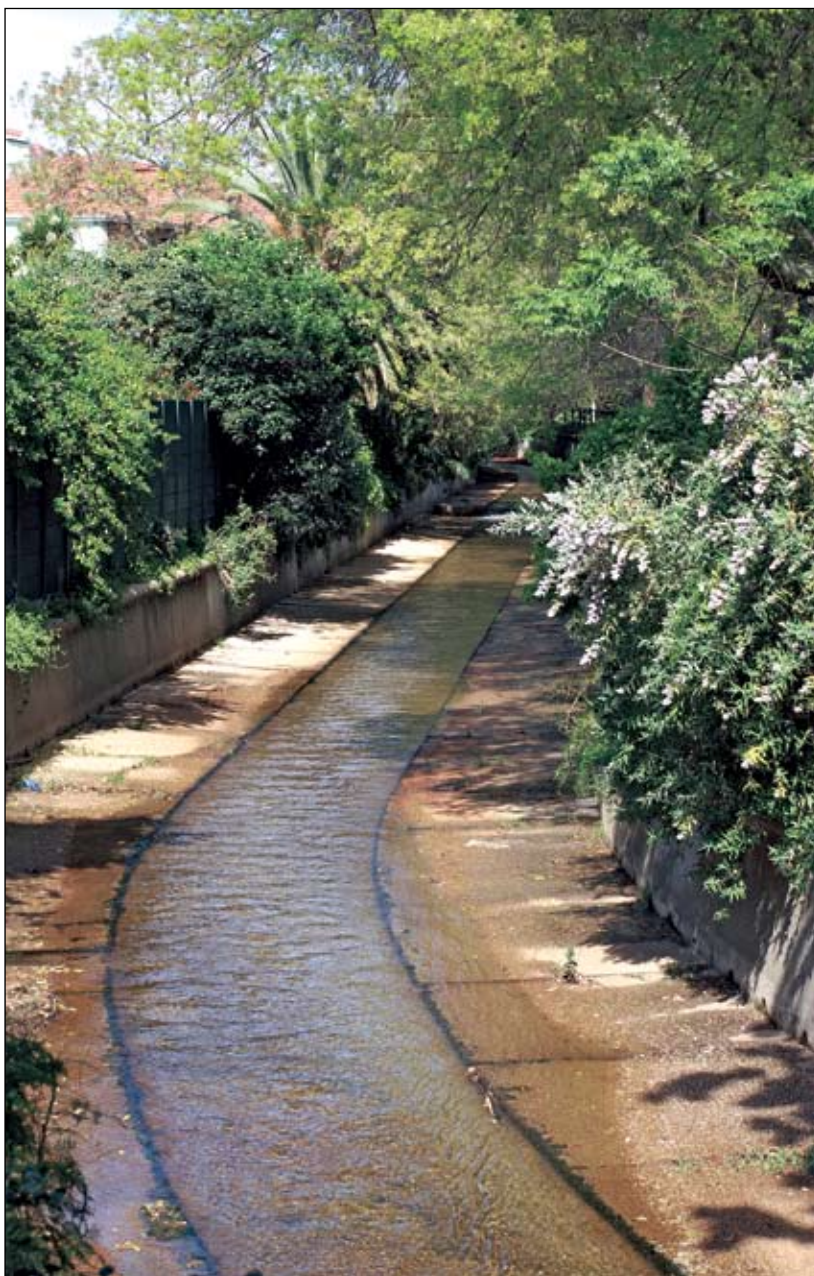
The municipality reports that, since the implementation of the programme, more than R13-million worth of debt has been written off from 28 750 signed up customers. This write-off has been offset by R15,5-million of new income. Furthermore, over 70% of the customers have made regular monthly payments.

Importantly, water consumption savings of up to R270 000 per month have been achieved through improved consumption behaviour and repair of leaks. Water consumption of all debt relief customers has reduced from an average of 0,63 kℓ per day to 0,55 kℓ per day.

Gounden explained why this strategy is considered unique: "While targeting customers in arrears, the programme provides an option that takes into account difficult financial circumstances but, at the same time, brings people who can afford to pay into the net through credit control. Customers who have fallen behind in payment are provided the opportunity to be able to get back into a positive payment cycle and credit rating."

There have been a number of spill-over effects due to the programme, including a dramatic increase in general payment levels and consequently an increase in revenue for the municipality. In addition, eThekweni has become a learning centre for other municipalities who are experiencing low payment levels and consequent financial difficulties. 

Tracing Van Riebeeck's Footsteps



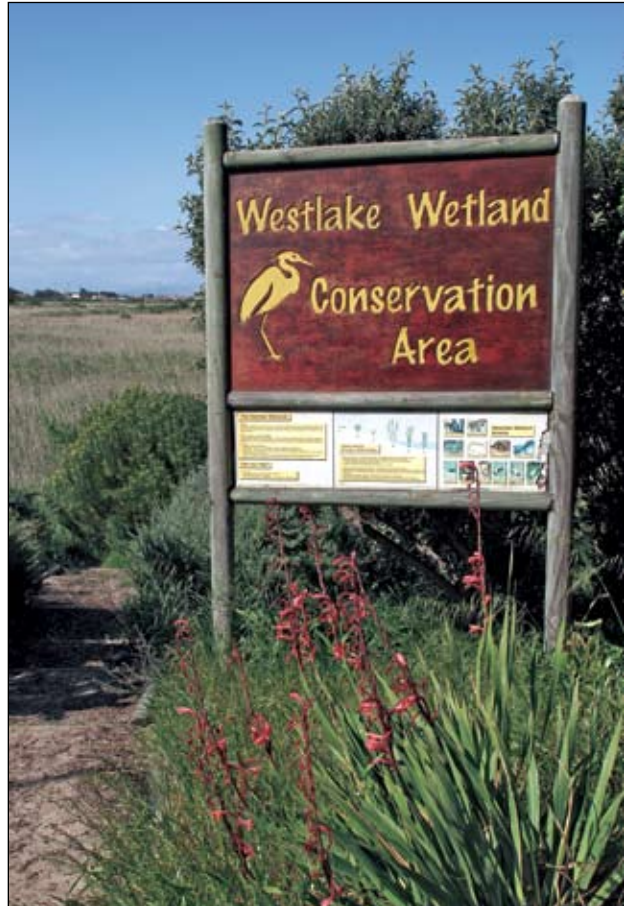
Jan van Riebeeck called the Liesbeek River "the loveliest of fresh rivers" on discovering it on 28 April 1652, and later allocated farmland along its banks to the first free citizens of the Cape settlement. Today some 40% of the river is canalised, but the upper reaches flowing through Bishopscourt are natural havens from the city bustle.

A WRC-funded project on the history of Cape Town's river systems is providing insight that could help guide their future management. Sue Matthews reports.

Some of Cape Town's rivers are in a sorry state, but efforts to rehabilitate them are hampered by the fact that they have been changed so much from their pre-disturbance condition. In the years since Jan van Riebeeck arrived at the Cape, the water in these rivers has been used for drinking, cooking, irrigation, washing and carrying away sewage and other waste, while their courses have been re-directed, excavated, cased in concrete and silted up with eroded sediment.

The Water Research Commission (WRC) funded project into the history of Cape Town's river systems – aimed at using hindsight to guide the management of urban river systems in South Africa – is documenting these human interventions, drawing on a wealth of information in the libraries of the Cape Town City Council, the State Archives and the University of Cape Town. "We are also looking at the inevitable mistakes that have been made, to see what lessons we can learn from them," explains project leader Dr Cate Brown, of Southern Waters.

At the end of the project the findings will be published as a book containing chapters on the 13 major river and vlei catchments in the area. Much of the historical information for these aquatic systems was gleaned from an unpublished account of the



The Westlake wetlands bordering the vlei form part of the Greater Zandvlei Estuary Nature Reserve. A local community group, the Zandvlei Trust, regularly clears invasive alien vegetation from the wetlands, and has planted an indigenous 'pavement garden' on the wetland edge to draw attention to this biodiversity jewel.

history of Cape Town from an engineering perspective, written by Tony Murray, a retired city council engineer. "We were fortunate that Tony was happy to come on board and incorporate his work, which gave us the basis from which to start," says Dr Brown. "We have now completed a draft version of this 'illustrated history' and will be distributing it to the various Friends groups, asking them to share their knowledge and contribute anecdotal information, photos, and so forth."

The penultimate chapter of the book will cover the costs and benefits of management interventions on rivers, the aim being to assess whether these were worthwhile from an economic perspective. The cost-benefit analysis will focus on two or three rivers as case studies, and take

into account values relating to health, harvested resources, recreational use, aesthetic appeal, and ecosystem services such as water storage, water purification and flood attenuation.

“Cape Town’s rivers and wetlands were originally shaped by forces that had nothing to do with humans.”

Of course, Cape Town’s rivers and wetlands were originally shaped by forces that had nothing to do with humans, so the book begins with background information about the area’s geology and geomorphological history, and the effect of long-term climate change and sea

level oscillations, dating back to 250 million years ago. For example, the low-lying Cape Flats would at one time have been covered with numerous inter-connected shallow vleis, which probably dried up during the dry season. But with the last emergence from the sea, changes in topography altered the drainage, and wind-blown sand filled up many of the depressions, isolating the remaining waterbodies. Most of these have since disappeared, sucked dry by the water-thirsty invasive acacias, Port Jackson and Rooikrans – introduced in the mid 1800s to stabilise the Cape Flats’ driftsands – or filled in and built over for urban expansion. Those that remain have been heavily modified.

The earliest inhabitants of the Cape – the San and Khoikhoi people – had little impact on the area’s rivers and

14 Water resources management



The project team and steering committee view the city centre from the slopes of Table Mountain – the source of countless streams and springs – and extraction chambers built in the mid-1800s to exploit springs on the farm Oranjezicht.

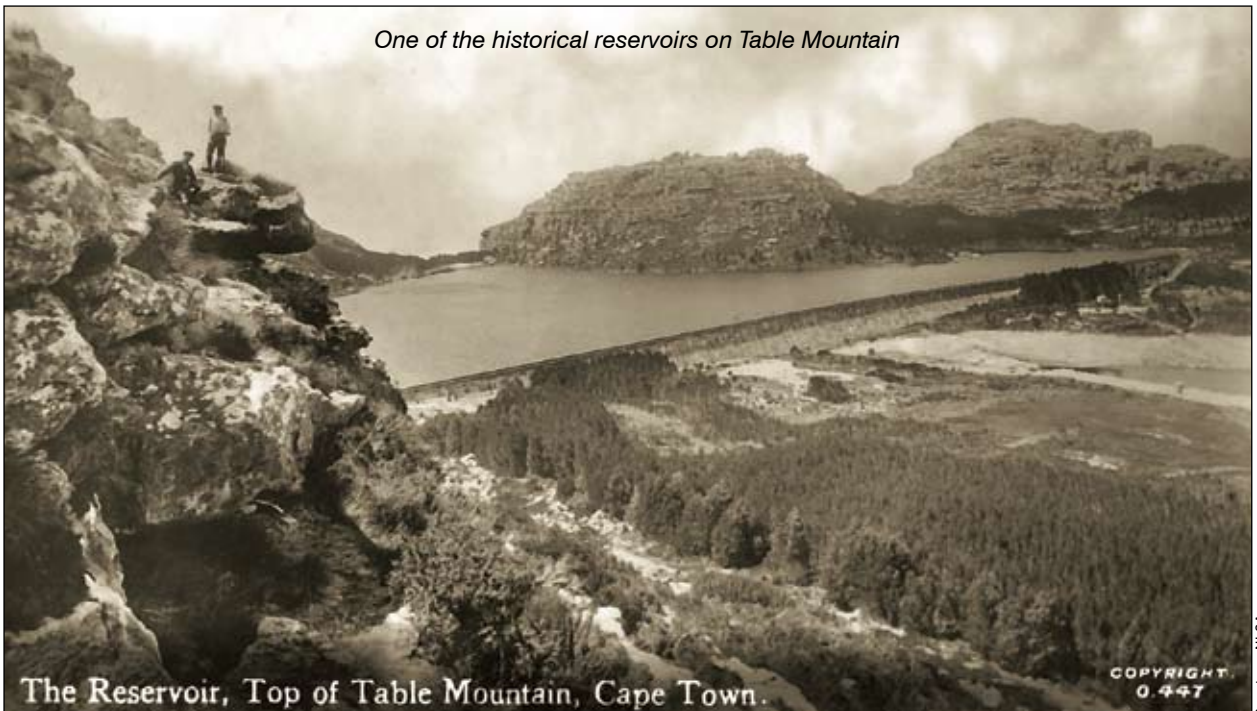


vleis. They lived in harmony with their surroundings, visiting each summer to graze their animals, hunt wild game and harvest edible plants in Table Valley. It was only after Jan van Riebeeck arrived in 1652 to establish a provision station for the Dutch East India Company that the aquatic environment

began suffering at human hands.

The British took permanent occupation in 1806, gaining full control in 1813, when the Cape became a colony of the British Empire. By 1880 sanitation problems, water shortages and flooding from stormwater had reached a dire state. So in 1894

construction commenced on Woodhead reservoir – the first of five dams on Table Mountain – and a viable sewerage system was finally implemented between 1897 and 1903. The first phase of a stormwater scheme was completed by 1899, but had to be amended as land was reclaimed



Courtesy NLSA

for the construction of Duncan Dock and development of the Foreshore.

As the city grew, land-use changes meant that natural fynbos and cultivated fields were replaced by buildings, roads and other hardened surfaces, reducing the ability of soils to absorb rainwater. The resulting increased runoff turned gentle rivers into raging torrents, in some cases causing bank and bed erosion.

The 'engineering solution' was to canalise the rivers to whisk the water away more efficiently. And where the rivers once drained into seasonal wetlands, the lower reaches are today confined in concrete canals or earth channels dug by bulldozers. Due to the flat topography of these areas, though, the gradient is insufficient to generate flows needed to 'flush' the systems of poor quality water, while silt constantly settles out, reducing channel depth and providing a substrate for plants that thrive in these nutrient-enriched environments.

Invasive alien weeds like water hyacinth and parrot's feather now form such dense infestations that they clog the channels and obstruct the flow of stormwater, necessitating annual 'river maintenance' – which is expensive and often ecologically destructive – before the onset of winter rains.

The water quality problems in most of Cape Town's aquatic systems are largely due to polluted stormwater, often contaminated with faecal matter from informal settlements, leaking pipelines and septic tanks, and pump malfunctions. However, five systems – the Black, Mosselbank, Diep, Kuils and Eerste Rivers – receive effluent discharges directly from one or more of the city's 21 wastewater treatment works. In fact, the summer flow in some of these rivers is 100% treated effluent.

While there is growing awareness of the important role river corridors play in linking fragments of remaining habitat, restoration projects are typically done on a site-specific basis



Higher in the catchment, restoration of the Prinskasteel River is being conducted as a Working for Wetlands project. Gabions have been built to arrest erosion that was resulting in loss of wetland habitat.



Zandvlei, on the False Bay coast, has been extensively modified over the last 150 years, particularly with the construction of Marina da Gama during the 1970s. The vlei is a popular recreational site, used for sailing, canoeing, fishing and birdwatching.

– some conducted as mitigation measures for new developments, and others taken on by local community groups keen to make a difference in their own 'back yard'. "We are highlighting the value of these small projects," says Dr Brown. "Individually they might not do much for biodiversity conservation, flood attenuation and water purification, but their collective impact could be significant".

The book concludes with a chapter entitled 'Looking to the future', offering some practical suggestions for improving river and wetland functioning while dealing with the challenges of flooding and waste disposal. A line in its introduction, however, cautions against high expectations: "In a nutshell, much has been done, more needs to be done, and it's easier said than done."





Government has poured millions of Rands into smallholder irrigation schemes in the hope that they will contribute to economic growth, employment and poverty alleviation in rural areas. Yet many of these schemes remain in ruin. Now a new set of Water Research Commission (WRC) guidelines hopes to provide the map to the rocky road of smallholder irrigation scheme recovery.

There are more than 300 smallholder irrigation schemes in South Africa, covering about 50 000 ha. Most of these are located in the former homelands. Despite ongoing annual government investment, many of these schemes have collapsed or remain under-utilised. The reasons for failure are diverse and the debate on possible solutions for the challenges faced by these schemes continues unabated.

As the authors of the WRC Irrigation Revitalisation guidelines, Jonathan Denison and Siyabu Manona, point out, there is no simplified answer. "Hard experience of programmes across the country since 1994 shows clearly that unlocking potential through revitalisation initiatives is far more difficult, time consuming and costly than many professionals and politicians have realised."

Still there is clear and committed political intent to finance irrigation revitalisation initiatives and expansion at national, provincial and municipal levels. Thus the funding of these schemes is likely to continue and even increase.

The WRC guidelines, presented in two volumes, are based on three years of research and document best South African and international practice. They are specifically intended for government decision makers, technical and extension staff, consultants, development practitioners and scheme leadership.

'Volume 1 – The Rough Guide', is a quick reference guide that covers policy implications and revitalisation objectives as well as recommended principles, approaches and methodologies for scheme diagnosis,

participative planning, feasibility evaluation and formulation of farmer support programmes. 'Volume 2 – Concepts and Cases', contains the theoretical rationale for the guidelines.

Four major South African revitalisation initiatives are compared with international initiatives and success factors are identified. Eight farmer support approaches are documented, providing lessons of best practice as well as alternatives for programme design. A number of new approaches are put forward, including a tailored consultative planning approach, a land-leasing strategy for irrigation schemes and the formulation of four basic farming styles to guide planning.

“Comprehensive strategies which consider all the activities that make up the irrigation enterprise are needed for success. These include markets, finance, inputs, infrastructure, institution-building and crop-production information.”

The central theme of the guidelines, according to Denison and Manona, is the critical need to appreciate and address the complexity of these schemes. They note that infrastructure development alone or as a dominant part of an intervention is highly unlikely to succeed. Rather, comprehensive strategies which consider all the activities that make up the irrigation enterprise are needed for success. These include markets, finance, inputs, infrastructure, institution-building and crop-production information.

Major investment in human capital development is critical, say the

authors. “While capacity and skills development is one of the primary areas of engagement in revitalisation, it has rarely been afforded the appropriate funding by decision-makers. It is also a complex and uncertain arena in which to be investing major funding compared with the relatively concise and low-risk engineering and agricultural hardware components.”

It is advised that total project cost in revitalisation relating to the infrastructure component must be no more than 60% of the total project cost. The costs attributed to human capital development (farmer training, institution building, negotiation skills development, marketing, support, mentoring and planning) must be a major budget item amounting to



Comprehensive strategies which consider all the activities that make up the irrigation enterprise, including markets, are needed for success.



Meaningful involvement and information exchange between farmers, plottolders and technical experts are crucial elements of success.



Women are responsible for some 65% of farming activity in the smallholder irrigation sector.

at least 40% of the total budget for success.

Plotholders need to be at the centre of the planning and implementation process which demands substantial two-way information transfer

so that the implications of their decisions can be fully appreciated. Gender-power imbalances must be constructively addressed so as to avoid the exclusion of large numbers of key players (i.e. the women) from the process with subsequent


failure of the interventions. Women are responsible for some 65% of farming activity in the smallholder irrigation sector. Yet most of the decisions in meetings are still made by men.

Challenges regarding land tenure and irrigation holding size are also discussed in the guidelines. It is noted that farmers who work small plots are forced to pursue a number of income and livelihood endeavours of which irrigation may be a small part and therefore with a negative impact on commitment and interest.

The guidelines have set out to achieve what many argue cannot be done and some suggest is a fundamentally flawed concept, i.e. smallholder irrigation in the South African financing, procurement and political context.



The guidelines present alternative pathways to constructive change in schemes, with full appreciation of the complexity and adversity on and between the schemes. They are based on meaningful involvement and information exchange between farmers, ploholders and technical experts, thus ensuring co-constructed plans for land tenure, agricultural, technical, institutional, marketing and financial aspects.

- To obtain *Participatory Revitalisation of Smallholder Irrigation Schemes Volume 1* (Report No TT 308/07) and/ or Volume 2 (Report No TT 309/07), contact Publications at Tel: (012) 330-0340 or E-mail: orders@wrc.org.za 



The WRC research reports argue that smallholder irrigation schemes can be successful.



For smallholder revitalisation to be successful, significant resources need to be poured into human capital development.

Household Wastewater Still a Grey Area



Kathy Edries

The total volume of greywater that is generated on a daily basis in South Africa's non-sewered areas is estimated at just over 500 000 m³.

There remains a noticeable gap between the South Africa government's policy on water provision and the long-term sustainable water management challenges of the country. This is one of the main findings of a new report published by the Water Research Commission (WRC). Lani van Vuuren reports.

The report, which focuses on greywater in non-sewered areas, is based on a two-year investigation undertaken by the Department of Civil Engineering at the University of Cape Town. It states that while authorities' water supply interventions are aimed at improving the health of communities, no attention has been given to the resultant longer-term impacts on environmental health in non-sewered areas (i.e. the proper management of resultant greywater). "At a local government level there is still debate whether grey-

water is a stormwater (drainage) or a sanitation issue. Further, national policies and programmes do very little to promote greywater management in water and sanitation improvements," the authors report.

Government has focused strongly on improving communities' access to basic water and sanitation in recent years. Strict deadlines (all people to have access to basic water supply by 2008 and basic sanitation by 2010) have led to the connection of low-income settlements to municipal water sources on a massive scale.

However, this frequently occurs without giving adequate attention to greywater management in those areas which are non-sewered. According to the WRC report, it is likely that the problems related to the disposal and management of greywater will increase as basic water and sanitation services are attained and improved, and solutions are therefore urgently required to manage these impacts.

POTENTIAL STREAMS OF ILLNESS

At present, there are no definitive health regulations, bylaws or guidelines in place for the use and/or disposal of greywater in non-sewered areas in South Africa. The total volume of greywater that is generated on a daily basis in these areas is estimated at just over 500 000 m³. This amounts to about 185 million m³ a year – equivalent in volume to a medium-sized dam such as Voëlvelei Dam outside Cape Town, or about 50% of the present water demand of that city.

“There is also risk of transmitting waterborne diseases if the greywater has been cross-contaminated with faecal waste. Children are especially at risk as they play in this dirty water.”

According to the WRC report, the quality of greywater in non-sewered areas differs significantly to the greywater that is generated in higher-income, sewerred areas in that there is a greater variation in the concentration of the various pollutants (such as sodium and phosphorus). At its most concentrated, it should be considered hazardous.

In the absence of suitable conveyance systems, people generally dispose of their greywater on to the ground outside their homes. The resulting total pollution load, particularly from densely populated settlements, reportedly has the potential to create a host of environmental and health impacts. This includes the pollution of nearby estuaries, wetlands and streams, mosquito breeding (from ponding of greywater), contamination of drinking water supplies and odours from stagnant water.

There is also risk of transmitting waterborne diseases if the greywater

has been cross-contaminated with faecal waste. Children are especially at risk as they play in this dirty water.

A survey of selected communities in South Africa indicated that dense, non-sewered informal settlements pose the greatest risk to the biophysical environment and to human health. It has been shown that although households in these settlements often consume less water per capita than less densely-settled areas, the disposal of greywater to the ground surrounding the houses leads to ponding and runoff, which is often exacerbated by water leakage at the tapstands.



Greywater disposal down a stormwater manhole.



At its most concentrated, greywater from non-sewered areas should be considered hazardous.

Kathy Eales

This runoff is frequently channelled into the stormwater drains.

In some cases settlements are serviced by stormwater drains and canal systems that channel wastewater directly into water bodies. Such canals are frequently unsightly, unhealthy and contribute to the overall deterioration of the urban environment.

IMPROVING GREYWATER MANAGEMENT

“It is essential that there is systematic management of greywater in non-sewered settlements, both in terms of reducing health risks by eliminating inappropriate disposal and surface ponding, and also to provide benefits in terms of greywater use initiatives,” say the authors of the WRC report. “While it is important that communities are educated and empowered with respect to greywater management it is the responsibility of the local authority concerned to ensure that working systems are in place.”

“While it is important that communities are educated and empowered with respect to greywater management it is the responsibility of the local authority concerned to ensure that working systems are in place.”

Settlement planning is key. The management of greywater should be included in the planning stage for the provision of water services in non-sewered settlements, in collaboration with the affected communities. As the authors of the WRC report point out, a sense of ownership, and therefore



Kelley Eales

Above and below: The disposal of laundry water outside the home is a common occurrence in non-sewered settlements.



A greywater stream in Khayelitsha.

responsibility, is critical for the success of any sanitation system. “Greywater management initiatives are unlikely to be successful unless the recipient communities are involved in the decision-making process, as well as in the implementation and operation of the systems, so as to ensure buy-in and thereby enhance the likely success of service delivery.”

It is possible that greywater could make some contribution to water conservation and to easing the pressure on sources of potable water. Many people interviewed in the non-sewered communities were conscious of potable water scarcity and indicated a willingness to conserve water if the authorities showed them how this could be done.

It is important to note that greywater is generally unfit for use except under controlled conditions. However, greywater can potentially be used in pour-flush toilets, irrigation of gardens, lawns, shrubs and trees, as well as dust control, among others. The jury is still out with regards to the use of greywater for irrigation of food crops, and investigations continue in this matter.

In densely-settled areas where greywater use initiatives are generally not feasible, local authorities should provide greywater disposal systems that either treat the greywater on-site or convey the greywater to a sewerage system. It is vital that the local authorities are committed to the proper operation and maintenance of these systems.

Following up on this project, the UCT Department of Civil Engineering is conducting further research into sustainable options for community level management of greywater.

- To order the report, WRC Report No 1524/1/07, contact Publications at Tel: (012) 330-0340 or E-mail: orders@wrc.org.za



Signing a Shot in the Arm for Skills Training

The signing of an education & training agreement between the Department of Water Affairs & Forestry (DWAf) and the United Nations Educational, Scientific and Cultural Organisation (UNESCO) promises to go a long way towards building much needed capacity in the South African water sector. Lani van Vuuren reports.

Phase II of the Framework for Education and Training in Water (FETWater) came into being earlier this year. FETWater is a programme for effective cooperation in research, education, training and capacity building initiatives to achieve integrated water resources management (IWRM) in South Africa. It provides institutional support and financing in the form of seed funding to encourage the creation of training networks as a method for co-operation between universities, research institutions, as well as public and private sectors in the country.

The programme was first established in 2002 as a response to a 1998 study by DWAf, UNESCO and the World Meteorological Organisation which revealed a marked lack of human resources and competencies in the local water sector. This deficiency not only jeopardises the implementation of the National Water Act, but also hampers the country's ability to conform with, and take advantage of, global trends in IWRM.

In her speech, read by former DWAf DG Jabu Sindane, Minister of Water Affairs & Forestry Lindiwe Hendricks said that The FETWater programme was one of the avenues explored by her department to alleviate some of the capacity constraints plaguing not



UNESCO representative Dr Claudia Harvey and Water Affairs Minister Lindiwe Hendricks at the signing of Phase II of the FETWater programme.

only government departments but the private sector as well. She added that DWAf had also been engaging with selected institutions for higher learning. Partnerships had been established with eight universities which were currently administering bursaries to students studying in engineering, science and technical fields.

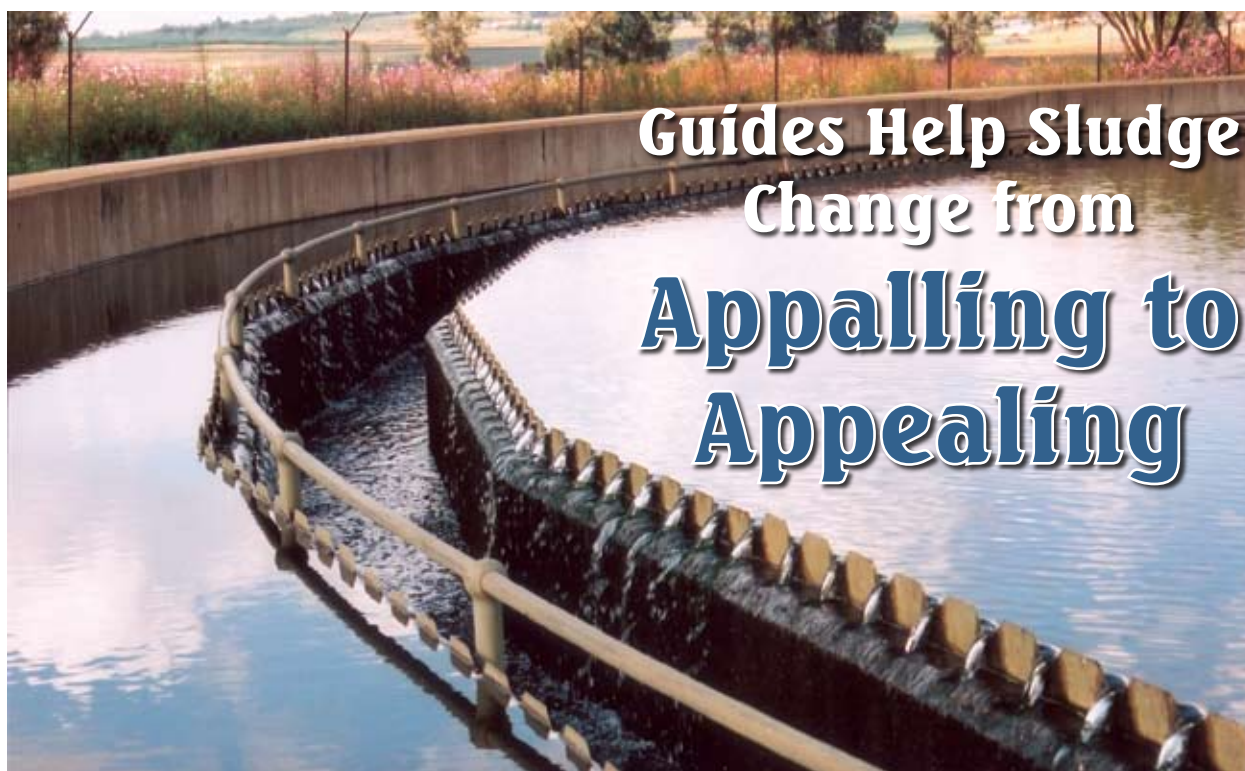
The signing of the latest FETWater agreement follows on the successful implementation of the first phase, which saw the establishment of six networks focusing on themes such as resource directed measures, groundwater, the beneficial use of water, and expertise development in catchment management. While FETWater provides financial and structural support, these networks identify particular needs in their field of expertise and develop specialised content

for training courses that build the capacities of students, practitioners, water management professionals and industry stakeholders.

To date about 400 professionals and students have received training through the programme. The programme is funded jointly by the Flemish government, UNESCO, DWAf and the Water Research Commission (WRC). The WRC is also the local implementing agent for the programme.

Signing the agreement on behalf of UNESCO, Dr Claudia Harvey, Director: UNESCO office in Windhoek, said that the study of water resources and their optimum management were vital for the well-being of people in any country, as water constitutes a basic need. "Other than its potable use, its application in agriculture, energy generation, sanitation and environmental sustainability make it more expensive in many parts of the world than gasoline."

"Trained professionals contribute to water resources management which, in turn, allow ordinary citizens to use their resources in a sustainable manner," she continued. "We hope FETWater Phase II will surpass the accomplishments of the first phase."



Guides Help Sludge Change from Appalling to Appealing

The sustainable management of sewage sludge is a critical element of the wastewater treatment process. While improper management can lead to health and environmental risks, good management practices can see sludge being reused for the benefit of municipalities and the communities they serve. Lani van Vuuren reports.

Sludge, the solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works, is mostly still seen as a waste product in South Africa. There is still little beneficiation taking place outside the large metropolitan centres, despite international trends to the contrary. However, adequately treated, good quality sludge, if managed properly, can be reused without harming the public or the environment.

In 2003, the Water Research Commission (WRC) and the Department of Water Affairs & Forestry (DWAF) launched a joint initiative to develop a series of guidelines dealing with all wastewater sludge management practices. Compiled following a comprehensive stakeholder consultation

process, the guidelines are aligned with updated South African laws and regulations pertaining to the environment, waste and water. Moreover, the guidelines support the principles of sustainable use of resources and are in line with international trends and practices.

Each sludge management option is being developed as a separate guideline document. This simplifies the guidelines for users (including regulatory authorities, managers, practitioners and operators), as each document focuses on the management, technical and legislative aspects associated with a particular option. Volume 1 focuses on selecting the appropriate management options for the sludge streams generated by a specific wastewater treatment plant.

CLASSIFICATION PROCESS

Among others, this volume guides the user through the sludge classification process, a crucial step before any management option can be selected, explains WRC research manager Dr Heidi Snyman. "The better the quality of the sludge, the more management options are available. Certain types of sludge bring with it certain restrictions, for example, sludge with a high microbiological and metals content may not be used in agricultural applications." Once a suitable management option has been selected, the user is referred to the relevant volume that deals with the selected management option.

For wastewater treatment plants that have sludge of a good enough quality to be used for the production

of crops, Volume 2 deals with the requirements for agricultural application. This volume may also be used to manage compost containing sludge that is not distributed to the general public for use.

The potential benefits of the nutrients (nitrogen, potassium and phosphorus) as well as the high organic carbon content of sludge have been well demonstrated. Sludge can also assist in increasing the organic content of the soil.

It is believed that subsistence and small-scale farmers can particularly benefit from the agricultural use of sludge, since the farmer will benefit financially due to savings on commercial inorganic fertilizers. However, as with the widespread use of inorganic fertilizers or organically rich products, such as manures, potential negative effects on environmental resources need to be managed. These issues are all addressed in the second volume.

SAFE DISPOSAL

While beneficial use is encouraged, it is recognised that not all sludge generated can be used safely. For this reason, guidelines have also been developed for the on-site and off-site disposal of sludge (Volume 3). Dr Snyman points out that sludge that cannot be used beneficially is

regarded as waste and should be managed as such. "As with waste disposal in general, the negative effects on environmental resources need to be managed. Therefore sludge disposal must be controlled effectively and monitored for the protection of human and animal health, water resources and overall land quality."

Volume 4 deals with requirements for the beneficial use of sludge at high loading rates. These include using sludge in the rehabilitation of mine tailings, as landfill cover, and for industrial agriculture (such as growing cotton or lawn cultivation). There are also opportunities for once-off applications, such as the development of new golf courses, or the establishment of vineyards and fruit orchards.

COMMERCIAL PRODUCTS

Lastly, Volume 5 deals with the requirements for thermal sludge management practices and for commercial products containing sludge. Incineration is a costly process, however, even when sludge is incinerated the resultant ash can at times be used beneficially to offset some of the costs. These include products such as bricks and artificial rock and pumice.


Many innovative product applications have emerged internationally, for example, in some Asian countries

sludge-derived artificial marble is being used to create tombstones. While it is recognised that many of these applications are not financially viable in South Africa, the last volume does provide guidance on how to implement such a process in the local legislative environment.

Volumes 1 and 2 are already available, while Volume 3 was being finalised at the time of writing. The stakeholder consultation process for Volumes 4 and 5 have been completed, and these guidelines should become available early next year. In the interest of transparency, the scientific basis, assumptions and thought processes were also documented as separate documents that are available from the WRC.

There has been an overwhelmingly positive response to the guideline development process, illustrating a clear need for such a series, reports Dr Snyman. The latest round of workshops, which included training on the first three volumes and stakeholder consultation on remaining two volumes, attracted double the expected numbers. The workshops were hosted by DWAF and the WRC in association with the Water Institute of Southern Africa's Anaerobic and Sludge Processes Division.

These workshops also identified other requirements within the wastewater sector, including the need for guidelines on the management of on-site sanitation sludge as well as sludge from drinking water treatment processes. Investigations into the latter have already started under a new research project funded by the WRC.

- To order *Volume 1, Selection of Management Options* (WRC Report No TT 261/06) or *Volume 2, Requirements for the Agricultural Use of Wastewater Sludge* (WRC Report No TT 262/06), contact Publications at Tel: (012) 330-0340 or E-mail: orders@wrc.org.za 



In some of South Africa's metropolitan centres sludge is being dried and reworked into compost for the agricultural sector.

New Tools to Assess Health Impacts of Taps & Toilets



Novel measures, such as determining the effect of carrying water on the physical body structures of children and young women are being included in the new water and sanitation toolkit.

Kelley Eaters

Authorities have spent millions of Rands on improving access to safe water and sanitation in communities during the last decade. But how do we measure the improvements in the lives of the people these interventions are meant to serve? A three-year Water Research Commission (WRC) project aims to quantify just that. Lani van Vuuren reports.

The Department of Water Affairs & Forestry remains positive that South Africa will eradicate its water supply backlog by 2008 and the general sanitation backlog by 2010. An estimated 14% of South Africa's population still makes use of unsafe water resources, while 27% of the country's people still do not have access to adequate sanitation.

However, to date there has been no real way in which to measure how much of a positive impact these water and sanitation interventions are making on affected communities. "There is an urgent need to

find plausible measures to quantify the benefits of water, sanitation and hygiene supply interventions, not only locally, but internationally," notes WRC Director: Water Use and Waste Management Jay Bhagwan.

Reviews of international burden of disease analyses suggest that disease could significantly be prevented through better access to safe water supply, adequate sanitation and better hygiene practices. International organisations, such as the World Health Organisation, have undertaken initiatives to provide generic methodologies to quantify the

benefits of improved water, sanitation and hygiene services. However, these methodologies, because of their generic nature, are usually based on wide ranges of assumptions that may or may not have been tested at country levels elsewhere, or in South Africa.

It is for this reason that the WRC commissioned research into the development of a set of instruments or tools to estimate the benefits of interventions related to water supply and sanitation. The University of Johannesburg's Water and Health Research Unit is leading the research project.

It is hoped that by March 2009, the team will have developed a toolkit for the South African water and health sectors which can be used to quantify health, economic, social, environmental, technical and health aspects of water supply and sanitation. It is expected that the proposed toolkit will especially assist policy makers to determine which interventions have the most economic and social value.

Water and Health Research Unit head Prof Paul Jagals explains the need to calculate the benefits of water and sanitation interventions. "It is assumed that improved water and sanitation will result in benefits for communities. But it is an assumption for which we are still trying to understand the true meaning in the real-time situation. For instance, what does 'improved' really mean when we talk about improved access? We find many situations where the initial improvement has been diluted by factors such as population growth and water and/or sanitation system degradations."

The research team is investigating the use of both conventional approaches, such as the occurrence of pathogenic microbes as well as some novel measures. The latter includes determining the effect of


carrying water on the physical body structures of children and young women. Subtle indications in data from the work currently being done by the research team suggest that this may be a hugely underestimated aspect of water toil related to poor access. "The research team is being led in its search for the right measurement tools by problems expressed by South African communities themselves in focus groups, the experience of the researchers as well as what is reported elsewhere in the world," explains Prof Jagals.

He goes on to say that the greatest challenge of this project is understanding how the multi-variable data sets in the toolkit will be informing each other to come up with the required answer. At present the project is focusing on rural areas and pilot studies are being undertaken to develop and test new impact measuring tools.

It is believed that even if clear benefits can be demonstrated at the time of assessment, it remains a question whether such benefits are sustainable, and what the costs would be to keep it sustainable. It is also important therefore that sustainability measurement

"It is assumed that improved water and sanitation will result in benefits for communities. But it is an assumption for which we are still trying to understand the true meaning in the real-time situation."

features strongly in the development of the measurement tools.

Another major feature to be considered in this development is that the toolkit should be capable of serving a dual purpose of measuring impact of present and past services as well as predicting sustainability (need, maintenance, upgrading) for present and future systems. This should then enable authorities to use the toolkit to measure the impact of present and past interventions and, where needed predict future sustainable interventions. 



It is expected that the proposed toolkit will especially assist policy makers to determine which water and sanitation interventions have the most economic and social value.



Sanitation – Weapon Against Death and Disease

Whether it is called a toilet, latrine, porcelain throne, john, water closet or the loo, speaking of sanitation tends to make people uncomfortable. Yet, the humble toilet is one of the most important defences against disease and death.



Courtesy of CSIR

Alternative sanitation, such as urine diversion toilets, are gaining ground in South Africa.

Why is sanitation important? Sanitation, defined as any system that safely manages human excreta, has a major impact on the health and dignity of people. Around the world, an estimated 2,6 billion (mostly poor) people, including 980 million children, lack access to proper sanitation facilities. This means they are forced to defecate in bags, buckets, fields, or roadside ditches, causing serious health risks to them and others.

Poor sanitation promotes the spread of health problems – including chronic diarrhoea, intestinal worms, bilharzia, hepatitis, and scabies. In fact, diarrhoea remains the number one killer of young children around the world. It is estimated that improved sanitation facilities could reduce diarrhoea-related morbidity in young children by more than a third. If hygiene promotion is added, such as proper hand washing, it could be reduced by two thirds.

Bad sanitation facilities pollute the environment and threaten drinking water facilities. It also threatens social and economic development as people have to stay home from school and work because of illness.

So important are toilets considered to our health that the *British Medical Journal*, following a global survey, has hailed sanitation as the greatest medical advance of the last 150 years.

Today, there is an international movement to address the lack of sanitation. This movement is largely spurred on by the United Nations General Assembly who in adopting the *Millennium Development Goals* in 2000 agreed to halve the global backlog in sanitation and water by 2015.

USEFUL WEBSITES

- www.dwaf.gov.za
- http://en.wikipedia.org/wiki/Flush_toilet
- <http://en.wikipedia.org/wiki/Sanitation>
- <http://home.howstuffworks.com/toilet.htm>
- www.mieliestronk.com/troon.html
- www.victoriancrapper.com
- www.who.int/water_sanitation_health/publications/factsfigures04/en/
- www.worldtoilet.org

SANITATION IN SOUTH AFRICA

South Africa supports these goals, and the government has taken up the challenge to wipe out the water and sanitation backlog in this country. It has set itself even more stringent targets, aiming to ensure that all buckets in formal settlements are eradicated by December 2007, all clinics have safe and adequate water and sanitation by December 2007, and that all households have access to basic sanitation by 2010.

The latter will be no mean feat as an estimated 15 million people still don't have access to acceptable toilet infrastructure in South Africa. The country is making steady progress, however. Last year, an additional 250 000 households received access to basic sanitation.

Improved sanitation does not necessarily have to mean a flush toilet. Full water-borne sanitation is extremely expensive to implement as well as operate and maintain. These systems also use a lot of water. There are

FLUSH TOILETS IN HISTORY

- **26th century BC:** Flush toilets were first used in the Indus Valley Civilisation, in India. The ancient cities of Harappa and Mohenjo-daro had a flush toilet in almost every house, attached to a sophisticated sewerage system.
- **15th century BC:** Flush toilets were found in the remains of the Minoan city of Akrotiri.
- **1596:** Sir John Harrington is said to have invented 'the Ajax', a flush toilet, for Elizabeth I of England.
- **1738:** A valve-type flush toilet is invented by JF Brondel.
- **1775:** Alexander Cummings invents the S-trap, still used today. It uses standing water to seal the outlet of the bowl, preventing the escape of foul air from the sewer.
- **1824:** The first public toilet appears in Paris, France.
- **1859:** Queen Victoria's toilet is decorated with gold.

many alternative forms of sanitation which are gaining popularity around the world, for example, urine diversion (UD) systems.

In UD systems, waste is deposited in a chamber and dry material (usually sand or ash) is added after each use to deodorise decomposing faeces while controlling moisture and facilitating biological breakdown (composting). Urine is diverted through a

specially adapted pedestal. In South Africa, most of the urine is led to a soakaway pit, but it can be tapped and used as a fertilizer in home gardens.

Other sanitation options include ventilated improved pits (VIPs – the most popular basic sanitation applied in South Africa), pour-flush toilets, aquaprivies, conservancy tanks, septic tanks or shallow sewers.



DID YOU KNOW?

World Toilet Day is celebrated on 19 November

Far left: An aqua privy is another form of sanitation.

Left: The government hopes to eradicate the backlog of those people who still have to use bucket toilets by the end of this year.

Kally Estes

Exhibition Attracts Big Business

The First Sustain exhibition, organised by Exhibitions for Africa, was held at the Sandton Convention Centre in August. The business-orientated exhibition, which incorporated Afriwater, presented an overview of business

solutions and scientifically-based technologies for the water and energy markets, among others. Various water management, treatment and assessment systems and programmes were demonstrated. Among the exhibitors were the

CSIR, Department of Water Affairs & Forestry, Department of Science & Technology, ERWAT, Eskom, Rand Water, Sedibeng Water, and TCTA, the Water Institute of Southern Africa and the Water Research Commission to name a few.



The TECHNEAU Project and Consortium

In both industrialised and developing countries, there is a growing concern about the ability of traditional drinking water supply systems and existing technologies to cope with present and future demands and threats.

To face these challenges, the TECHNEAU project was started in January 2006 for a five-year period. The broad goal of TECHNEAU is to analyse the present water situation in different regions of the world and to rethink current water supply options.

Targeting stakeholders from the whole drinking water sector including water utilities, water authorities, research institutes, water technology suppliers and NGOs, TECHNEAU will provide new and improved technologies, monitoring tools and management practices for the whole water supply chain.

The TECHNEAU consortium consists of:

Universities

Riga Technical University (LV), NTNU (N), UNESCO-IHE (NL), University of Surrey (UK), RWTH Aachen (D), Chalmers University of Technology (S), TU Delft (NL), FU Berlin (D), Indian Institute of Technology Delhi (IND IIT)

Research and Technology Institutes

Kiwa Water Research (NL), SINTEF (N), KWB (D), EAWAG (CH), TZW (D), WRc (UK), LNEC (P), Water Research Commission (RSA), Anjou Recherche Veolia (FR), Institute of Freshwater Ecology and Inland Fisheries/ Forschungverbund Berlin e.V. (D), Mekorot (IL), Chris Swartz Water Utilisation Engineers (RSA), National Institute of Public Health (CZ)

Technology providers / SME

EUCETSA (B), BDS (NL), ALPHA M.O.S. (FR), S::can (A), Aqualyng (N), Opalium (FR), bbe Moldaenke (D), Vermicon (D)

Contact for general information on TECHNEAU

Dr. Theo van den Hoven: theo.van.den.hoven@kiwa.nl
 Ronald Wielinga: ronald.wielinga@kiwa.nl
 Project website: www.techneau.eu

The Regional Technology Platforms

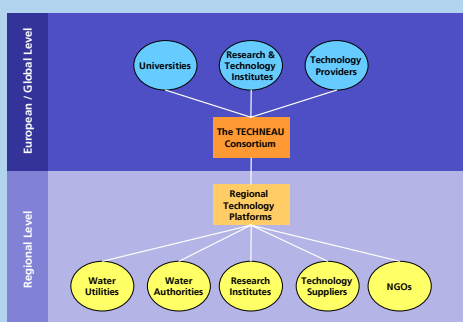
TECHNEAU results are to be shared at Regional Technology Platforms (RTPs), which are one-day workshops that focus on consultation of regional water experts and stakeholders.

RTPs will enable intensive information exchange through personal contacts and dissemination of knowledge between the project team, operators, researchers, regulators and technology suppliers on a regional level.

The third RTP will take place in Cape Town and will highlight the water situation in Southern Africa. It will be supported by the European Commission, Water Research Commission (RSA) and Swartz Water Utilisation Engineers (RSA).

A wide range of national and international speakers will cover the following topics:

- Future challenges in water supply
- Treatment technologies
- Monitoring and control technologies for safeguarding the drinking water quality
- Risk assessment and management
- Regional challenges in assuring the drinking water supply in Southern Africa



Technology for safe drinking water in Southern Africa

3rd Regional Technology Platform
 Cape Town,
 November 29th, 2007



Contract-No. 018320



www.techneau.eu

THE RECLAIM WATER PROJECT AND CONSORTIUM

Water scarcity and water stress endanger the water resources in both industrialised and developing countries. Water reclamation and reuse are major options to cope with these growing problems. Artificial groundwater recharge can be one of the most promising approaches but requires the highest raw water quality.

To face these challenges, the RECLAIM WATER project was started in October 2005 for a three years period. The objectives of RECLAIM WATER are

- New and improved water reclamation and reuse technologies and optimized operational concepts
- Knowledge about the fate and removal mechanisms of emerging contaminants and pathogens in water reclamation systems for groundwater recharge based on new analytical methods
- Integrated technological hazard mitigation concepts investigated in case studies with focus on artificial aquifer recharge
- Knowledge, concepts and models of natural processes occurring in subsurface systems, when the reclaimed water is used for artificial recharge

The RECLAIM WATER consortium consists of:

Universities

RWTH Aachen University (D), TU Berlin (D), Cranfield University (UK), University of Barcelona (E), UNESCO-IHE Delft (NL), Tsinghua University, Beijing (CN), UNAM Autonomous University of Mexico (MEX), National University of Singapore (SIN)

Research and Technology Institutes

IRSA CNR (I), EAWAG (CH), DHI Water & Environment (DK), Mekorot (IL), BFG - German Federal Institute of Hydrology (D), Bureau de Recherches Géologiques et Minières (F), United Water & CSIRO (AUS), CSIR Council for Scientific and Industrial Research (RSA), Public Utilities Board (SIN)

Technology providers / SME

IEI - Institute for Ecological Engineering (SI), Aquafin NV (B)

Contact for general information on RECLAIM WATER

Dr. Thomas Wintgens: wintgens@ivt.rwth-aachen.de
 Christian Kazner: kazner@ivt.rwth-aachen.de
 Project-website: www.reclaim-water.org

THE RECLAIM WATER REGIONAL WORKSHOPS

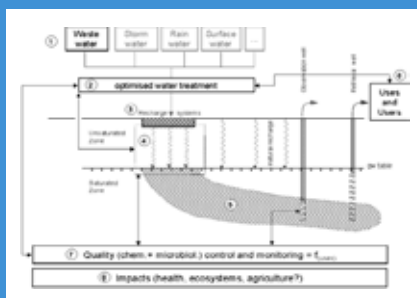
RECLAIM WATER results are to be shared at Regional Workshops, which are one-day events that focus on consultation of regional water experts and stakeholders.

These meetings will enable intensive information exchange through personal contacts and dissemination of knowledge between the project team, operators, researchers, regulators and technology suppliers on a regional level.

The first regional workshop will take place in Cape Town and will focus on water reclamation and reuse in Southern Africa. It will be supported by the European Commission and the Council for Scientific and Industrial Research (RSA).

A wide range of national and international speakers will cover the following topics:

- Current situation and trends in water reclamation and reuse
- Treatment technologies
- Risk assessment and management
- Geohydrology
- Regional examples and case studies in Southern Africa



Water Reclamation and Reuse Technologies in Southern Africa

1st Regional Workshop
 Cape Town
 November 30th, 2007



Reclaim Water is a Specific Targeted Research Project funded by the European Commission under the Sixth Framework Programme contributing to the implementation of the Thematic Priority "Global Change and Ecosystems"

Contract-No. 018309



www.reclaim-water.org

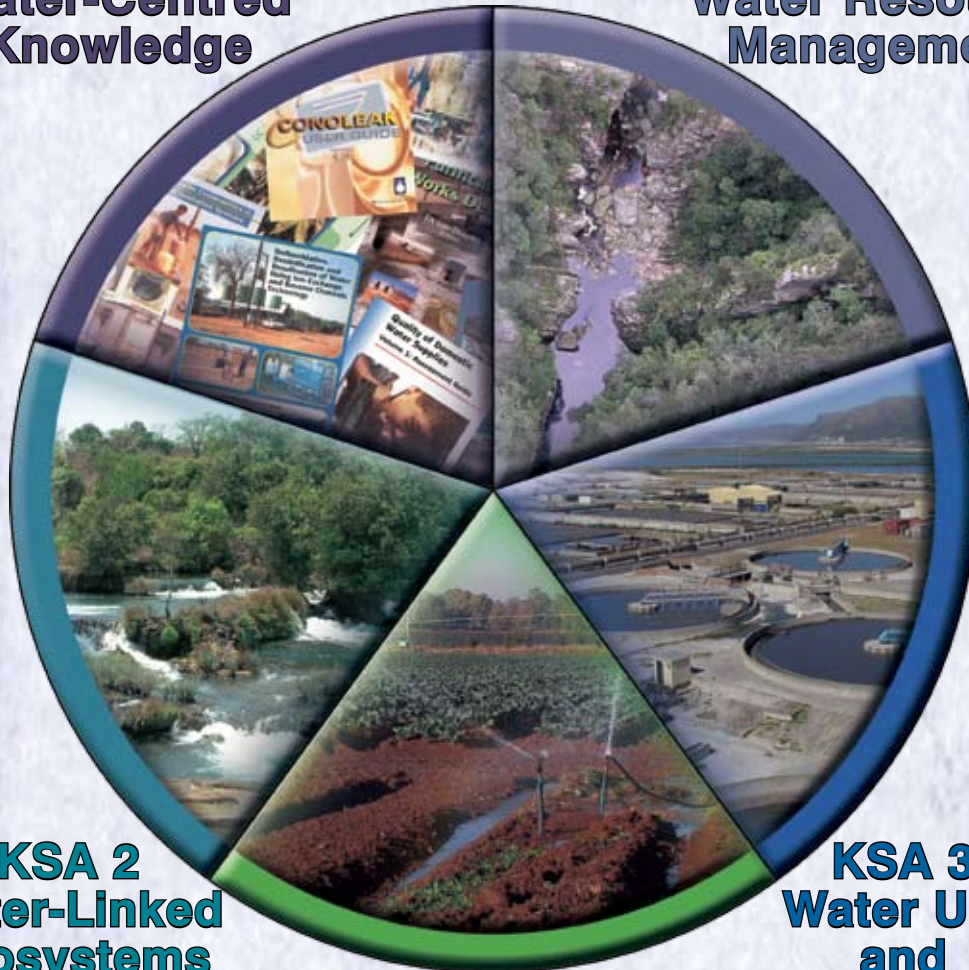


Water Research Commission

Invests in the creation, dissemination and application of knowledge in five Key Strategic Areas (KSAs)

KSA 5 Water-Centred Knowledge

KSA 1 Water Resource Management



KSA 2 Water-Linked Ecosystems

KSA 4 Water Utilisation in Agriculture

KSA 3 Water Use and Waste Management

SOUTH AFRICA'S WATER KNOWLEDGE HUB

Tel +27(0)12 330-0340; fax +27(0)12 331-2565; website www.wrc.org.za

