Award for Rivers Programme

In celebration of their CSIR Environmentek Knowledge Management Award, members of the State-of-the-Rivers (SoR) reporting team recently staged a two-day learning and knowledge sharing event for their clients and partner organisations.

During the two days, participants experienced typical biomonitoring surveys while contributing to lively debates. Guided by experts, those partners who are usually only involved in the theoretical aspects of river health got first-hand experience of a typical river health assessment.

A mini-seminar on the second day covered various SoR related topics, including capacity building within provinces; institutional and financial responsibilities; and the inclusion of wetlands, estuaries and groundwater as part of aquatic ecosystem health monitoring.

Participants included representatives from the Departments of Water Affairs & Forestry and Environmental Affairs & Tourism, Water Research Commission, provincial River Health Programme champions, the Western Cape SoR team and the CSIR SoR reporting team.

The SoR reporting team was also a finalist of the 2005 CSIR Annual Award for Best Team Contribution.

Global Review

- The US Army is conducting an experiment that could convert the exhaust pipes of military vehicles into water fountains. The technology, developed for the space programme, involves a complex system built into a vehicle's truck bed which can recover water from engine exhaust fumes, purifying as much as half the liquid volume from a tank of fuel.
- The first phase of the Africa Stockpiles Programme, aimed at eliminating the stockpiles of obsolete pesticides on the continent, has been approved by the World Bank, the Global Environment Facility and the United Nations Food and Agriculture Organisation. It is reported that virtually every country in Africa has stockpiles of obsolete pesticides that have accumulated over the past several decades. Many of these chemicals and their containers are in poor condition, threatening local and regional environments and human health through contamination of soil, water, air and food.

- Each year as the Amazon River floods, it makes a large portion of South America sink several centimetres before rising again once the flood has cleared, according to research published in *Geophysical Research Letters*. It is reportedly the first time anyone has recorded the movement of a landmass in response to river flow. The researchers believe their finding could help calculate the amount of freshwater on Earth.
- Chinese researchers have reportedly genetically modified a species of algae to remove toxic heavy metals such as mercury from water. A rate gene was inserted into the algae to make it produce metallothionein, a protein produced in the livers of people and other mammals that binds easily to heavy metals. The algae is pasted on to a nylon membrane, which is then lowered into polluted water. After absorbing the heavy metals, the algae-covered membranes are taken out of the water and the heavy metals extracted in a laboratory.

Water Quality Doyenne Wins Prize

Dr Jo Barnes of the Department of Community Health of the University of Stellenbosch has won the Cape Times/Caltex Environment Award 2005 for a contribution to environmental concerns.

She was given the award in recognition of her research contribution over the past eight years regarding the extent of pollution in the rivers in the Boland due to untreated sewage contamination.

Water Diary

WATER QUALITY
FEBRUARY 6-10
An Introduction to Managing Environmental Water Quality Course will be held in Pretoria. Presented by the Unilever Centre for Environmental Water Quality, Rhodes University' Institute for Water Research and DWAF, the course will focus on managing environmental water quality using toxicology, biomonitoring and chemicals monitoring. Enquiries: E-mail: course@iwr.ru.ac.za; Web: www.ru.ac.za/institutes/ucewq.html

WATER & SANITATION SUPPLY
FEBRUARY 13-16
The 13th African Water Association Congress will take place in Algiers, Algeria. The theme of the congress is 'Water and Sanitation: What Strategies to Meet the Challenges of the Millennium?'. Enquiries: Tel: +21321 79 1763; Fax: +21321 79 0047; E-mail: contact@integralconseil.net; Web: www.uade.org

WATER & ENVIRONMENT
FEBRUARY 20-22
EnviroWater, to be held in Stellenbosch, will focus on protection of water resources, production and treatment of drinking water, wastewater treatment, and water business management, among others. Enquiries: Elsbeth Verhoeven-Lutsch, Tel: (021) 887-4113, E-mail: verhoeven@enviroWater.de; Web: www.enviroWater.de

Workshop on Low-Cost Sanitation

The Water Research Commission in association with the Water Information Network with support from the Department of Water Affairs & Forestry is hosting a specialist course on low-cost sanitation.

The two-day course, to be presented by Prof Duncan Mara of Leeds University, in the UK, is aimed at municipal water services managers, technologists, planners and decision makers, and will cover an in-depth technical introduction to sanitation technologies and international experiences, their opportunities and impacts, the linkages with diseases, health and the environment, and an introduction to a strategies approach to sanitation planning and technology choice.

According to the organisers, the course is in answer to the inadequate professional courses offered in South Africa on sanitation technology, planning and choice. "This gap reflects the present status and approaches as to who sanitation is being implemented in the country."

The course will be held at four venues around the country: Pretoria (23-24 January); Cape Town (26-27 January); East London (30 and 31 January); and Durban (2 and 3 February). For more information, e-mail Mmule Majole at win-sa@wrc.org.za or Sandra Fritz at sandraf@wrc.org.za

Company Briefs

- **Johannesburg Water** has teamed up with the Johannesburg Metro Police Department to crack down on people and businesses breaking the City's water bylaws. Metro police officers received two months' training in various laws relating to water services and enforcing specific by-laws. Transgressors can be arrested, and face a minimum jail sentence of five years or a fine of up to R1 500.
- **Grundfos South Africa** has acquired local borehole pump manufacturer Brisan Turbo. While Grundfos develops and manufactures pumps for the water supply market, Brisan specialises in the agricultural and domestic borehole sector. Commenting on the acquisition, Grundfos South Africa GM Mitch Holmes said: "Having been in existence for well over 20 years, Brisan Turbo has a wealth of experience in the borehole pump market. Their firmly established national distribution will further help Grundfos establish itself in regions where it did not normally operate."
- **GTZ** has signed a €2,5-million deal with the Southern African Development Community for the regional harmonisation of water sector-related national policy, legislation and management strategies. The German firm will supply expertise on transboundary water management.
- **The Institution of Municipal Engineering of Southern Africa** (IMESA) will for the first time host its annual conference in Soweto this year. It is reported that the township, one of the largest in the country, has come a long way in the last 15 years in terms of infrastructure and development. The theme for this year's conference will be "Knowledge for Action".
- **Webster Ndodana** has become the first black president of the South African Association of Consulting Engineers (SAACE). He takes up the role at a time when the construction sector is in the midst of major transformation. Hailing from the Eastern Cape Ndodana owns his own consulting engineering practice.

Water by Numbers

- **82%** – The number of Americans that wash their hands after going to the bathroom, according to a recent study. Harris Interactive, who conducted the research, found that more women (90%) wash their hands compared with only 75% of men.
- **R600-million** – The capital set aside by Johannesburg Water in the current financial year to upgrade and refurbish water and sewerage infrastructure.
- **465** – The number of students supported by Water Research Commission funded research in 2004/05. About 60% were from historically disadvantaged backgrounds.
- **US$30-million** – The grant presented to Malawi by the World Bank to support emergency recovery activities in the country, which is experiencing its worst food crisis owed to drought since 1994. An estimated 4,2 million or 34% of the population will not be able to meet their minimum food requirements from now until the next harvest, according to UNICEF.
- **8,44 t** – The greenhouse gas carbon dioxide generated per person each year in South Africa. The US generates 16 t per person per annum.
- **900 000 ℓ** – The capacity of the new reservoir constructed in Dwarsloop township, near Bushbuckridge in Limpopo.
- **US$50-billion** – The additional funding for development aid agreed upon by world leaders at the recent World Summit in New York to fight poverty.
- **R1-billion** – The funds to be set aside by Rand Water over the next five years to upgrade its distribution infrastructure. The objective of the renovation programme, which includes an additional R70-billion to investigate the conditions of the utility's 3 800 km pipelines, is to ensure security of water supply amid growth in the economy and population.
- **650 000** – The number of households in the Eastern Cape without basic sanitation facilities, according to Eastern Cape deputy director of environmental health, David Bezani.

Groundwater Not Above the Law

FAO and UNESCO have jointly launched a publication entitled *Groundwater in International Law: Compilation of Treaties and Other Legal Instruments.*

To date, international law has paid much less attention to ground- than to surface water. Slowly, however, a body of rules dealing with this vital resource is emerging that indicates a trend towards more comprehensive international regulation.

The publication brings together binding and non-binding international law instruments that, in varying degrees and from different angles, deal with groundwater. It aims to report developments in international law and to contribute to detecting law in-the-making in this important field.

** To access a free online copy, visit* www.unesco.org/water/ihp/publications/groundwater_law.shtml

SA Technology Wins International Award

Dr Brian La Trobe of South Africa's Enviro Options won the first prize in the Environmental category at the international 2005 Tech Museum.

The Tech Museum of Innovation, located in San Jose, California, announced 25 laureates for its awards programme, which celebrates those who leverage new and existing technologies to benefit humanity.

Enviro Options initiated the research and development of a dry sanitation system in the early 1980s. The Enviro Loo has been sold nationally and internationally since 1993, and is patented in some 64 countries, including the US.

The Enviro Loo sanitation technology does not use water and requires no other chemicals. It is driven by radiant heat and wind power. It does not pollute groundwater. The solid human waste is stabilised with the aid of aerobic bacteria. The liquid is either evaporated or diverted out of the system.

Botswana's Largest Dam Nears Construction

Preparations for the construction of the Dikgatlhong Dam, set to be the largest dam in Botswana, are at an advanced stage. This is against the backdrop of continued water shortages and restrictions gripping parts of the country. The Dikgatlhong Dam, which will be built at the confluence of the Shashe-Tati-Limpopo rivers, will provide water to the villages of Molepolole, Kanye and Serowe. At 400 million cubic metres, the dam is expected to surpass the combined capacity of the Gaborone, Letsibogo and Shashe dams.

Tenders for the project have already been invited, and constructed is due to take four years.

Water on the Web

www.agu.org/journals/gl/
Published by the American Geophysical Union, *Geophysical Research Letters* publishes short, concise research letters that present scientific advances that are likely to have immediate influence on the research of other investigators. GRL letters can focus on a specific discipline or apply broadly to the geophysical science community.

www.baselpretoria.org.za
For those wanting to keep abreast of national and international environment and waste management issues, the website of the Basel Convention Regional Centre Pretoria offers a daily roundup of news regarding pollution, waste management and environment issues.

www.iwmi.org/africawaterupdate
The Africa Water Update provides practical information on sustainable water and land management for food, livelihoods and nature. Here, policymakers, researchers, implementers and other development professionals can find the latest thinking on key water and land management issues in Africa.

www.northernwater.net
NoWNet, a partnership for water in the North, is a network of industrialised countries with the aim of sharing experiences encountered specifically by countries in the North with countries from the South. The member countries include Japan, the Netherlands, Denmark, Australia, South Korea, Sweden and France.

http://water.nationalacademies.org
The US National Academies has launched its Water Information Centre, a portal of more than 100 peer-reviewed reports from the National Academies of water-related issues. The website aims to assist the work of water scientists, engineers, managers, policy-makers, and students throughout the world.

Study Shows not all Answers in Science

Approaching research merely from a 'scientific' point of view without regarding the human element may lead to short-sighted results as a recent study in the wetlands of the Sand River catchment, in Mpumalanga, demonstrates, writes Karen King.

The study was undertaken in a multi-disciplinary manner, thus aside from hydrologists, geologists, soil scientists and wetlands experts, sociologists made up core members of the research team. A part of the study focused on the impoverished, rural, wetland communities' use of the small wetlands in the area, thus a comparison was made between two small wetlands in the catchment termed the 'Craigieburn' wetland and the 'control' wetland.

Although all the scientific evidence collected within this study points toward recommendation of the use of one wetland over the other, in practice the opposite occurs. This non-scientific approach to farming in the area occurs to the extent that the seemingly less desirable wetland is decidedly over-utilised, and the far more pristine of the two is not used at all. Evidence suggests that a very small number of plots were once cultivated in this wetland, but had not been used in the more recent past, and no new plots had been created.

The characteristics of many wetlands that lead to their use in subsistence farming are their typically high fertility, abundance of water, even during the drier seasons, and shallow gradients. Although the soils underlying the wetlands of the Sand River catchments are characteristically sandy, areas of relatively clay-rich soils were identified. The clay-rich soils have a greater cation exchange capacity than those dominated by silt and sand particles, thus are more fertile soils.

An intensive survey of the characteristics of both the abovementioned wetlands was undertaken. Soil samples were collected and analysed by the University of KwaZulu-Natal (UKZN) to determine the textural and nutrient composition of the soils sampled. A topographic survey of the area was also performed by the university, while the percentage vegetative coverage was estimated by the project team (Prof Graham Jewitt, Prof Fred Ellery, Dr Donovan Kotze of the UKZN, and Dr Sharon Pollard and Tessa Cousins of the Association for Water and Rural Development).

These analyses produced interesting results. A visit to the site highlighted the uncharacteristically lush vegetation, flat gradients, clay-rich soil and a wet environment. Results of soil sample readings show significantly higher clay content in the control wetland than in the Craigieburn wetland.

In turn, results of the topographic survey show that the slope of the control wetland is gentler than that measured in the Craigieburn wetland plots. Further measured and calculated variables of the respective wetlands highlighted the differences between the characteristics of the wetlands. A hydrological modelling exercise that made use of the small-scale HOWWET? model, calculated for and averaged over one year, was also performed.

From these results it becomes evident why one would conclude that the control wetland is far more arable, thus preferable for the members of the local wetland community to place subsistence plots in. This conclusion is, however, false. While the control wetland remains free of plots, attempts are made to cultivate some of the steepest, driest, most infertile pieces of land available in the Craigieburn wetland.

When questioned, few members of the community appeared eager to offer an explanation for this phenomenon. On further investigation, it was found that it is believed that the 'control' wetland area of the catchment is home to an evil spirit, thus the local community's fear of cultivating the area.

This belief clearly holds enough weight to deter the vast majority of the community from attempting to cultivate this area, and to prevent those who have made such an attempt from persisting with their efforts.

Don't Forget World Wetlands Day

World Wetlands Day will be celebrated on 2 February. It marks the date of the signing of the Convention on Wetlands on 2 February 1971 in the Iranian city of Ramsar on the shores of the Caspian Sea. World Wetlands Day has been celebrated since 1997. This year, the theme is "Livelihoods at Risk."

TABLE 1
SOIL TEXTURE CLASSIFICATION SUMMARY TABLE

	Average % Sand	Average % Silt	Average %Clay
Upper 0 – 10 cm of the soil profile			
Craigieburn wetland	72.62	8.46	18.92
'control' wetland	48.50	26.04	25.46
Lower 40 – 50 cm of the soil profile			
Craigieburn wetland	78.05	9.22	12.73
'control' wetland	47.97	35.40	16.63

TABLE 2
DIFFERENCES IN INPUT VARIABLES USED WITHIN THE HOWWET? MODEL FOR THE CRAIGIEBURN AND 'CONTROL' WETLANDS

Wetland	Average slope	Organic carbon	Vegetative coverage
Craigieburn	2.1%	0.74%	60%
'Control'	1%	1.04%	90%

Package Plants Under the Microscope

Concerns over the efficacy of small-scale sewage treatment plants have raised much debate around South Africa recently. To increase local knowledge about these systems, the Water Research Commission is funding an investigation into the performance of small-scale package sewage treatment plants under South African conditions.

The project is evaluating different types of sewage treatment package plants for rural and peri-urban community use. While this is admittedly not ground-breaking research, it is practical and should enhance the capacity of local authorities and other service providers in achieving more effective management of package sewage treatment plants.

According to Paul Gaydon and Neil McNab, both from Umgeni Water, who are undertaking the project, these type of package sewage treatment plants seem to be used quite widely in South Africa, but usually only as a last resort, i.e. where soil conditions or available areas dictate against the use of septic tanks and the availability of centralised disposal facilities are absent. The scale of the plants employed varies widely, from single household size to larger institutional units, which typically include housing estates, hotels, schools, mines and shopping complexes.

The team surveyed different types of package sewage treatment technologies, include a submerged bio-contactor, a rotating bio-contactor, and activated sludge plant. These units were tested at Umgeni Water's Darvill Wastewater Treatment Works, using screened and degritted influent from the works.

The investigation has certainly yielded some interesting results. "The inability of some technologies to successfully nitrify despite careful management has been unexpected," say the team members, "it had been anticipated this may have been a design or management issue. Also, the capacity of some systems to function beyond their designed capacity has been unexpectedly good."

Gaydon and McNab point out that the aim of the investigation was not to select the best suitable technology; but rather to explore the efficacy of the technologies employed. However, from the experience gained during the ongoing investigation, it seems that the scale of the plant has a huge influence on the reliability of treatment as larger plants are easier to operate.

The team members report that some degree of technology selection can become important in specific cases such as where flows are very seasonal. In these instances appropriate selection would make success of treatment more likely. "Correct specification, sufficient capital available for effective wastewater treatment and the fate of the treated effluent are the most important factors in selecting a suitable treatment technology."

"Our experience has shown that larger-scale package plants can meet discharge criteria; smaller ones may not," say Gaydon and McNab. "The question arises as to whether the impact of these smaller plants leads to any environmental degradation. The possibility of relaxed limits for low impact plants is a question to be posed to the regulators."

Fact is that package plants remain the only option for wastewater treatment under many conditions. "Certainly we have identified some technologies as more likely to succeed than others, and perhaps the project has helped confirm the expectation that the most successful technologies require the greatest operator expertise and capital expenditure. Many designs may well benefit from further development," say the team members.

It is hoped that the project will raise the profile of sanitation provision in South Africa, and that it will assist by demonstrating successful solutions to wastewater treatment using package plant technology. It is also hoped that the question of environmental impact will assist the regulators in considering appropriate and sustainable regulatory standards for such units in the future.

The project is scheduled for completion at the end of March.

How do package plants work?

- **Submerged bio-contactor**
  The sewage passes through a set of two septic tanks where settling of solids and anaerobic digestion takes place. It subsequently flows via an equalisation tank to an aeration tank filled with randomly orientated packing. The treated effluent is fed to a constructed wetland, whereafter it is chlorinated using chlorine tablets and irrigated. A pump for irrigation is included in the plant.

- **Rotating bio-contactor**
  The sewage passes through a set of two septic tanks where settling of solids and anaerobic digestion takes place. It then flows through the aeration tank where it is treated by the rotating bio-contactors. From there solids are settled out and it is chlorinated using chlorine tablets.

- **Activated sludge**
  The unit obtained for the WRC project is a sequencing batch reactor in which extended aeration takes place prior to settling, all in the same tank. Once the aeration cycle has been completed, the aeration is switched off and the tank contents settled before decanting the effluent to two 15 m^3 plastic tanks in series. Chlorination takes place between the reactor vessel and the first contact tank using a sodium hypochlorite solution dosed by an adjustable dosing pump. There is also provision for sand filtration of the sand filter using a pressurised upflow filter. The entire system is managed by a programmable logic controller.