

# S4 waterbulletin

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## GROUNDWATER

Co-operation planned between China and South Africa

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## HYDROLOGY

Calculating water quantity for the ecological reserve

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## IRRIGATION

SAPWAT computer model shows strength in the field

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# LEAKAGE REDUCTION & WATER DEMAND MANAGEMENT: PRACTICAL APPLICATIONS

## VENUES:

**Western Cape:** Cape Town - 3 June 2002

**KwaZulu-Natal:** Pietermaritzburg - 5 June 2002

**Gauteng:** Johannesburg - 7 June 2002

Venues will be confirmed on registration and location maps will be emailed to all attendees.

## PRESENTERS:

**Ronnie McKenzie** WRP (Pty) Ltd  
**Tim Waldron** (Wide Bay Water)  
**Allan Mayne** (Queensland Government)  
**Basil Bold** (Meinecke)

## CONTENTS:

The seminar will cover a wide variety of topical and important issues as part of eight distinct seminar modules. These will explain:

- The background and concepts of component-based leakage management;
- The importance of proper sectorising and metering;
- The benefits and pitfalls of retrofitting;
- The concepts and practical implementation of pressure management through the use of advanced pressure control;
- Importance of night flow logging and the interpretation of MNF results;
- Practical applications & case studies;
- The various WRC models and how they can be used to assist water suppliers in reducing their non-revenue water;
- The way forward where proper WDM can be used to prolong the life of the reticulation system and thus improve asset value.

## AGENDA:

The seminars will start, promptly, at 08:00 (8 AM) and conclude at 17:00 (5 PM). There will be three refreshment/discussion breaks of 30, 60 and 30 minutes respectively. Coffee and finger lunch will be provided.

## COST AND PAYMENT:

The cost of attending the seminar is **R1 140** per person (inclusive of VAT). Numbers may be limited and early registration is recommended.

Fees should be paid, in full, before commencement of the seminar in question. Please do not send payment by post. Payment should be made directly into the bank account of CTT (Pty) Ltd, the training subsidiary of WRP (Pty) Ltd:

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Each attendee will receive a full set of course notes, as well as a complimentary CD containing the user manual and latest version of the SANFLOW, BENCHLEAK, PRESMAC, ECONOLEAK and HDF models, developed by the WRC to assist water suppliers in understanding and managing leakage in their systems.



## Main Sponsors:



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## REGISTRATION FORM

I will be attending the seminar at the following venue (tick appropriate):

☐ Cape Town ☐ Pietermaritzburg ☐ Johannesburg

For additional enquiries please contact:

Mrs Chantelle Neethling (coordinator)  
 Tel No.: (012) 346-3496  
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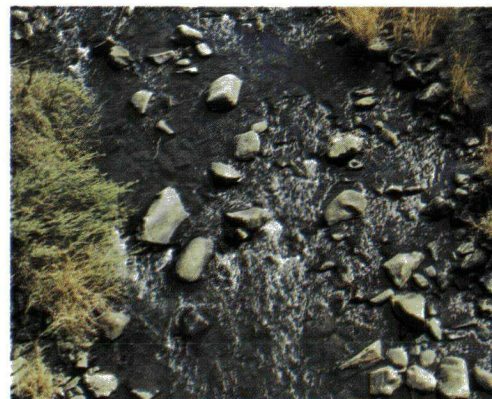




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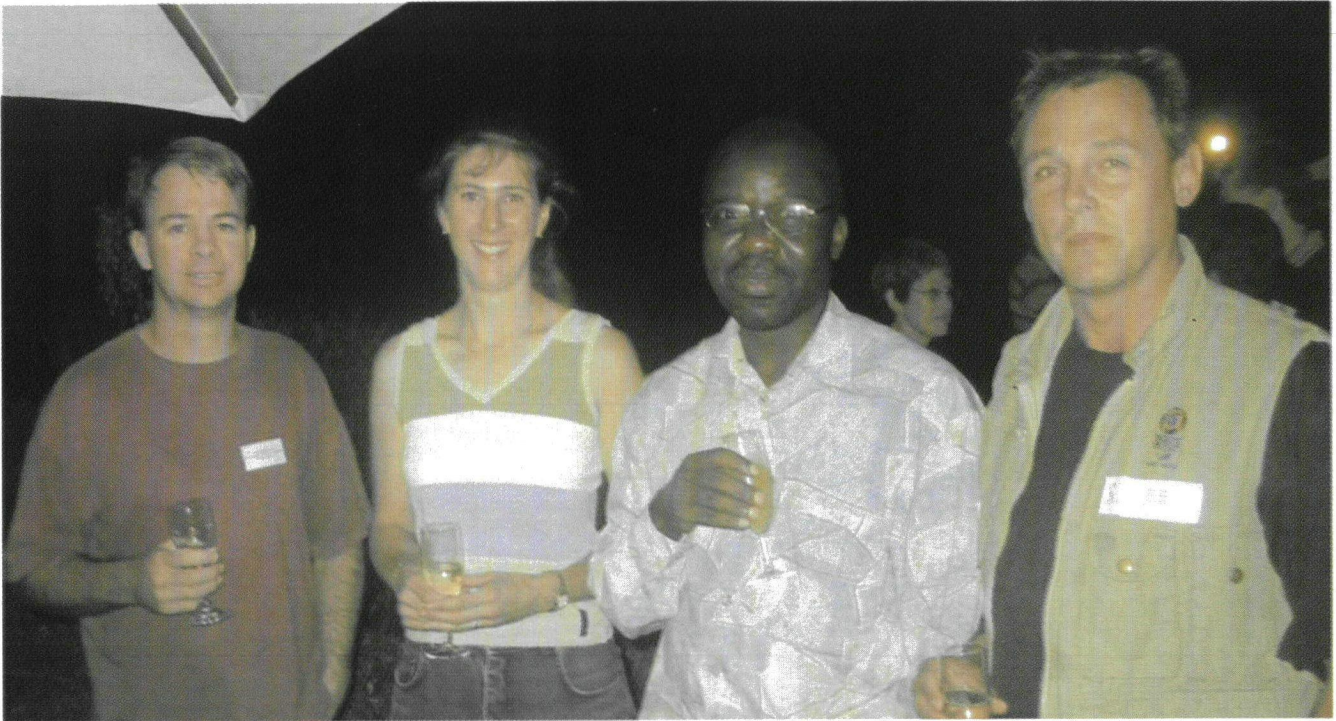
GROUND WATER	<b>8</b>	Towards co-operation between South Africa and China in the groundwater field
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*Cover: A hiker cooling off in a Mpumalanga pool. (Photo: SA Waterbulletin)*

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## Delegates discuss the sustainable use of river systems



*James McKenzie (CWE, University of the Witwatersrand, South Africa), Debbie Jacoby (University of the Witwatersrand, South Africa), John Odiyo (School of Civil and Environmental Engineering, University of the Witwatersrand, South Africa), Peter Hoge (Rand Water, South Africa) at the South African braai.*

**T**he International Conference Environmental Flows for River Systems, which incorporated the Fourth International Ecohydraulics Symposium was held at the Baxter Theatre (UCT) in Cape Town from the 3-8 March 2002. Planned for one year after the launch of Dams and Development, the Report of the World Commission on Dams, the Conference focussed on methods, knowledge-development and policies for promoting sustainable use of river systems through proactive management of river flows.

All parts of the river system were addressed: the river channel and banks, associated wetlands, lakes, floodplains, groundwater, estuary and near-shore ocean - as was subsistence use of the system's resources.

The Conference was organised by Southern Waters Ecological Research and Consulting (Pty) Ltd, with a committee of Advisors drawn from, inter alia, the South African Water Research Commission, the Ecohydraulics Section of the International Association for Hydraulic Research and the Centre for Catchment and In-stream Research, Australia. Dr Jackie King of Southern Waters chaired the conference.

The aim was to provide a forum for an international meeting of minds on the subject of managing flows for river health, and to demonstrate the positive effects of environmental flows. Water scientists, water managers, engineers, policy makers, resource economists, social scientists working with riparian peoples, and all those interested in the

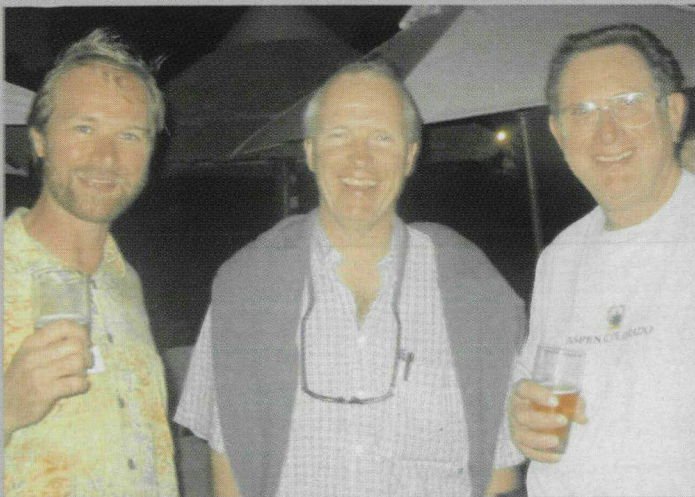
sustainable use of rivers, were invited to share information and experiences that could further the understanding and management of environmental flows.

Over 300 water managers, scientists, engineers, policy makers and funders, from some 36 countries, attended the Conference, which consisted of plenary sessions on matters of general interest, parallel specialist sessions and poster sessions. The accent was on practical application of data, knowledge and techniques for setting and managing environmental flows.

The Honourable Minister of Water Affairs Mr Ronnie Kasrils opened the Conference. Plenary speakers spoke to

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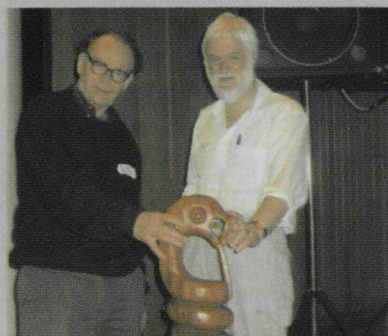




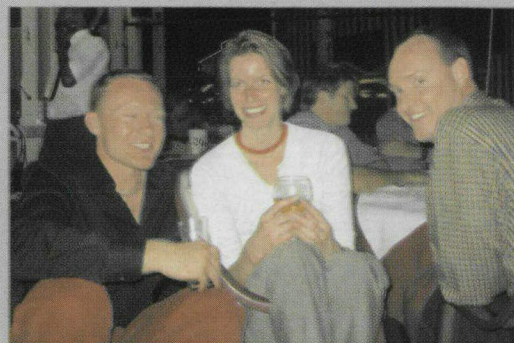
Delegates at the 'Good Old South African Braai': Dr. Richard Beilfuss (International Crane Foundation, USA), Dr. Patrick Dugan (ICLARM, Egypt) and Dr. Robin Welcomme (Imperial College, UK).



Delegates who attended the 'Managing River Flows to Sustain Tropical Fisheries Workshop'. Standing from left: Dr. Robert (Bob) Milhous (US Geological Survey, USA), Dr. Robin Welcomme (Imperial College, UK), Rebecca Tharme (University of Cape Town, South Africa), Dr. Ian Cambell (Mekong River Commission, Cambodia), Dr. Mathew McCartney (Centre for Ecology and Hydrology, UK), Ms. Bronwen Jones (Department of Land and Water Conservation, Australia), Dr. Glenn Wilson (Cooperative Research Centre for Freshwater Ecology, Australia) and Dr. Angela Arthington (Centre for Catchment and Instream Research, Australia). Kneeling: Dr. Patrick Dugan (ICLARM, Egypt).



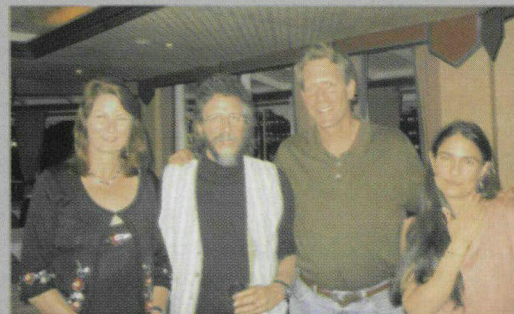
Prof. Thayer (Ted) Scudder (CALTECH Institute of Development Anthropology, USA) and Prof. Brian Moss (University of Liverpool, UK) with the Nyami-nyami sculpture.



Mark Seibentritt (Cooperative Research Centre for Freshwater Ecology, Australia), Karen Meijer (Delft University of Technology, Netherlands) and Dr. Glenn Wilson (Cooperative Research Centre for Freshwater Ecology, Australia) at the banquet held at the Victoria and Alfred Waterfront, Cape Town.



Bill Rowston (Department of Water Affairs and Forestry, South Africa), Sue Lane (Birmingham University, UK), Prof. Geoff Petts (Department of Geography, Birmingham University, UK).



Prof. Angela Arthington (Centre for Catchment and Instream Research, Australia), Dr. David Galat (University of Missouri, USA), Brian Richter (The Nature Conservancy, USA) and Diana Papoulias at the banquet held at the Victoria and Alfred Waterfront, Cape Town.



# FRIEND conference

## Bridging the gap between research and practice



*A "plenary" photograph of delegates attending the international FRIEND conference in Cape Town.*

The 4th International Conference on FRIEND (Flow Regimes from International Experimental and Network Data) was held during the week of 18-22 March at the Breakwater Lodge on the Cape Town Waterfront. The conference was convened jointly by UNESCO IHP, the Southern African FRIEND group, IAHS and WMO. Additional financial sponsorship was provided by the IHP National Committees of Germany and the Netherlands, UK DFID, French Ministry of Foreign Affairs and IRD (Institut de Recherche pour le Développement). The local organization of the conference was undertaken by the Institute for Water Research at Rhodes University (Denis Hughes and Juanita McLean) and supported by André Görgens of Ninham Shand. A large part of the financial sponsorship contributed towards the costs of attending the conference by some 60 delegates from developing countries throughout the world. A total of 130 delegates attended the conference, representing more than 35 countries from North and


South America, Western and Eastern Europe, Africa, South East Asia and the Indian sub-continent.

The conference was preceded by several of the FRIEND Programme Steering Committee meetings, including the FIGC (FRIEND Inter-Group Committee) and the Southern African FRIEND meeting. These groups meet every year to coordinate activities within the various FRIEND regions.

The conference was followed by a 1-day workshop on 'Poverty and Hydrology', organized by the Centre for Ecology and Hydrology at Wallingford in the UK. In this workshop ideas were developed to ensure greater relevance of the FRIEND programme in terms of contributions to poverty relief and development.

The theme of the conference was 'Bridging the Gap between Research and Practice', with the intention of demonstrating the extent to which the FRIEND research programme can con-

tribute to the solution of real water resource problems. A wide variety of papers were offered covering issues of water scarcity, managing hydrological risks, regional water resource problems and sustaining ecological functioning. All the full papers were refereed and pre-published in an IAHS red book (IAHS Publication No. 274), which was ably edited by Henny van Lanen and Siegfried Demuth. Written summaries of the poster papers were published on a CD which is available from the IWR at Rhodes University.

The overall impression of the delegates was that the conference was a great success and that everything ran quite smoothly in a relaxed and non-pressured environment. Many of the delegates were visiting South Africa, and particularly Cape Town, for the first time. The proximity of the conference venue to the Waterfront allowed the delegates to enjoy relaxed evening discussions at a wide choice of restaurants within walking distance. 



(from page 4)


four main themes. Prof. Brian Moss (UK) and Prof. Thayer Scudder (USA) spoke

to the theme Ecosystems and People; Dr Cate Brown (SA), Prof. Geoff Petts (UK) and Mr Bill Rowston (SA) to Policy development, decision-making and implementation; Dr Catherine Sabaton (France), Prof. Chris Katapodis (Canada) and Prof. Klaus Jorde (USA) to Technology: models and methods; and Prof. Angela Arthington (Australia), Prof. Kevin Rogers (SA) and Dr John Nestler (USA) to Flow restoration and the conservation of biodiversity. One hundred

and sixty-one papers were then presented in parallel oral sessions, as well as 25 poster papers. Sixty-four of the presented papers were submitted for consideration for a special Conference issue of the international journal *Rivers Research and Application*. A further ten were submitted for a special Conference issue of the *Journal of Hydraulic Research*.

Seven workshops were held in parallel on the last day of the Conference. These addressed a variety of topics, such as Fish passage for developing countries; Subsistence use of river resources; Dams in the future; and

River-coast linkages. Some workshop groups have already initiated new proposals for international co-operative research. There was also much activity at the WRC desk, where recent relevant research reports were in great demand.

The Conference Proceedings should be available within two months on CD-ROM. Enquiries should be directed to Dr Cate Brown of Southern Waters. [cbrown@southernwaters.co.za](mailto:cbrown@southernwaters.co.za) Postal address: Southern Waters Ecological Research and Consulting CC, PO Box 13280, Mowbray 7705. Tel: (021) 685 4166. Fax: (021) 685 4630. 

## ATTENTION CCWR USERS

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## New publications from IWApublishing.com



### Water Recycling and Resource Recovery in Industry Analysis, Technologies and Implementation

**Editor(s):** P Lens, L Hulshoff Pol, P Wilderer, T Asano  
Integrated Environmental Technology Series

**Publication Date:** April 2002 · Pages: 677 · ISBN: 1843390051 · Hardback ·

**Publication Type:** Books

**IWA Members Price:** £64.00 / US\$96.00

**Non Members Price:** £85.00 / US\$128.00

<http://www.iwapublishing.com/template.cfm?name=isbn1843390051>

### Environmentally Sound Technology for Wastewater and Stormwater Management: An International Source Book

**Author(s):** UNEP International Environmental Technology Centre

**Publication Date:** April 2002 · ISBN: 1843390086

**IWA Members Price:** £64.00 / US\$96.00

**Non Members Price:** £85.00 / US\$128.00

<http://www.iwapublishing.com/template.cfm?name=isbn1843390086>

### Urban Rivers Our Inheritance and Future

**Editor(s):** G. Petts, J. Heathcote, D. Martin

**Publication Date:** April 2002 · Pages: 128 · ISBN: 1900222221 · Paperback ·

**Publication Type:** Books

**IWA Members Price:** £15.00 / US\$24.00

**Non Members Price:** £20.00 / US\$32.00

<http://www.iwapublishing.com/template.cfm?name=isbn1900222221>

### Minewater Treatment Technology, Application and Policy

**Author(s):** M Brown, B Barley, H Wood

**Publication Date:** April 2002 · Pages: 472 · ISBN: 1843390043 · Hardback ·

**Publication Type:** Books

**IWA Members Price:** £64.00 / US\$96.00

**Non Members Price:** £85.00 /

US\$128.00

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### Water for Agriculture Irrigation Economics in International Perspective

**Author(s):** S Merrett

**Publication Date:** March 2002 · ISBN: 184339006x

**IWA Members Price:** £30.00 / US\$45.00

**Non Members Price:** £40.00 / US\$60.00

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# Towards co-operation between South Africa and China in the groundwater field

*This article is a report back on a visit to China by Eberhard Braune, Department of Water Affairs & Forestry and, Professor Yongxin Xu, University of Western Cape*

*In April 2001 the Minister of Water Affairs and Forestry, Mr Ronnie Kasrils, undertook a visit to China. He was impressed by the level of development in general and water resources development in particular and, on his recommendation, a follow-up visit focusing groundwater resources was to be undertaken.*

*At that time, South Africa and China were also scheduled to sign a bilateral agreement of co-operation (in December 2001) while priority areas of co-operation had to be established.*

*With the above as background, a study visit regarding the groundwater field in China was undertaken by Eberhard Braune of the Department of Water Affairs and Forestry, co-ordinated and guided by Professor Yongxin Xu of the University of the Western Cape. Between 12 - 26 November 2001 ten different government and academic institutions were visited in the capital, Beijing, and in Sichuan and Shaanxi provinces.*

*The reception was overwhelming and the interest for co-operation very high.*

From north to south, China straddles six climatic zones from frigid-temperate to equatorial. Precipitation differs sharply in different regions, largely depending on the effect of the summer monsoon. There is a progressive drop in precipitation from more than 1 000 mm in the south east to less than 200 mm in the north-west, the heart of Eurasia.

China is a mountainous country, with about 65 per cent of its total land area made up of mountains, plateaus and hilly areas. The Chinese landmass drops in height from west to east in a stair fashion. The highest stair is the Qinghai-Tibet Plateau with elevations of 5 000-6 000 metres. This sloping topography allows humid air currents to penetrate from the sea deep into China's interior. At the same time China's big rivers flow eastward into the sea, in particular the Yellow River, the Yangtze River and the Pearl River.

## GROUNDWATER PROBLEMS

### Resource over-exploitation

Few regions in the world have such vast over-exploited groundwater re-

sources as China. The large scale dropping of water levels in shallow unconfined aquifers and pressure levels in the deeper confined systems not only causes many boreholes to dry up, but also causes many other environmental problems. For example, in the Hai, Huai and Huang River basins, covering an area of 1.4 times that of South Africa, the total groundwater use equals the exploitable resources for the area, indicating major over-exploitation at a local level. Many large cities, e.g. Shanghai, also have completely over-exploited their groundwater.

### Land subsidence

Land subsidence has been one of the key impacts, with some 30 examples in China resulting from groundwater resource over-exploitation. Twenty of these are due to abstraction from deep confined aquifers. An example is Tianjin Municipality where the subsidence had reached 1.5m by 1994, causing settlement of structures, bridge collapse, significantly aggravated storm water drainage problems, and a reduction in the capacity of river levees to resist high tides and floods. Ground subsidence around the Beihai

Sea on the North China Plain had already extended to an area of 10 000 km<sup>2</sup> by the mid 80s. Karst surface collapse is also a very common problem and is often related to groundwater abstraction.

### Other Karst hazards

In China, carbonate rocks are exposed in nearly ten per cent of the total land area. Karstification is most intense in South China, whereas in the dry North West there is usually no karst development.

Drought and floods are two of the unique geological hazards of karst areas. Cave networks will drain rainfall and surface runoff very quickly, causing drought which is affecting large areas. On the other hand heavy rains and underground cavities filling to capacity often lead to sudden floods.

### Sea water intrusion

A serious impact of over-exploitation in coastal areas has been seawater intrusion, resulting in over one million people having problems of accessing drinking water. An inland movement of the saline front of 170 m/year is reported for some cities. The key problem



here is the virtually irreversible nature of seawater intrusion in a practical time frame.

Quality degradation is also happening in inland aquifers through both horizontal and vertical migration of poorer quality waters into over-exploited aquifers.

### **Pollution**

Surveys have indicated that there is already widespread pollution of shallow unconfined aquifers in China and in some cases of the deep confined aquifers. Major problems are land disposal of large quantities of untreated sewage, as well as the use of pesticides and fertilisers. Phenols and heavy metals in elevated concentrations are already found in the groundwater underneath a number of urban areas.

### **Natural contaminants**

High fluorides are very common in some regions of China, causing problems of fluorosis, endemic goiter and other regressive diseases of the bone structure. The occurrence of fluoride is related to hydro-geological conditions, geotectonics and geomorphology.

### **COMMUNITY WATER SUPPLY**

Provision of a safe drinking water supply is one of the rural development priorities in China, especially for the water-scarce and poverty stricken remote rural areas as well as areas where the available groundwater resources are unusable due to naturally occurring high fluoride or arsenic concentrations.

A lot of emphasis has been on employing suitable appropriate technologies based on local conditions. There are deep-well piped water supplies, gravity-fed piped schemes, rainwater harvesting and slim boreholes with handpumps.

### **WATER RESOURCES MANAGEMENT**

Following the organisational reform of government in China in 1998, all water resource management, i.e. groundwater and surface water, falls under the Ministry of Water Resources. This is taking place at two main levels, i.e. national government for policy and strategy and provincial government for implementation and administration.

The key focus in groundwater manage-

ment is the reversal of groundwater over-exploitation occurring in many areas. A special government regulation has just been passed which has the aim to stop over-exploitation within five years.

Groundwater resource monitoring is carried out by the Geological Survey Branch. The purpose is not control, but improvement of natural resource and human impact characterisation. Shaanxi province has approximate 100 of these monitoring points with the following sampling frequency: groundwater levels: 6/month and groundwater quality: 2/year

### **GROUNDWATER TECHNOLOGIES**

This paragraph only lists a few technologies that were encountered. It is clear that the country is able to make its own apparatus or suitably modify equipment from outside.

#### **Radon gas measurement for groundwater exploration**

China is a leader in this field and has refined its own instruments over the last two years. The principle is that hard-rock groundwater occurs in fractures, and fractures are carriers of Radon gas from the inner earth. Radon gas anomalies on the surface thus present a very detailed indication of open fractures underground and can be used for borehole siting.

The alpha-cup apparatus for in-situ measurement is used extensively in China for groundwater exploration and has also been used for locating thermal water. In groundwater surveys in the Gobi desert some 400 km of Radon gas cross-sections were undertaken.

New, more specific and laboratory-based technologies that are being researched, are geogas measurement for mineral exploration and gamma-ray measurement for exploring deep buried fractures.

#### **Appropriate groundwater development equipment**

For community water supply in the steep, densely populated rural areas of Sichuan Province, a combination of appropriate technologies were piloted, suitable for the local conditions, characterised by a steep terrain, very scattered population, no surface water, low yielding aquifers and availability of electricity.

The technologies included:

- portable drill which can be carried up the mountains by two people and can produce a borehole 30 m deep and 150 mm diameter in weathered mudstone/sandstone material;
- electrical pump which runs on 2 phase electricity and can just be plugged into the home electricity supply. It can provide water at 1m<sup>3</sup>/hour.

The whole installation of borehole casing, pump, rising main, distribution pipes and yard tap was done at a cost of 1 000 Yuan (1 Yuan ~ R1.20) of which the government subsidised 200 Yuan. Having carried water over long distances up to now, villagers are very keen to pay 800 Yuan for a permanent water supply at the house.

### **TOWARDS CO-OPERATION BETWEEN SOUTH AFRICA AND CHINA**

#### **Possible areas of co-operation**

There is a strong desire in China for international co-operation. This is in line with the increasing opening-up of the country as reflected in the recent signing up to the World Trade Commission. There is also considerable interest in co-operation with South Africa, a leading developing world nation. The desire for action from the Chinese side was reflected by the presence of the vice-chancellor at all meetings we had at three different universities and the strong endorsement by the DDG of a provincial government department.

There would be tremendous benefits for South Africans to work for shorter or longer periods in China. The country is vast and its hydrogeology and groundwater management focus highly varied. Both individuals and joint projects can benefit from the broad base of hydrogeology in China, which includes a deep understanding of the hydrogeological system, its mathematical formulation at many different scales and its practical solutions for water supply and environmental problems.

Areas of possible co-operation that we identified during our short stay included:

- Groundwater quality protection (protection zoning, vulnerability mapping, cost-benefit analysis, legal implementation)



- ❑ Exploration of deep groundwater (conceptual understanding, technology, e.g. alpha-cup meter, hydrogeochemistry, including isotopes)
- ❑ Fractured rock aquifer modelling (conceptual understanding, mathematics and statistics, different scales, 3D)
- ❑ Surface water/groundwater interaction (hydrological system understanding, groundwater-dependent ecosystems, structural geology and geomorphology platform, remote sensing, isotopes, basin scale analysis)
- ❑ Techniques of water resources planning (Optimisation, decision-support systems)
- ❑ Appropriate technologies for groundwater development (appropriate for different hydrological and use conditions, joint manual)
- ❑ Great West initiative (pioneering hydrogeology, arid semi-arid area resource evaluation)
- ❑ Policy development (allocation, protection, conservation)

#### Approaches to co-operation

The co-operation model that emerged after many different discussions, was the establishment of a link between universities in South Africa and China, who are in turn supported by the appropriate government departments. This could in turn lead to support from the respective national research support agencies and ultimately to support from international agencies like UNESCO and even the World Bank.

Various modes of implementing the university link with the coupled support mechanisms were proposed by Chinese counterparts:

- ❑ Respective work on specific projects, e.g. South Africans would be welcome to work on the pioneering undertaking of groundwater supply to the remote West China region. A submission for a special budget for this purpose could be made to the Ministry of Transport.
- ❑ Exchange of experts for short visits.
- ❑ Exchange for higher education, in particular, masters and post-doctorate students.

China sees tremendous benefits in such exposure.

*For a broad context for co-operation, some population and water resources statistics are provided.*

	CHINA	SOUTH AFRICA
Area (10 <sup>6</sup> km <sup>2</sup> )	9.6	1.0
Population (million)	1260	40
Average population density (inhabitants/km <sup>2</sup> )	130	40
Mean Annual Runoff (10 <sup>9</sup> m <sup>3</sup> )	2712	50
Mean Annual Groundwater Recharge (10 <sup>9</sup> m <sup>3</sup> )	829	19

#### Funding sources for universities in China include:

- ❑ Universities can apply directly for national government funds for ventures of international co-operation. A typical undertaking could be an expert visiting for two months over two years to supervise some project part. 40 000-50 000 Yuan would be available for something like this, with rapid approval by the dean.
- ❑ Joint proposal to the National Research Foundation of China equivalent. This is more difficult to achieve. Key criteria are the meeting of a national priority and the research standing of participants.
- ❑ Application for projects from a provincial bureau. Income from water sales can be used for research purposes.

Language is not seen as a major obstacle anymore. In line with national policy, universities are putting increasing emphasis on the learning and using of English. Ten per cent of teaching must already take place in English. The working medium for South Africans active in China would be English.

Experience has shown that co-operation progress has been more rapid when there has been a strong bridge in the form of a Chinese-speaking expert in the counterpart country. For example, the groundwater liaison between the Netherlands and China is conducted by a Chinese speaking academic at the TNO in Delft. Prof. Xu of the University of the Western Cape is well placed to fulfill a similar role in South Africa.

#### Actions towards co-operation


Because of the freshness of relations, great distance and language barriers involved, it is important not to lose momentum after the very successful visit.

The following actions are proposed:

- ❑ Information of higher authorities and formalisation of co-operation proposals (Department of Water Affairs and Forestry, Water Research Commission, University of the Western Cape, Department of Foreign Affairs, South African Embassy in Beijing);
- ❑ Communication of findings (Articles in Water SA and in the Journal of Land and Resource Management, China);
- ❑ DWAF/university link (Standing contracts between DWAF and the University of the Western Cape (Prof. Xu) and other appropriate SA universities);
- ❑ University education. Identification of suitable projects as basis for post-graduate education. The following levels are seen as the most suitable - PhD, Post-doctorate, Visiting scientist (shorter period). To give substance to above, a visiting professorship at Chengdu University of Technology was formally offered to E. Braune.
- ❑ Advertising of these opportunities in China through the newly established channels.

#### First project

The alpha-cup technology for identifying fracture groundwater is seen as the ideal project to initiate co-operation.

A pilot project is proposed in the Northern Province to test and describe the methodology under various South African conditions. The co-operation component would be the visit of a Chinese expert for a few field visits. If implemented in time, the pilot project could produce technology transfer to the Cape Metropolitan Council project for deep groundwater exploration, intended for 2002. 



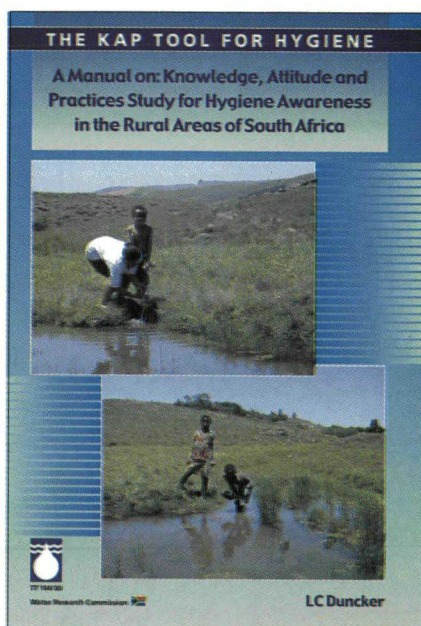
## Initiating hygiene studies in rural areas using the KAP Tool manual

**F**or decades the rationale for the vast majority of water supply and sanitation projects has been the improvement in the health and economic productivity of the target population. Based on what is now known about the complexity of the disease transmission chain, investments in water and sanitation appear to be a necessary but incomplete step to attain a tangible health impact. Modifications in human behaviour and the way in which people interact with their environments, especially at the level of the household, have been shown to exert a greater influence on morbidity and mortality than the simple provision of clean water or latrines.

This is the view of LC Duncker, author of a manual on hygiene awareness in rural areas, recently published by the Water Research Commission. The manual will enable the reader to gather information regarding the hygiene situation in rural communities and is based on the KAP (knowledge, attitudes and practices) study conducted by the World Health Organisation.

The author says that when the Water Decade commenced in 1981, the statistics on water and sanitation related diseases were staggering - 80 per cent of all sickness in the developing world and 25 000 deaths a day were attributable to water-related diseases; diarrhoea killed as many as 18 million children and three out of every five people in developing countries were without access to safe drinking water while only one in four had suitable sanitation.

Two major issues surfaced during the Water Decade. Firstly, that rural water facilities in the developing world were falling rapidly into disrepair and often became disused shortly after they were installed. The causes seemed, among others, to be the following:




❑ The technology used did not withstand the demands of the users;

❑ The financial costs and logistics of maintaining and servicing the systems proved too great for the limited economic and human resources of the water institutions; and

❑ The systems were in some cases rejected by communities whose needs, preferences and cultural beliefs had not been incorporated into the project design.

Secondly, the health benefits always assumed to accompany the provision of potable water came into question, as research increasingly pointed to human behaviour in relation to water as a more critical determinant of health outcome. It became clear that water supply projects could not achieve their full impact without a complementary sanitation and health education component.

The report says that although there has been extensive research on water and sanitation related diseases in South Africa, there is a paucity of information on health and hygiene education. Part of the current research reported on in this publication is to explore and understand knowledge, attitudes, beliefs, perceptions and traditional practices of target communities where hygiene education programmes will be implemented. The importance of understanding the social aspects of the community before designing intervention programmes cannot be overemphasised.

The quality of the information gathered is critical in the assessment of hygiene practices in a community. This manual demonstrates the use of more than one information gathering technique in order to obtain useful and valid data from the target groups. 

Copies of the publication entitled **The KAP tool for hygiene - a manual on knowledge, attitude and practices study for hygiene awareness in the rural areas of South Africa** (WRC report TT 144/00) are available free of charge (in South Africa) from the Water Research Commission, Private Bag X03, Gezina 0031.



# Determining the water quantity component of the ecological reserve for South African rivers



*According to new water legislation the requirements for both basic human needs and the environment (the Reserve) will have to be met before potential users can be licensed to abstract water.*

**T**he Department of Water Affairs and Forestry is currently in the process of implementing the new legislation relating to the control and licensing of water abstraction from all significant water bodies in South Africa. Part of this legislation refers to the need to ensure that the requirements for both basic human needs and the environment are met before potential users can

be licensed to abstract water. These two requirements are referred to as the "Basic Human Needs Reserve" and the "Ecological Reserve". Quantifying the ecological reserve is about determining the water quantity and quality requirements of rivers, estuaries, wetlands and aquifers to ensure that they are sustained in a pre-determined condition. This pre-determined condition is

referred to as the ecological management classes, and is related to the extent to which the required condition differs from natural or pristine conditions. There are four main classes (A to D), where A refers to a condition that is largely natural and D assumes a highly modified condition where there is a large loss of natural habitat, biota and basic ecosystem functioning. The responsibili-



ty of determining which class should be used for a specific water body lies with the Minister of Water Affairs and Forestry after consultation with stakeholders. The reserve has, therefore, superseded all other water resource management requirements in terms of setting instream flow requirements and has introduced a new element of urgency with respect to the need to quantify ecological flow requirements for many rivers of South Africa.

The Water Research Commission recently published a report which summarises the hydrological information requirements of the various levels of ecological reserve determination for the water quantity component in rivers.

The report, compiled by DA Hughes and F Münster from the Institute for Water Research at the University of Grahamstown, is divided up into three main sections. The first section presents a summary of the hydrological information requirements for determining the reserve and reviews some of the possible approaches to satisfying those requirements. The second section explains the detail of desktop estimation methods that have been developed dur-

ing the course of this project, while the third section discusses the potential for including physical and biological factors into some of the more rapid reserve determination methods.


### FIVE PHASES

The authors say that, for the purposes of the report and the hydrological data inputs, reserve determinations have been divided into five phases, namely, data generation, data interpretation, design flow requirements, scenario planning, and, finally, implementation. The options and methods available for satisfying the hydrological information requirements at various levels are discussed from the low-confidence (and low-cost) desktop approach to the much higher confidence (and higher cost) Comprehensive Reserve.

The desktop approach is almost completely based upon the hydrological characteristics of rivers and the biotic component is only included through a series of fairly subjective parameters. These have been based on extrapolations from previous detailed instream flow requirement studies and some more recent inputs of expert judgement.

The reason for this is that the hydrological data are available (through the publication "The Surface Water Resources of South Africa 1990 - also known as WR90) nationwide, while quantitative information on the biotic components is not. The authors say the final result is a pragmatic, but nevertheless, far from satisfactory approach which leads to the "low confidence" label that is given to the results. The desktop approach is now being used within the National Water Balance Model to populate the database with rough estimates of the reserve requirements (for water quantity in rivers) at the outlet of every quaternary catchment for the full range of ecological management classes.

The authors also describe in the report a more site-specific application of the desktop approach which can be used with the WR90-type data files, or alternative simulations and observations of monthly data which are stored in a similar format. In this computer program the user has far greater flexibility in being able to over-ride or adjust the default generic regional parameter values. This program is, therefore, equally applicable to the rapid reserve approach, where there is scope for limited input of some site-specific ecological expertise, which may determine the most appropriate ecological management class to be used or which may be able to identify the range of flows that might be expected during different seasons of the year. The software has built-in procedures for visualising the input data and parameters, modifying them where necessary and assessing the results. A version of the software package has been posted on the Institute for Water Research web site at Rhodes University (<http://www.ru.ac.za>) so that updates can be communicated efficiently to existing and potential users.

Copies of the report entitled **Hydrological information and techniques to support the determination of the water quantity component of the ecological reserve for rivers** (WRC report TT 137/00) are available free of charge (in South Africa) from the Water Research Commission, Private Bag X03, Gezina 0031. (Overseas price: US\$ 20 - via surface mail). 



*The Reserve supercedes all other water resource management demands in terms of setting instream flow requirements.*



# Researchers test the SAPWAT irrigation program in the field

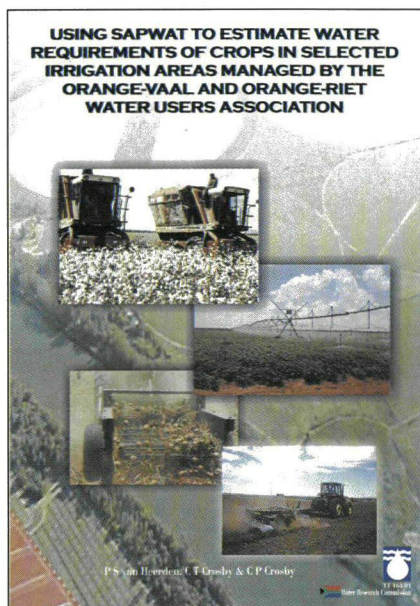
**P**lanners and managers of irrigation water are sometimes confronted with the question of whether the irrigation requirements estimated for areas are correct and can be applied unconditionally.

To try and enhance the credibility of these predicted irrigation requirements, the Water Research Commission sponsored the development of a computer model called SAPWAT (see WRC report 624/1/99), designed to satisfy the need for a user-friendly and credible aid to planning of irrigation schemes and for water management by water user associations.

Within the South African context, it is a further development of, and an improvement, on the Green Book of 1985 which has been the basis of irrigation requirement planning for many years, but which has been overtaken by developments in irrigation practice and management. On the international front, SAPWAT links to and is also a further development on a FAO (Food and Agricultural Organisation) planning model, CROPWAT, which in turn leans strongly on several FAO irrigation and drainage reports on irrigation management that have been published since 1977.

SAPWAT is not a crop growth model. It is a planning and management aid that is supported by an extensive South African climate and crop database. Some of the biggest improvements that have been incorporated into SAPWAT are:

- ❑ The replacement of the American Class A evaporation pan with reference evaporation from a short grass surface;



- ❑ The inclusion of the Penman-Monteith calculation methodology for reference evaporation, which is acknowledged internationally; and
- ❑ The use of a simple methodology whereby crop factors can be determined and adapted to provide for virtually any growing situation.

The inclusion of an extensive climate and crop database enhances the user friendliness because the user does not have to look elsewhere for data.

SAPWAT takes the user through a process from the selection of up to six weather stations out of 350 which are shown on a map; comparative reference evaporation graphs; crop factors for a selected crop; and a screen which shows the water requirement for that crop, effective rainfall and irrigation requirements. Several options are pro-

vided, enabling the user to replicate a specific situation. These include choice of growing periods, planting dates, geographic regions, basic irrigation management options, favourable, normal or severe climatic conditions, inclusion or exclusion of rain as a factor and changeable irrigation efficiency levels.

A management module is also provided that enables the user to evaluate different irrigation strategies in order to identify a "best" strategy for a specific situation.

## TEST

To test the applicability of the SAPWAT computer procedure and to estimate crop water requirements for a selected irrigation scheme hypothesis and to develop a reliable methodology, a pilot study was done in the area of the Orange-Vaal Water User Association (situated at the confluence of the Orange and Vaal Rivers) and in the sub-district: Lower Riet River of the Orange-Riet Water Users Association.

Portions of the evaluation area have been irrigated for more than a 100 years and historical farming patterns and water management approaches have been developed that provide a basis for sound water management. The two areas are subdivided into eight sub-areas, each of which acts as a separate water management unit, with overall management by the two water user associations. About 244 irrigation farmers farm on 12 030 hectares, with an average of 49 hectares scheduled area, ranging from less than five hectares to bigger than 500 hectares.

The farmers themselves, through the water user associations, are responsible





*Centre-pivot irrigation - many farms in the Orange-Vaal Water User Association area have been irrigated for more than hundred years.*

for building and for maintenance of the water distribution infrastructure. Support from the state was given in the form of grants as well as direct involvement of the Department of Water Affairs and Forestry in the construction and upgrading of canals and weirs.

Initially lucerne, wheat and cotton were produced in the area. During the late fifties potato production increased substantially, but the big distances to the larger fresh produce markets limit the production of fruit and vegetables. Since the erection of the first centre pivots in the late seventies, this method of irrigation has become the most important and maize production has increased drastically.

SAPWAT was evaluated in the study area against results obtained with a neutron water meter-based scheduling ser-

vice and it was found that it gave reliable results within the framework of the complex irrigation management environment. Furthermore, it was found that the farmers of the area have generally accepted the application of SAPWAT as a planning aid and that the results are seen as being credible.

The potential role that SAPWAT can play in water use and water management planning has been tested and a methodology for the application of SAPWAT in such a role has been demonstrated. The conclusion is that SAPWAT can be used with confidence to do the following:


- ☐ Estimate the irrigation requirements of individual crops
- ☐ Estimate the irrigation requirements of crop rotation systems

- ☐ Estimate the irrigation requirements of areas and sub-areas
- ☐ Evaluate existing management strategies
- ☐ Estimate irrigation requirements with inclusion or exclusion of rain
- ☐ Estimate irrigation requirements with inclusion or exclusion of leaching requirements
- ☐ Estimate the irrigation requirements of alternative crop combinations

In all these cases the irrigation requirements has been estimated on a monthly basis, which planners and managers can then use with confidence to plan and manage the irrigation requirement of an area or sub-area.

Copies of the report entitled **Using SAPWAT to estimate water requirements of crops in selected irrigation areas managed by the Orange-Vaal and Orange-Riet water users associations** (WRC report TT 163/01) are available free of charge (in South Africa) from the Water Research Commission, Private Bag X03, Gezina 0031. (Overseas price: US\$ 30, via surface mail).



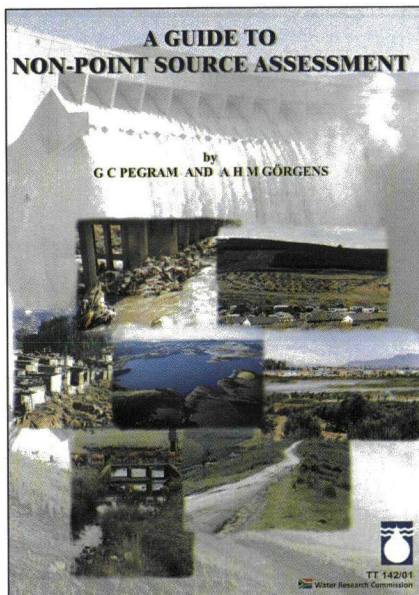


## Guide published for assessing non-point source pollution of surface waters

*The application of complex models for non-point source assessment in South Africa does not necessarily provide more accurate information, due to the limited data availability to support inputs and calibration.*

**N**on-point source pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, interflow, seepage, groundwater flow or river course modification. Technically, non-point sources are all sources of pollution that are not defined as point sources. Although there is currently no definition of "point sources" in the National Water Act, these are discernable and confined sources of pollution that discharge from a single (point) conveyance, such as a pipe, ditch, channel, tunnel or conduit. Non-point sources represent those pollution sources that are not included in this definition.

A significant amount of research has been conducted into the topic of non-point source contamination. However, these studies have been in danger of not fulfilling their potential due to inadequate linkages between the water quality management philosophies, strategies and



information needs, and the processes governing water quality in the catchment, particularly with respect to non-point sources.

The Water Research Commission recognised this need and funded a project to develop a Guide for the assessment of non-point sources of pollution, which represents an attempt to link together the understanding of non-point source problems, the assessment techniques and available information, to provide for the appropriate management measures associated with non-point source contamination.

The research was carried out and the Guide compiled and written by GC Pegram and AHM Görgens from Sigma Beta Consulting Engineers in Cape Town.

The primary focus of this Guide is to support water quality management of surface water resources, and particularly non-point sources management, through the provision of appropriate and cost-effective information for decision-making.



Underlying the new approach to water resource management in South Africa is the recognition that water should be managed in an integrated manner. Integrated water resource management is simultaneously a philosophy, a process and an implementation strategy to achieve equitable access to and sustainable use of water resources by all stakeholders at catchment, regional, national and international levels, while maintaining the characteristics and integrity of water resources at catchment scales within agreed limits.

The recognition that water resource management should be performed at a catchment scale, with input from all stakeholders, led to the requirement for catchment management strategies to be formulated and established in law. This strategy should outline a framework for water resource protection, use, development, conservation, management and control within a water management area, which is consistent with the national water resource strategy.

The need to ensure sustainable utilisation of South Africa's water resources led to the recognition that the resource itself must be protected from over-utilisation that would cause their irreversible degradation. The concept of water resource protection addresses all water uses defined by the Act, including water abstraction, waste discharges, streamflow reduction, water storage, instream activities and recreation.

Efficient and effective non-point source pollution management requires information about the non-point source areas that contribute to water quality concerns. Providing this information is the role of non-point source pollution assessment, but this, in turn, implies an understanding of the cause and effect relationships between the non-point source areas and the water quality concerns, as well as the type and detail of the information required to support the management decision-making process.

Although this Guide focuses on surface water resources, resource pro-

tection in the context of integrated water resources management requires the link between groundwater and surface water to be explicitly addressed. This Guide is focussed on the impacts of non-point sources on surface water in South Africa. The impacts on groundwater are also important, but the nature of the contaminant processes and the techniques for their assessment are significantly different and should be the focus of a similar Guide.

The Guide aims to assist users in understanding their non-point pollution sources assessment needs in a particular situation, and thereby enable them to identify and apply appropriate non-point source assessment techniques. Although evaluating the manageability of non-point source impact may be part of the assessment process, techniques for management (that is, measures and practices) are not presented in this document.



*A number of physical activities, processes and mechanisms may cause non-point source impacts. The importance of these processes may vary for different water quality concerns, but all are related to either the production or delivery of contaminants.*

Copies of the publication entitled **A Guide to non-point source assessment** (WRC report TT 142/01) are available free of charge (in South Africa) from the Water Research Commission, Private Bag X03, Gezina 0031. (Overseas price: US\$ 20, via surface mail). 



# New reports published by the Water Research Commission

The following reports are available free of charge (in South Africa) from the Water Research Commission in Pretoria. To order a copy, please contact the librarian, WRC, Private Bag X03, Gezina 0031. Tel: (012) 330-0340. Fax: (012) 331-2565. E-mail: [orders@wrc.org.za](mailto:orders@wrc.org.za)

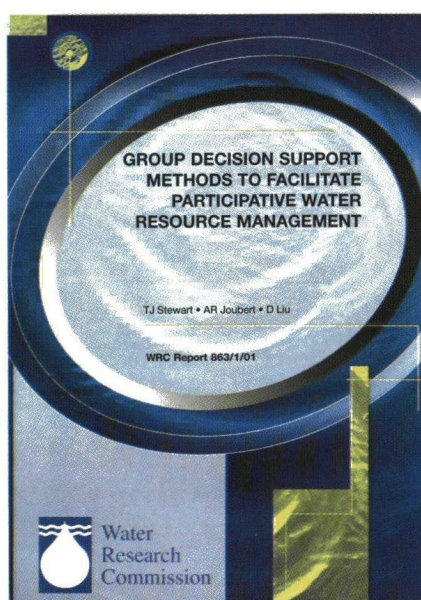
## **Report 863/1/01 - Group decision support methods to facilitate participative water resource management**

Report to the Water Research Commission by the Department of Statistical Sciences, University of Cape Town.

**Authors:** TJ Stewart, AR Joubert and D Liu

**Overseas price:** US\$ 25 (via surface mail)

This report deals with the third Water Research Commission (WRC) project on water resource management and decision-aid completed by the decision analysis group in the Department of Statistical Sciences at the University of Cape Town. In the previous WRC-funded projects the researchers have developed the concept of Scenario Based Policy Planning (SBPP) for use in the evaluation of strategic alternatives within any public sector planning context, but in particular for water resources planning. Scenario Based Policy Planning was subsequently combined with the established concepts of Multi-Criteria Decision Analysis (MCDA) to further assist interest groups to formulate their preferences.




The SBPP and MCDA concepts have been detailed in previous Water Research Commission reports (WRC report 296/1/93 and WRC report 512/1/97), and are summarised together with some updated concepts in Chapter 2 and Chapter 3 of this report.

The report says that the original development of the Scenario Based Policy Planning and Multi-Criteria Decision Analysis procedures were motivated by a realisation that strategic decision-making must involve all stakeholders effectively from an early stage of planning. This was recognised as good practice, even though there was at that time little in the way of legislative

requirement for involvement of stakeholders in policy formulation and decision processes. However, the promulgation of the National Water Act of 1998 has both recognised the existing of many potentially conflicting criteria in water resources planning and mandated the effective involvement of different stakeholders in the process (especially through catchment management agencies or CMAs).

A detailed comparison is made in the report of the links between SBPP/MCDA and not only the new National Water Act, but also related legislation such as the National Environmental Management Act, the Environment Conservation Act and the National Forests Act. Within the context of the National Water Act it is argued that the SBPP/MCDA process is directly relevant to the determination of management classes, the determination of the Reserve for basic human ecosystem needs, the determination of resource quality objectives and the formulation of catchment management strategies and water allocation.

A number of chapters in the report are devoted to a series of case studies (and the lessons drawn from them) in which the SBPP/MCDA procedures have been implemented. Experiences from these case studies have led to the development of a web-based decision support system, which is designed to facilitate the implementation of the SBPP/MCDA approach for geographically dispersed stakeholders. 



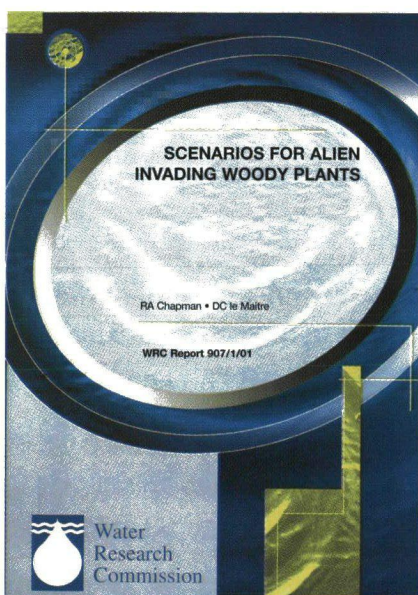
## Report 907/1/01 - Scenarios for alien invading woody plants

Report to the Water Research Commission by the Division of Water, Environment and Forestry Technology in conjunction with the Institute for Plant Conservation, University of Cape Town.

**Authors:** RA Chapman & DC le Maitre  
**Overseas price:** US\$ 15 (via surface mail)

Research has shown that there are approximately 10 million hectares, or eight per cent of South Africa, invaded to some extent by alien woody plants. The invaded area is expanding rapidly, at a rate of perhaps five per cent per year, leading to a doubling of invaded area in 15 years. The impact of these alien plants in South Africa is particularly deleterious, using an additional 3 300 million cubic metres of water per year, or seven per cent of South Africa's runoff.

Control and removal of the aliens is enormously expensive and the aim of this study, therefore, was to develop techniques to estimate how much



money will be required to achieve effective control of invasive plants in the different provinces of South Africa as well as how long it will take to achieve significant reductions in water lost due to alien invasion resulting from varying rates of expenditure on control. The researchers also looked at what impact biological control will have on control costs in the long term.

A simulation model was developed and applied to different future scenarios

and different South African landscapes.

The key conclusions were as follows:

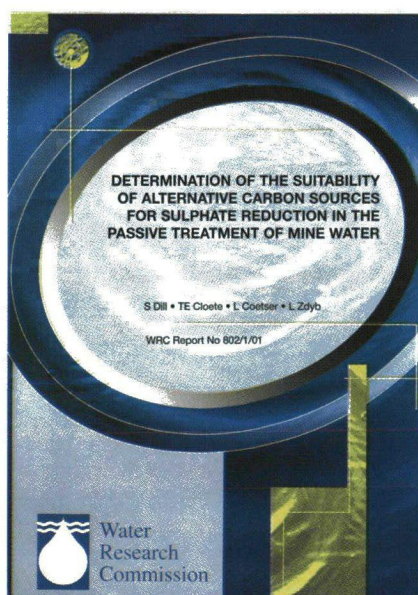
- ☐ A coherent set of laws, policies and regulations that control the import and distribution of invasive species needs to be rigorously and comprehensively implemented.
- ☐ Biological countermeasures can offer a very cost-effective solution to continuing invasion, but other methods of control also need to be investigated.
- ☐ Control measures should not be delayed because of the cost implications.
- ☐ Projects for clearing alien plant invaders should use rate of spread as a means of prioritisation; and
- ☐ Both scenario development and simulation modelling offer powerful analytical techniques for better understanding alien invasion and the strategies necessary to combat invasion.

The numerical simulation model is available from RA Chapman as an executable. He can be contacted at the CSIR in Stellenbosch E-mail address: [achapman@csir.co.za](mailto:achapman@csir.co.za)

## Report 802/1/01 - Determination of the suitability of alternative carbon sources for sulphate reduction in the passive treatment of mine water

Report to the Water Research Commission by the CSIR Division of Water, Environment and Forestry Technology in association with the Department of Microbiology and Plant Pathology, University of Pretoria.

**Authors:** S Dill, TE Cloete, L Coetser and L Zdyb  
**Overseas price:** US\$ 15 (via surface mail)



The report contains the results of a research project aimed at developing a quick test method for assessing the suitability of certain defined and undefined carbon sources for use in passive mine water treatment systems. The test procedure compares the sulphate reduction under controlled experimental conditions in an anaerobic reactor, using defined carbon sources such as lactic acid and others with undefined (complex) carbon sources.

The methodology developed was found to be reproducible and low in cost and can easily be implemented in other laboratories to screen potentially suitable carbon sources for sulphate reduction.



## Report 646/1/01 - An irrigation management tool for processing tomato production

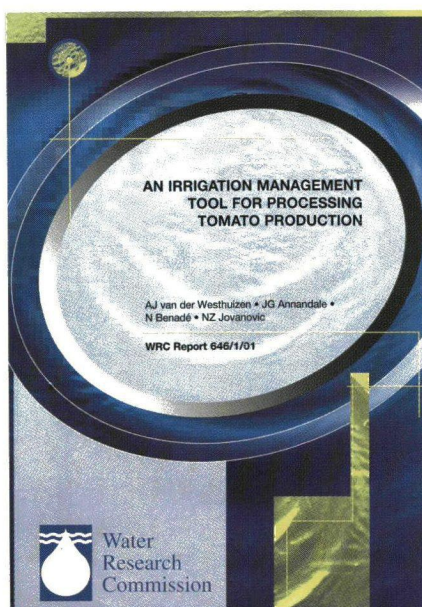
Report to the Water Research Commission by the Department of Plant Production and Soil Science, University of Pretoria.

**Authors:** AJ van der Westhuizen, JG Annandale, N Benadé and NZ Jovanovic

**Overseas price:** US\$ 20 (via surface mail)


This project, which was funded by the Water Research Commission in conjunction with Langeberg Foods and the University of Pretoria, was aimed at the maximisation of economic water use efficiency in processing tomato production. A computer program, TOM-MAN, was developed as a prototype model with processing tomatoes as an example, and will eventually be incorporated in the soil water balance (SBW) irrigation scheduling program which is currently under development by the University of Pretoria.

It is clear from numerous reports that irrigation management is the most important factor towards economic



optimisation of processing tomato production. The most crucial decision about irrigation management for processing tomatoes is to decide on when and to what extent irrigation should be reduced to apply the right amount of stress. This "right" amount of stress is not only a function of the physical situation, but is determined to a large extent by the economic situation as far as expected costs and benefits are concerned. To optimise economic

water use efficiency for the processing tomato industry, the total cost of the entire process (production as well as processing) should be minimised. To achieve this, the processor's quality based price for producer's tomatoes, should be structured in a way that the farmer's profit is maximised at the yield/quality combination where the total cost of the entire process is minimised. Producers need to be able to identify this optimum for their own situations and must then be able to manage the production system to achieve the target set. Optimisation of this system requires integration of all variables and constants affecting the crop-soil-climate-irrigation-management system, as well as the economic situation of the producer and processor.

A modelling approach seemed to be the only practical way of integrating all different variables into a single decision making process. Therefore, to facilitate this integration, a management tool in the form of a computer program was developed. The TOM-MAN program integrates the TOMYIELD crop growth model (which is based on the soil water balance irrigation scheduling program), and an economic optimisation model, TOM-ECON, which was developed during this project. 

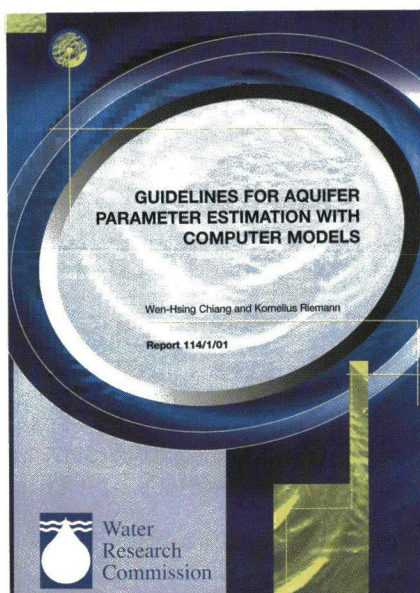
## Report 1114/1/01 - Guidelines for aquifer parameter estimation with computer models


Report to the Water Research Commission by the Institute for Groundwater Studies at the University of the Free State.

**Authors:** Wen-Hsing Chiang and Kornelius Riemann

**Overseas price:** US\$ 20 (via surface mail)

The report describes the fieldwork, the computer simulation and the step-by-step guidelines and recommendations



for conducting and analysing hydraulic test data. The geology of the test sites and the drilling program is explained in chapter 2. The results of the different hydraulic tests conducted on the test sites are presented in chapter 3, while the steps to analyse these hydraulic test data and to estimate the aquifer parameters with a numerical model are shown in chapter 4. The results from both the analytical and the numerical methods are compared and recommendations for analysing hydraulic test data are given in chapter 6. The guidelines for analysing hydraulic test data with numerical models, as given in chapter 5, consists of a detailed description of the steps for estimating the aquifer parameters using inverse modelling techniques. 





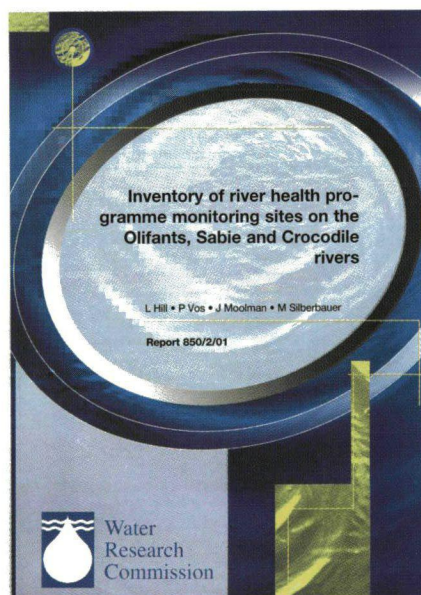
## **Report 850/2/01 - Inventory of river health programme monitoring sites on the Olifants, Sabie and Crocodile rivers**

**Report to the Water Research Commission by the Institute for Water Quality Studies, Department of Water Affairs, in conjunction with Environmentek, CSIR.**

**Authors:** L Hill, P Vos, J Moolman and M Silberbauer

**Overseas price:** US\$ 35 (via surface mail)


As resource managers are continually faced with increasingly complex challenges, they depend on the information provided by effective resource monitoring. To address the need for information on the state of aquatic ecosystems in South Africa, the Department of Water Affairs and Forestry launched an initiative to develop a programme for monitoring the health of aquatic ecosystems - the River Health Programme. The main purpose of this Programme is to serve as a source of information regarding the overall eco-



logical status of river ecosystems in South Africa. The Programme focuses primarily on biological characteristics as indicators of river health using the following primary indicators and indices - communities of fish (the Fish Assemblage Integrity Index), aquatic invertebrates (the South African Scoring System - SASS 4) and riparian vegetation (the Riparian Vegetation Index). Most of these indices are either

in a developmental stage or in the process of being refined. It is therefore crucial that testing, demonstration and integration of these different indicators take place to mould all the concepts into an operational programme. The Mpumalanga province was used as a pilot area for conducting tests and demonstrations.

This inventory contains information on each of the 201 sites monitored during these surveys as well as summaries of the three primary biological indicators that are used in the River Health Programme. The inventory layout gives definitions and descriptions of the terms used in the Inventory.

The layout provides, at a glance, details of each site in terms of date sampled, physical location (province, river, quaternary catchment, latitude and longitude, ecoregion, 1:50 000 map code) and a brief description of how to get to a site. Information about fish and macroinvertebrates includes the method of sampling, habitats sampled and whether historical information is available. Riparian vegetation information includes the width of the riparian zone, observations made in terms of the river channel, the surroundings and dominant species. 



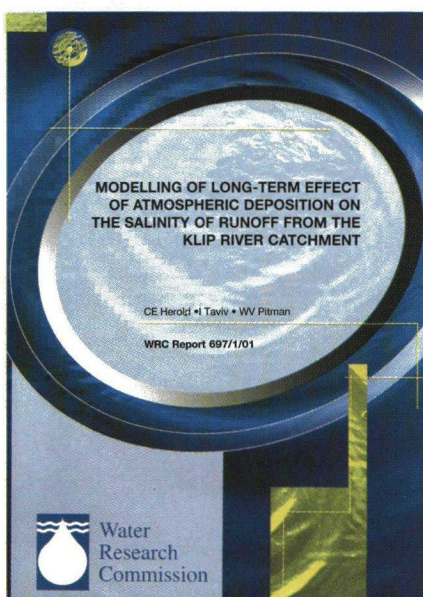
## Report 697/1/01 - Modelling of long-term effect of atmospheric deposition on the salinity of runoff from the Klip river catchment

Report to the Water Research  
Commission by Stewart Scott Inc.

**Authors:** CE Herold, I Taviv and WV Pitman


**Overseas Price:** US\$ 20 (via surface  
mail)

The water resources of the Vaal Dam catchment are of vital importance for the development of the Gauteng complex and downstream gold mining and agricultural areas. A report from the Department of Water Affairs & Forestry (DWAF) entitled a "Preliminary investigation of the impact of air pollution on water quality in the Vaal Dam" showed the potential economic and environmental impacts of air pollution on future



salinity levels in the runoff from the Vaal catchment. This DWAF report prompted a series of investigations starting with an assessment based on readily available water quality and atmospheric emission and deposition data. Thereafter, a Water Research

Commission (WRC) project was initiated to address the capacity of the soils of the catchment to retain sulphate. A second WRC project was aimed at investigating the total atmospheric sulphate deposition.

This report deals with the last uncertainty identified by the researchers - the catchment lag time. This aspect had to be addressed timeously, since planning decisions taken now could result in water quality problems in the medium to long term that cannot easily be remedied, except at crippling expense. The researchers say the question of the response time of the catchment can best be addressed by means of a conceptual computer model. This model is also essential for tying together the research work already undertaken by the WRC to render it useful as a water quality planning and management tool. An existing daily time step hydro-salinity model was adapted for this purpose and six different scenarios of Klip River catchment TDS and sulphate export for a 55-year period to 2050 have been simulated and compared with the natural background condition. 

## Report 331/1/01 - Oxygen transfer in filamentous biocultures

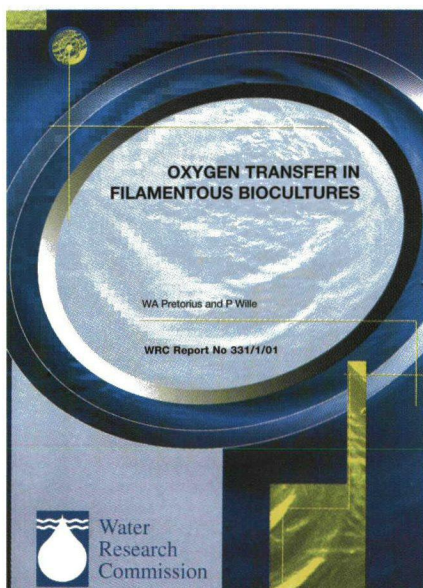
Report to the Water Research Commission by the Department of Chemical Engineering, Water Utilisation Division, University of Pretoria.

**Authors:** WA Pretorius and P Wille

**Overseas price:** US\$ 10 (via surface  
mail)


This report deals with the development of improved cultivation techniques of filamentous fungi (growing on a fatty acid containing industrial effluent) with special emphasis on oxygen transfer in such biocultures.

Researchers at the University of Pretoria have developed a micro-screen method for the selective cultivation of essentially mono-cultures of filamentous algae and fungi. In this



process the micro-screen also acts as a cell separator, similar to a secondary clarifier in activated sludge. Because of the screening action of the micro-screen, it is possible to increase the biomass in a continuous culture of fila-

mentous fungi to higher concentrations than what is usually achieved by other means. Unfortunately, increasing the biomass usually leads to a decrease in the efficiency of oxygen transfer in such cultures. Since oxygen is an essential (and costly) nutrient for aerobic biochemical processes, optimisation of oxygen transfer in filamentous fungi was identified as essential for the successful application of the micro-screen selective cultivation method for the treatment of some specific industrial wastewater streams.

A literature survey was done of the different methods used for determining the oxygen transfer rates obtainable from aeration devices, while the aeration efficiency in a biological growth system was also determined under various experimental conditions. It was found, inter alia, that there exists a linear relationship between the submergence depth of the diffuser and the rate of oxygen transfer. This means that the deeper the aeration depth, the better. 

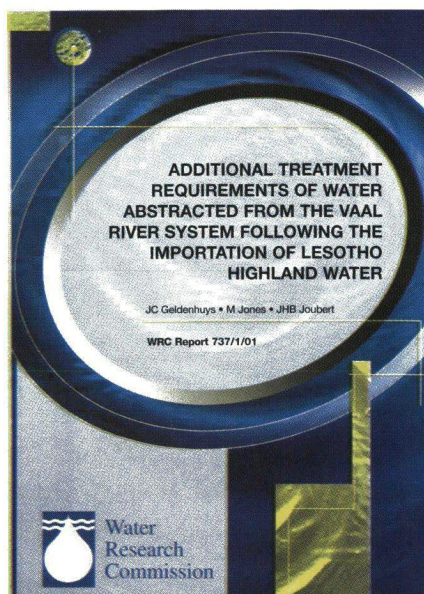


## Report 737/1/01 - Additional treatment requirements of water abstracted from the Vaal River system fol- lowing the importation of Lesotho Highland water


Report to the Water Research  
Commission by Scientific Services,  
Rand Water.

**Authors:** JC Geldenhuys, M Jones  
and JHB Joubert

**Overseas price:** US\$ 15 (via surface  
mail)



Data indicate that by the year 2006 demands for water made on the Vaal River system will exceed its capacity. To augment this invaluable resource strategic plans have resulted in numerous inter-basin transfer schemes, the latest of which is the Lesotho Highlands water project. At present, water from Lesotho flows through the Ash River outfall and down the Ash - Liebenbergsvlei - Wilge River system to the Vaal Dam from where it is abstracted for treatment at Rand Water's treatment works or released for downstream users.

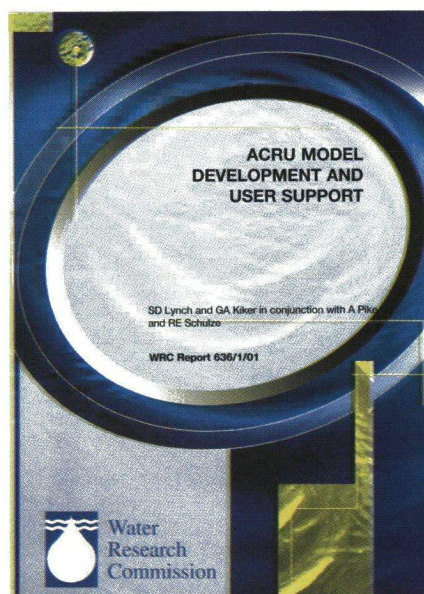
The report gives an idea of the expected effect of Lesotho Highlands water on the quality of water to be abstracted from the Vaal River below the Vaal Dam and guidelines for additional treatment requirements, as a result of the changes, are proposed. 

## Report 636/1/01 - ACRU model develop- ment and user sup- port

Report to the Water Research  
Commission by the School of  
Bioresources Engineering and Envi-  
ronmental Hydrology at the Uni-  
versity of Natal, Pietermaritzburg.

**Authors:** SD Lynch and GA Kiker in  
conjunction with A Pike and RE  
Schulze

**Overseas price:** US\$ 10 (via surface  
mail)




Since its origins as a catchment model applied in the Natal Drakensberg of KwaZulu-Natal, the ACRU modelling system has been enhanced to address numerous water-related challenges in South Africa and beyond. As a result of the many researchers, graduate students and consultants interacting with the model code and making various improvements, each consecutive addition has created a more difficult design and coding challenge for subsequent researchers. With the many contributions to the model over the past fifteen years, the result has been a code framework within which it is relatively

difficult to make new additions to the ACRU model, and in some instances the model structure has been unable to accommodate new modules at all.

The ACRU program code was developed in the Fortran 77 programming language which has some advantages in computational efficiency, but also has disadvantages in developing a modular, easily expandable program design.

As social and governmental interest in water-related issues increases, new capabilities and tools are being requested by various stakeholder groups to allow them to manage hydrological information more effectively. These requests can be grouped into two general categories, namely, requests for improved input and output tools to aid in the interpretation of hydrological information and requests for improved model performance to simulate hydrological features of interest.

The report describes a project aimed at improving the modelling of hydrological processes by restructuring the ACRU modelling with regard to model performance, user-oriented utilities and user educational support. The project was divided into three sections - viz. the internal development of the ACRU2000 model which sought to create a modular and well-designed model framework for current and future hydrological modelling innovations, the ACRU2000 utilities which provided improvements to the user interface system as well as data processing capabilities and the operations of the ACRU user consultant who provided both products and expert services to model users. 

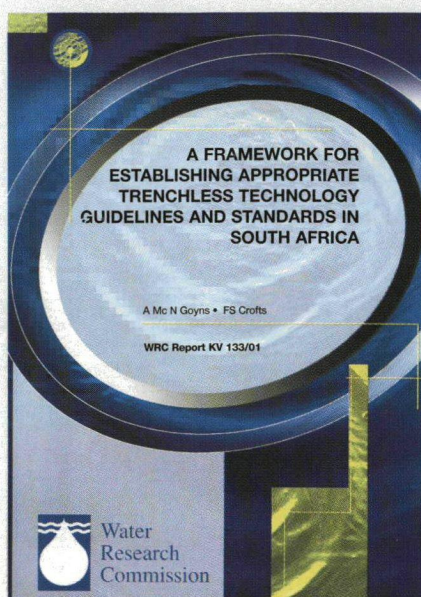


## Report KV 133/01 - A framework for establishing appropriate trenchless technology guidelines and standards in Southern Africa

Report to the Water Research Commission by the Technikon Pretoria in conjunction with Pipeline installation and Professional Engineering Services CC.

**Authors:** A Mc N Goyns & FS Crofts  
**Overseas price:** US\$ 20 (via surface mail)


The supply of clean water and the disposal of wastewater are essential components of primary health care for any community. These services are traditionally supplied via buried pipelines. Trenchless technology is the science of installing, repairing or renewing underground pipes, ducts and cables using



techniques that minimise or eliminate the need for excavations.

Many of the water supply lines and sewers in South Africa are reaching the end of their design lives and now need

to be replaced or rehabilitated. Due to increasing urbanisation and population densities, traditional open-cut or trenching techniques for doing this are becoming more technically difficult, socially disruptive, environmentally unacceptable, and also expensive. The option and potential for using trenchless technology to install and rehabilitate water and other services is, therefore, becoming increasingly prominent.

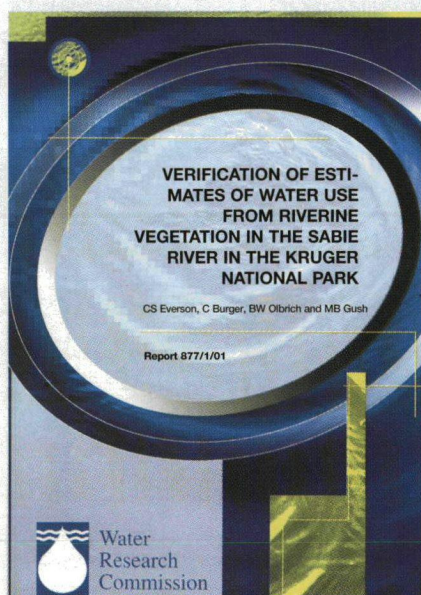
Although the trenchless industry has an annual turnover of about R50 million, hardly any national standards or guidelines exist to set quality requirements for these activities. The aim of this study, therefore, was to develop a framework to establish a comprehensive set of national trenchless technology standards and guidelines. The report provides such a framework for guidelines to select, design and specify trenchless technology activities as well as determining standards for pipes, materials and services used in trenchless technology installations and standard specifications for trenchless technology installations. 

## Report 877/1/01 - Verification of estimates of water use from riverine vegetation in the Sabie River in the Kruger National Park

Report to the Water Research Commission by the Division of Environmentek, CSIR.

**Authors:** CS Everson, C Burger, BW Olbrich and MB Gush  
**Overseas price:** US\$ 30 (via surface mail)


Expansion of agricultural and forestry activities in catchments west of the Kruger National Park are placing increasing demands on their limited water resources. One of the rivers that has been most affected is the ecologically important Sabie River. Reduced winter base flows in the river have resulted in increased water stress levels amongst the natural river biota. Consequently, there is an urgent need



to manage the water resources within the catchment effectively to ensure the viability of riverine ecosystems.

This report focuses mainly on one aspect of riverine hydrology, namely, evapotranspiration. In many biological systems evapotranspiration is the most important output flux accounting for up to hundred per cent of annual water

losses in wetland systems.

Accurate estimates of evapotranspiration are notoriously difficult to obtain. Rivers running through semi-arid areas such as the Kruger National Park present a particularly difficult challenge for estimating evapotranspiration, because of the problems associated with advection from the surrounding dry (hotter) areas and the limited fetch within the generally narrow boundaries of the outer banks of the river. In addition, the riverine systems studied, range from open water or inundated areas where evapotranspiration is not constrained by water availability to those where the water table is frequently below the surface and water availability for evapotranspiration is controlled by vegetation factors. As a consequence the evapotranspiration results produced by the study are often inconclusive or conflicting. Nevertheless, the aim of the study was to verify the empirically based transpiration estimates (calculated by previous researchers) by using the physically based Bowen ratio technique to estimate evapotranspiration from the Sabie River. 



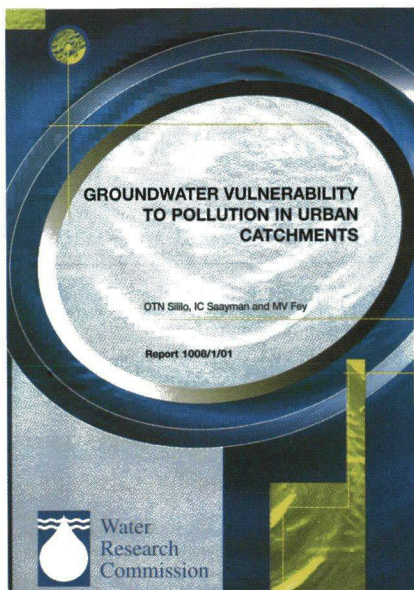
## Report 1008/1/01 - Groundwater vulnerability to pollution in urban catchments

Report to the Water Research Commission by the Water Programme, Division of Water, Environment and Technology at the CSIR in conjunction with the Department of Geology, University of Cape Town.

**Authors:** OTN Sililo, IC Saayman and MV Fey

**Overseas price:** US\$ 15 (via surface mail)

Groundwater contamination often occurs as a result of various human activities. The vulnerability of an aquifer to such pollution is directly linked to hydraulic characteristics of the aquifer overburden and to a significant degree determined by the characteristic of contaminant attenuation. The degree of interaction between the soil/aquifer characteristics and the pollutants will determine the vulnerability of an aquifer to pollution. Defining the extent of such interactions requires a multitude of physical, chemical and sometimes biological parameters for both the porous medium and the pollutant of interest. The Water Research Commission has funded a number of




projects to address certain aspects of these issues.

This report focuses mainly on groundwater vulnerability assessment with emphasis on soils and the unsaturated zone. Risk based approaches are not addressed. The authors say it was necessary to provide information on sources of groundwater contaminants and approaches to vulnerability assessment. An overview of sources, characteristics, fate and transport of

groundwater contaminants in the subsurface, including approaches to contaminant source mapping is given in chapter two of the report.

Vulnerability assessments provide a systematic way to evaluate how readily and quickly aquifers receive water (and contaminants) from the land surface. To understand the most important parameters that will influence the transport and fate of contaminants in the subsurface, it was important to review current approaches to groundwater vulnerability assessments internationally and in South Africa. This review is given in chapter three.

The use of soils data to assist in evaluating the fate and transport of contaminants is given in chapter four. This chapter also presents a preliminary qualitative assessment of soil horizons and other properties in terms of their contribution to groundwater recharge and the vulnerability of groundwater to pollution. In chapter 5, research issues which different experts deem important for groundwater protection are summarised. This is followed by a research agenda which will form a major part of the Water Research Commission's programme on groundwater protection. Chapter six is a discussion and conclusions chapter in which an overview is given of the project achievements in relation to project objectives. 

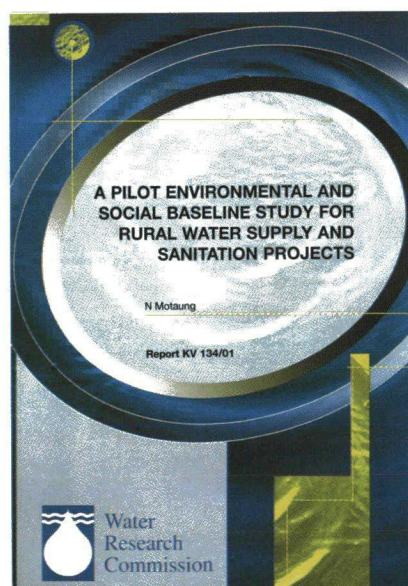
## Report KV 134/01 - A pilot environmental and social baseline study for rural water supply and sanitation projects

Report to the Water Research Commission by Bumba Research and Human Development Consultancy.

**Author:** N Motaung

**Overseas price:** US\$ 20 (via surface mail)


How do basic water supply projects benefit the people for whom they are intended? Do they improve the quality of life and health status of communi-



ties? If so, how? If not, why, and what needs to change to make them meet

the objectives for which they were intended?

Evaluation and impact studies best answer these questions. Such studies are, however, not very illuminating where there is no baseline information that depicts what conditions were prior to the installation of a water supply project.

This report summarises the results of a Water Research Commission sponsored project aimed at developing a methodological model for the baseline assessment of basic water supply and sanitation projects. The study identified key environmental and social variables, which through regular monitoring, would provide information on types and rates of changes brought about by the implementation of a water supply scheme. 



## Report 786/1/01 - An analysis of informal settlements and applicability of visual settlement planning (ViSP) in South Africa

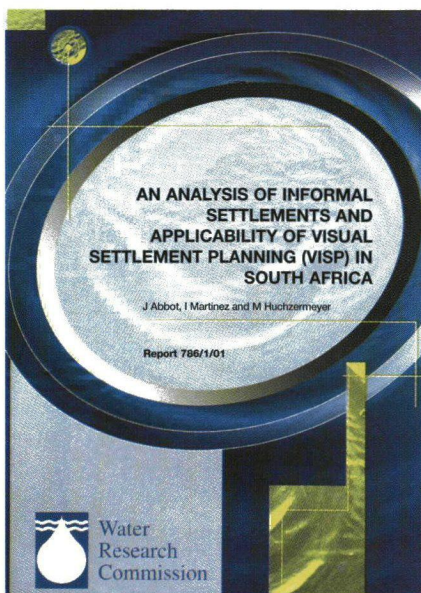
Report to the Water Research Commission by the Department of Civil Engineering, University of Cape Town.

**Authors:** J Abbot, I Martinez and M Huchzermeyer

**Overseas price:** US\$ 15 (via surface mail)

The analysis of informal settlement upgrading constitutes this report. Its initial focus was on a GIS-based planning methodology known as Visual Settlement Planning (ViSP). The methodology had been developed in Brazil and the intention was to explore whether the methodology was applicable and appropriate for South Africa.

The study differs from the norm for Water Research Commission studies in that its remit is wider than simply the aquatic environment of informal settlements. At the same time, it has a direct bearing on the work of the Commission and is intended to assist with the devel-



opment of policy in respect of water and informal settlements.

The report provides an overview of the issues that need to be addressed in developing a replicable methodology for informal settlement upgrading. It touches upon the issues of urbanisation and migration and the complexity of these issues. It then moves on to show that if upgrading is to become a component of national policy, three elements need to be addressed - these are, the technical methodology, the role

of the community and the organisational structure of the local authority.

The authors explore the international debate that compares sites and services with in-situ upgrading and discuss the benefits and disadvantages of each, saying that in spite of the recognised advantages, there still remains a strong general antithesis towards settlement upgrading in South Africa.

The report also focuses on the informal settlements themselves. It clarifies definitions and then explores the nature of settlement formation, before discussing economic processes that impact informal settlement development.

Three chapters in the report deal with Brazil. It covers the similarities that exist between Brazil and South Africa at a macro level with the objective of demonstrating the relevance of using Brazilian experience in South Africa. The authors describe settlement upgrading at the level of the favela, including the Alvorada programme in Belo Horizonte. This is done in two parts. The first part deals broadly with the upgrading methodology, while the second part deals specifically with the ViSP component. The report ends with a discussion of the way forward, which in turn lays the foundation for the second report in this series. 

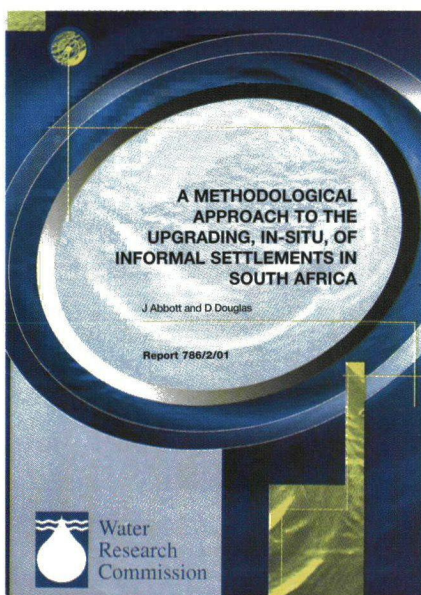
## Report 786/2/01 - A methodological approach to the upgrading, in-situ, of informal settlements in South Africa

Report to the Water Research Commission by the Department of Civil Engineering, University of Cape Town.


**Authors:** J Abbott and D Douglas

**Overseas price:** US\$ 15 (via surface mail)

The upgrading of informal settlements differs quite fundamentally from the development of vacant land for housing. Yet the majority of existing approaches continues to mirror traditional



practice in developing an implementation strategy. The underlying characteristics of informal settlements are poverty and social exclusion. All else flows from that. Thus any upgrading intervention should be able to define, and preferably quantify, its impact in ameliorating poverty as well as its contribution to social integration.

This report presents a methodological framework for upgrading high-density informal settlements in-situ. The framework derives from two primary sources - the first is an extensive desk study of informal settlements internationally, and the second is a practical experience of upgrading in the informal settlement of New Rest in Cape Town. Thus the first source provides the theoretical rationale, while the second source provides the practical experience of implementation. 





## **Report 897/1/01 - Asset management for the water services sector in South Africa**

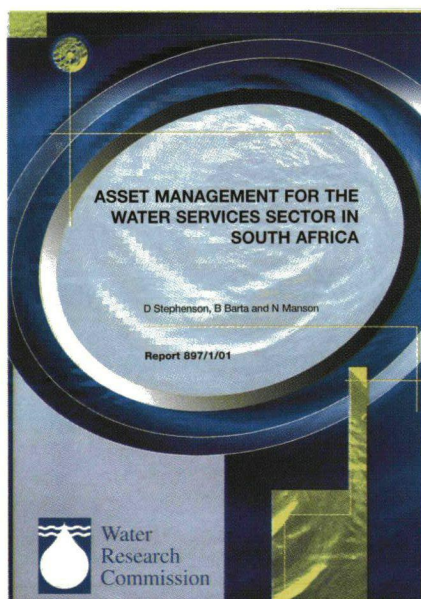
**Report to the Water Research Commission by the Water Systems Research Group at the University of the Witwatersrand.**

**Authors:** D Stephenson, B Barta and N Manson

**Overseas price:** US\$ 20 (via surface mail)


It is generally recognised that the development and rehabilitation of the water services sector infrastructure is extremely capital intensive. Therefore, to maximise the productivity of this industry's infrastructure assets, a sound understanding of the condition and performance of these assets is needed by those who own or administer them.

Against this background, it was realised that the subject of water asset management has not been properly attended to in South Africa to date and that the research of appropriate meth-



ods and techniques was urgently needed. The Water Research Commission acknowledged these needs and approved a research project with the objective of determining guidelines to improve asset management in the water services industry. This report contains the final results and products of the study.

The report says that although the responses to the implementation of the infrastructure asset management process has been positive, the asset information databases and extent of knowledge were found to be insufficient for direct implementation of standard asset management programmes. It says in a way, numerous water service authorities and providers will have to go through an evolutionary process to develop an adequate asset management plan. A great deal of asset management education in the water services industry will be needed to achieve a reasonable standard amongst all stakeholders.

Overall, this research project identified that the South African water services industry is at present without a unitary infrastructure asset management methodology. However, it is more than ready to implement one. It is believed that the standard procedures compiled in this report and the availability of standardised asset register software will add valuable products to the process of implementation of infrastructure asset management in the water services industry. 



## Report 754/1/01 - Assessing the ecological relevance of a spatially-nested geomorphological hierarchy for river management

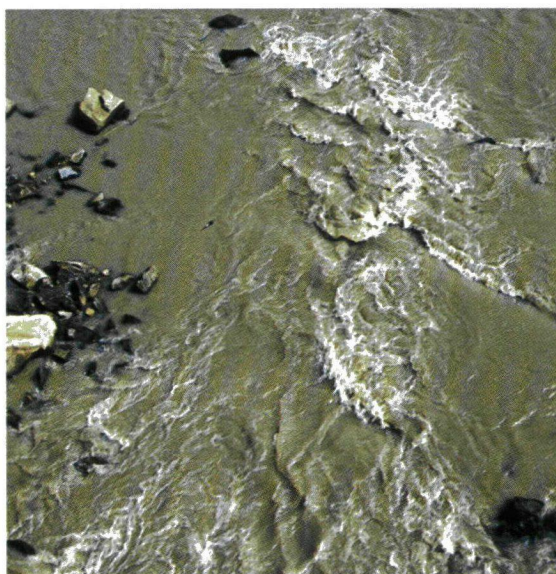
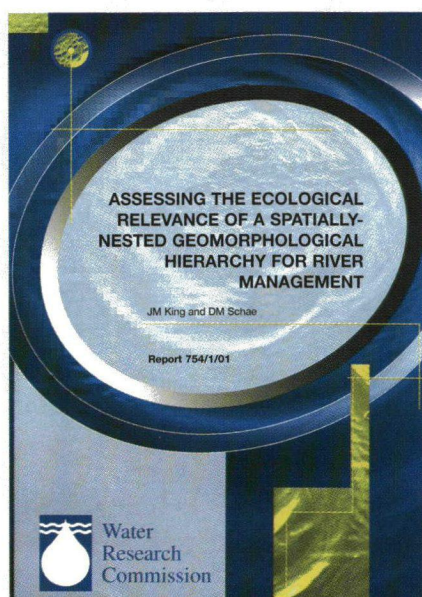
Report to the Water Research Commission by the Freshwater Research Unit, University of Cape Town.

**Authors:** JM King and DM Schaeel  
**Overseas price:** US\$ 35 (via surface mail)

Rivers are at the centre of our landscapes and lives. In South Africa they are the source of almost all freshwater which, arguably, is the most limited of the country's resources. Despite this, rivers are manipulated and used in many ways not conducive to the sustainable use of this resource.

Over the last two decades there have been concerted efforts by South African water managers and scientists to bring about more sustainable use of rivers. Such management of rivers requires a new approach based on an understanding of their nature and how they function as living systems. According to the authors of this report the data upon which to develop this understanding is sparse and generalisations will have to be made for management purposes, at least in the short term.

One generalisation often made for management purposes is that the physical and chemical (non-living or abiotic) attributes of rivers are good surrogates for their biological (living or biotic) attributes. By implication, the plants and animals (biota) that occur in one river with a given slope, altitude, geology, channel form and water chemistry, should be present in a similar stretch of all the other rivers in the region. If the river is undisturbed, then the degree to which the other rivers have not got similar biotas is a measure of the degree to which they are



degraded. This assumption, which is the foundation of river health biomonitoring programmes in South Africa and many other countries, is thus based on using abiotic attributes to infer ecological attributes. Such inference is useful, not least because abiotic attributes are often more easily measured.

However, the question remains: How well do such physical attributes truly reflect the ecological nature of the river systems? If they reflect them accurately, then generalising on river ecosystems based on physical data is a valid and useful management tool. If they do not, then such generalisations could represent a misleading "black-box" approach that is insensitive to the living

system, and could guide management decisions that are highly detrimental to it. Clearly, abiotic surrogates should not be a long-term management option until their ecological relevance is well understood.

### Hierarchy

To aid generalisations of the physical attributes of rivers, fluvial geomorphologists have suggested an hierarchical classification system for them. The system provides a way of grouping or classifying similar rivers or parts of rivers, based on their physical features. The hierarchy operates over a range of spatial and temporal scales. The catchment occupies the coarsest spatial level of the hierarchy, and changes to it occur over the longest time spans. Successively smaller-scale levels are the zone/segment, the reach, the morphological unit and the hydraulic biotope. The hydraulic biotope occupies the smallest-scale level and changes to it occur over the shortest time spans. Each level nests in the one above and is restricted by its characteristics.

The objective of the research project reported on in this publication was to assess the ecological relevance of this geomorphological hierarchy, and the question the researchers set out to answer was - Is the geomorphological character of a river a useful guide to its ecological character?

The researchers say a major impression from this project was that geomorphological hierarchies are exceedingly useful tools to aid organisation of thinking, studies and data analysis. Before such hierarchies were suggested, the country's ecologists were using a spatial hierarchy of sorts, but hierarchies such as those tested here enabled a giant step forward in the way ecologists viewed rivers. As a result, the study of physical-biotic links in rivers has gradually taken its place alongside studies of chemical-biotic links, providing a much more rounded perspective on river functioning, to the benefit of both fields of study.



SOUTHERN AFRICA  
& AFRICA

2002

## ENVIRONMENTAL AUDIT

JUNE 10 - 14

An IEMA approved environmental auditor course will be held by Crystal Clear Consulting in Durban and on 12 to 16 August in Johannesburg.

Enquiries: Crystal Clear - Tel 011- 882 3368. E-mail address: info@crystalclear.co.za

WATER RESOURCE  
MANAGEMENT

JUNE 20 - 21

A short course on water conservation and demand management will be presented by the University of Pretoria.

Enquiries: Anneke Kruger, University of Pretoria. Tel: 012-420 5026. Fax: 012-362 5285. E-mail: anneke.ce@up.ac.za

## WATER LAW

JUNE 24 - 28

A course on the new water law will be held at the Centre for Environmental Management, Potchefstroom University.

Enquiries: Mrs Dydre Greeff, Section for Training Co-ordination, PU for CHE. Tel: (018) 299-2714 or 299-2725. Fax: (018) 299-2726. E-mail: aokdg@puknet.puk.ac.za Web: www.puk.ac.za/bbdwww/aok/index.htm

## AQUATIC SCIENCE

JUNE 30 - JULY 5

A joint congress of the Southern African Society of Aquatic Scientists (SASAqS) and the Southern African Institute of Ecologists and Environmental Scientists (SAIE & ES) will be held at the University of the Free State in Bloemfontein. The theme will be "Research, conservation and management of ecosystems in Southern Africa". Enquiries: Dr JC Roos, Centre for Environmental Management, UFS, PO Box 339, Bloemfontein 9300. Tel: (051) 401 2265. Fax: (051) 401 2629. E-mail: roosjc@sci.uovs.ac.za

## SACI2002

JULY 1 - 5

The 36th convention of the South African Chemical Institute will be held in Port Elizabeth.

Enquiries: Dr CD Woolard,

Department of Chemistry, University of Port Elizabeth, PO Box 1600, Port Elizabeth 6000. E-mail: SACI2002@UPE.AC.ZA

## EMS (ISO14001)

JULY 1 - 5

An IEMA accredited training course on EMS (ISO14001) implementation and internal audit will be held by WSP Walmsley in Durban.

Enquiries: Sharali Barnard - Tel: 011- 233 7886/7. E-mail address: training@wspgroup.co.za

## ENVIRONMENTAL AUDITING

JULY 1 - 5

A short course on Environmental Auditing will be held at the Centre for Environmental Management, University of Potchefstroom.

Enquiries: Mrs Dydre Greeff, Section for Training Co-ordination, PU for CHE. Tel: (018) 299-2714 or 299-2725. Fax: (018) 299-2726. E-mail address: aokdg@puknet.puk.ac.za Web: www.puk.ac.za/bbdwww/aok/ind ex.htm

## ECOLOGICAL REHABILITATION

JULY 29 - AUGUST 1

A short course on the basic principles of ecological rehabilitation and mine closure will be held at the Centre for Environmental Management, Potchefstroom University.

Enquiries: Mrs Dydre Greeff, Section for Training Co-ordination, PU for CHE. Tel: (018) 299-2714 or 299-2725. Fax: (018) 299-2726. E-mail address: aokdg@puknet.puk.ac.za Web: www.puk.ac.za/bbdwww/aok/ind ex.htm

## SUSTAINABLE DEVELOPMENT

AUGUST 26 - SEPTEMBER 4

The international World Summit on Sustainable Development will be held in Johannesburg.

Enquiries: WISA - Tel: 011-805 3537. Fax: 011-315 1258. E-mail: wieenv@mweb.co.za Websites: www.wisa.co.za/worldsummit/ or www.johannesburgsummit.org or www.earthsummit 2002.org/roadmap

## ENVIRONMENT

SEPTEMBER 4 - 6

A new training course on environmental compliance, sustainable development and business opportunities will be held by WSP Walmsley in Johannesburg.

Enquiries: Sharali Barnard - Tel: 011- 233 7886/7. E-mail address:

training@wspgroup.co.za

## ENVIRONMENTAL

## MANAGEMENT

SEPTEMBER 17 - 19

A short course on environmental management will be presented by the Environmental Engineering Group at the University of Pretoria.

Enquiries: Ms Tanya de Bruin. Tel: (012) 420 5015. Fax: (012) 362 52 85. E-mail: tanya.ce@up.ac.za

## WATER &amp; SANITATION

SEPTEMBER 23 - 24

A short course on water supply and sanitation will be presented by the University of Pretoria.

Enquiries: Anneke Kruger, University of Pretoria. Tel: 012-420 5026. Fax: 012-362 5285. E-mail: anneke.ce@up.ac.za

## HYDRAULIC ENGINEERING

DECEMBER 4 - 6

The International Association for Hydraulic Research (IAHR) African Division's biennial congress with the theme "Water - the lifeblood of mankind" will be held in Arusha, Tanzania.

Enquiries: The Institution of Engineers, PO Box 2938, Dar-es-Salaam, Tanzania. E-mail: iet@iet.co.tz Tel: +255 22 212 4265. Fax: 212 2836. Web:

## OVERSEAS

2002

http://www.iet.co.tz

## ECWATECH-2002

JUNE 4 - 7

The 5th international congress and trade fair - Water, Ecology and Technology will be held in Moscow, Russia.

Enquiries: Sergey Malygin, SIBICO International Ltd, PO Box 173, Moscow, 107078 Russia. Tel/Fax: +7 (095) 975 1354, 975 5104. E-mail: ecwatech@sibico.com Website address: www.sibico.com/ecwateche/index.htm

## WATER UTILITIES

JUNE 12 - 14

A conference on the management of productivity at water utilities will be held at Praha in the Czech Republic.

Enquiries: Katerina Slaviakova, Aquion s.r.o., Delnika 38, CZ-170 00 Praha 7, Czech Republic. Tel: +420 283872265. Fax: +420 283872266. E-mail address:

ManProWU@aquion.cz

## AWWA

JUNE 16 - 20

The American Waterworks Association's annual conference and exhibition will be held in New Orleans, USA.

Enquiries: David Rossiter, AWWA, USA. E-mail address: rossiter@awwa.org Tel: +303 347 6209. Web: http://www.awwa.org/tande/awwaconf.htm

## GROUNDWATER

JUNE 17 - 19

A conference on soil and groundwater pollution induced by the transport industry will be held in Oslo, Norway.

Enquiries: Transport and Pollution, Department of Geology, PO Box 1047, Blindern 0316 Oslo, Norway. Fax: +47 22 85 42 15. E-mail address: transpollution@geologi.uio.no

## GROUNDWATER

JUNE 17 - 20

ModelCARE 2002 - the 4th international conference on calibration and reliability in groundwater modelling (a few steps closer to reality) will be held in Prague, Czech Republic.

Enquiries: Conference Secretariat, ModelCARE 2002 Guarant Ltd, Opletalova 22, 110 00 Prague 1, Czech Republic. Tel: +420 2 8400 1444. Fax: +420 2 8400 1448. E-mail address: modelcare2002@guarant.cz Website: http://www.guarant.cz/ModelCARE2002

## HYDROINFORMATICS

JULY 1 - 5

The 5th international conference on hydroinformatics - Hydroinformatics 2002 - will be held in Cardiff, UK. Hydroinformatics is concerned with the application of computer and networking technology for the planning, management and protection of the water environment.

Enquiries: Cherrie Summers, Hydroinformatics 2002, Conference Secretariat, Cardiff University, Cardiff School of Engineering, PO Box 925, Newport Road, Cardiff CF24 0YF, UK. Tel/fax: +44 29 20874421. E-mail: summersc@cardiff.ac.uk Web: http://www.cf.ac.uk/engin/news/confs/hydro

## ISWA 2002

JULY 8 - 12

The International Solid Waste Association (ISWA) world environment congress and exhibition will be held in Istanbul, Turkey.



Theme: Appropriate environmental and solid waste management and technologies for developing countries.

Enquiries: MICWORLD, Bagdat Cad. No: 254/2-8 81060 Göztepe, Istanbul, Turkey. Tel: +90 216 467 5398. Fax: +90 216 302 5216. E-mail address: iswa2002@iswa2002.org Web: <http://www.iswa2002.org>

## IRRIGATION

JULY 21 - 28

The 53rd IEC meeting and 18th international congress on irrigation and drainage will be held in Montreal, Canada.

Enquiries: Jean-Marcel Laferriere, Chairperson of the Organising Committee, CIDA, 200 Promenade du Portage, Hull, QC K1A 0G4 Canada. Tel: +1 819 953 4327. Fax: +1 819 994 0251. E-mail address: jean-marc-laferriere@ACDI-CIDA.GC.CA

## CSCE/ASCE

JULY 21 - 24

The 2002 joint CSCE/ASCE international conference with the theme - An international perspective on environmental engineering will be held at Niagara Falls in Canada.

Enquiries: Professor Richard G Zytner. E-mail: CSCEASCE\_2002@yahoo.ca Web-address: [www.eos.uoguelph.ca/web/files/CSCE\\_ASCE\\_2002](http://www.eos.uoguelph.ca/web/files/CSCE_ASCE_2002)

## WATER RESOURCES

JULY 22 - 26

The 3rd international conference on water resources and environmental research (ICWRER) with the theme "Water quantity and quality aspects in modelling and management of ecosystems will be held in Dresden, Germany. Enquiries: Conference Secretariat ICWRER 2002, Institute of Hydrology and Meteorology, Dresden University of Technology, Wuerzburger Str 46, 01187 Dresden, Germany. Tel: +49 351 463 3931. Fax: +49 351 463 7162. E-mail: icwrrer2002@mailbox.tu-dresden.de Web: [www.tu-dresden.de/fghhihm/hydrologie.html](http://www.tu-dresden.de/fghhihm/hydrologie.html)

## DAM SAFETY

AUGUST 12 - 23

An international technical seminar and study tour on dam safety, operation and maintenance will be presented by the US Department of the Interior's Bureau of Reclamation in Denver, Colorado, USA. Enquiries: International Affairs

Team, D-1520, US Bureau of Reclamation, PO Box 25007, Denver, Colorado 80225. Tel: 303-445-2127. Fax: 303-445-6322. E-mail: Lprincipe@do.usbr.gov Web: <http://www.usbr.gov>

## SOIL SCIENCE

AUGUST 14 - 21

The 17th world congress on soil science - confronting new realities - will be held in Bangkok, Thailand.

Enquiries: Mrs Catherine Vachon. Tel: 1 403 317 2257. Fax: 1 403 382 3156. E-mail address: vachonc@em.agr.ca Website: [www.res2.agr.ca/lethbridge/hebei/confindex.htm](http://www.res2.agr.ca/lethbridge/hebei/confindex.htm)

## ACID SOILS

AUGUST 25 - 30

The 5th world acid sulphate soils conference will be held at the Quality Resort Twin Towns, Tweed Heads, NSW Australia.

Enquiries: Jacki Rose. Tel: 0011 61 75536 4000. Fax: 0011 61 7 5599 5167. E-mail: hwtweedm@onthenet.com.au Web: [www.acro69.webcentral.com.au/acidates.html](http://www.acro69.webcentral.com.au/acidates.html)

## GROUNDWATER

AUGUST 28 - 30

A short course on groundwater in the mining industry will be presented by the Centre for Groundwater Studies in Australia.

Enquiries: Trevor Pillar, Manager Communications and Training, Centre for Groundwater Studies. Tel: 08 8201 5632. Fax: 08 8201 5635. E-mail: trevor@groundwater.com.au Web: <http://www.groundwater.com.au>

## ESBES-4

AUGUST 28 - 31

The 4th European symposium on biochemical engineering science - ESBES-4: Life Science and Technology - will be held in Delft, the Netherlands.

Enquiries: Information and registration through [www.esbes4.tnw.tudelft.nl](http://www.esbes4.tnw.tudelft.nl). E-mail: esbes4@tnw.tudelft.nl

## FLUVIAL SYSTEMS

SEPTEMBER 2 - 6

An international symposium on the structure, function and management implications of fluvial sedimentary systems will be held in Canberra, Australia.

Enquiries: Dr Fiona Dyer, School of Resource, Environment and Heritage Sciences, University of Canberra, Canberra ACT 2601, Australia. Tel: +61 2 62012267. Fax: +61 2 62012328. E-mail:

[fiona.dyer@canberra.edu.au](mailto:fiona.dyer@canberra.edu.au) Web site: <http://lake.canberra.edu.au/~iahs2002>

## RIVERS

SEPTEMBER 3 - 6

The 5th international river management symposium with the theme - "The scarcity of water - the future of rivers, the future of water" - will be held in the Brisbane Convention and Exhibition Centre, Brisbane, Australia.

Enquiries: Selina Ward. E-mail: [selina@riverfestival.com.au](mailto:selina@riverfestival.com.au). Phone: 61 7 38467444. Website: <http://www.riverfestival.com.au>

## ANAEROBIC DIGESTION

SEPTEMBER 11 - 13

The 3rd international symposium on anaerobic digestion of solid waste will take place in Garching, Germany.

Enquiries: Rüdiger Dalhoff, Am Coulombwall, D-85748 Garching. Tel: +40 89289 13710. Fax: +49 89289 13718. E-mail: Dalhoff@bv.tum.de

## DRY AREAS

SEPTEMBER 15 - 19

An international conference on environmentally sustainable agriculture for dry areas for the 2nd millennium will take place in Shijiazhuang, Hebei, People's Republic of China.

Enquiries: Mrs Catherine Vachon. Tel: 1 403 317 2257. Fax: 1 403 382 3156. E-mail address: vachonc@em.agr.ca Web: [www.res2.agr.ca/lethbridge/hebei/confindex.htm](http://www.res2.agr.ca/lethbridge/hebei/confindex.htm)

## MINE WATER

SEPTEMBER 15 - 21

The 8th international Mine Water Association congress will be held in Freiberg, Germany.

Enquiries: UMH@geo.tu-freiberg.de or <http://www.geo.tu-freiberg.de/institut/hydro/UMH>

## GROUNDWATER

SEPTEMBER 22 - 26

The 4th international symposium on artificial recharge of groundwater with the theme - Sustainability of artificial recharge - will be held in Adelaide, Australia.

Enquiries: Conference Manager, Hartley Management Group Pty Ltd, PO Box 20 Kent Town, South Australia 5071. Tel: +61 8 8363 4399. Fax: +61 8 8363 4577. E-mail address: isar4@hartleymgt.com.au

## WASTEWATER TREATMENT

SEPTEMBER 23 - 25

The IWA 5th specialised conference on small water and waste-

water treatment systems will be held in Istanbul, Turkey.

Enquiries: Prof Dr Izzet Ozturk, Istanbul Teknik University, Civil Engineering Faculty, Environmental Engineering Department, 80626 Maslak, Istanbul, Turkey. Tel: +90 212 2853790. Fax: +90 212 2853781. E-mail: iozturk@srv.ins.intu.edu.tr

## NUTRIENT REMOVAL

OCTOBER 2 - 4

An international conference with the theme "From nutrient removal to recovery" will be held in Amsterdam, the Netherlands.

Enquiries: Conference Secretariat, Buerweg 51, 1861 CH Bergen, the Netherlands. Tel: +31 20 460 2466. Fax: +31 20 4602475. E-mail: r.r.kruize@inter.nl.net

## GROUNDWATER

OCTOBER 21 - 25

The 32nd conference of the International Association of Hydrogeologists (Argentine Chapter) will be held in Mar del Plata, Argentina.

Enquiries: Sylvia Caesar Rey, Carlos Pellegrini 3775, 7600 Mar del Plata, Argentina. E-mail: scaesar@argenet.com.ar Web: <http://www.mdp.edu.ar/exactas/geologia/iah2002/iah2002.html>

## AGRO-ENVIRON 2002

OCTOBER 26 - 28

The 3rd international symposium on agro-environmental issues will be held at the National Authority for Remote Sensing and Space Sciences (NARSS) in Cairo, Egypt. Call for papers.

Enquiries: Prof Sami Abdel-Rehman, NARSS, 23 Joseph Brows Titi Street, El Nozha El Gedida, Cairo Egypt. PO Box 1564 Alf-Maskan. Tel (202) 2964386-2975688. Fax: (202) 2964387-2964385. E-mail: sirahman@intouch.com

## SANITATION

NOVEMBER 18 - 22

The 28th WEDC conference on sustainable environmental sanitation and water services will be held in Kolkata (Calcutta), India.

Enquiries: Mrs Dot Barnard, WEDC Conference Co-organiser, WEDC, Loughborough University, Leicestershire LE11 3TU, England. Tel: +44 (0) 1509 223772. Fax: +44 (0) 1509 211079. E-mail address: wedc-conf@lboro.ac.uk Web: <http://www.lboro.ac.uk/wedc/>



# SOUTH AFRICAN MULTI-STAKEHOLDER INITIATIVE ON THE WORLD COMMISSION ON DAMS REPORT

MULTI-STAKEHOLDER FORUM  
JOHANNESBURG: 23 July 2002

Return to:

<b>Secretariat</b>	
Cathy Sepeng C/o Development Bank of Southern Africa PO Box 1234 1685 Halfway House, South Africa	Tel +27 11 313 3615 Fax +27 11 313 3086 catherines@dbsa.org

## APPLICATION TO REGISTER (ALL DELEGATES)

First Name					
Family Name					
Organisation					
Mailing Address	Street/PO Box				
	Town	Code			
	Province				
Telephone					
Fax					
Cell					
email					
Indicate the sector you <b>most</b> closely identify with or views you can represent		Government	NGO	Affected community	Utility
		Labour	Agriculture	Research Finance	Private Sector
Briefly describe the constituency you represent					

## OPTIONAL APPLICATION FOR FINANCIAL ASSISTANCE

The Initiative expects to (but can not guarantee that it will) have sufficient financial resources to pay for part, or all, of the travelling and subsistence costs of delegates who, but for this assistance, would not be able to participate at the Forum. The Initiative will only pay for the costs it has agreed to in writing before the event. It will pay suppliers directly and not reimburse costs incurred by a delegate.

How will you travel to Johannesburg	
Will another delegate be travelling with you	
Do you require accommodation in J'burg	
Estimate the cost of your travel to J'burg	

Signature

Date

The SA Initiative on the World Commission on Dams Report was established by a multi-stakeholder group representing NGO's, affected communities, government, utilities, private sector and research and finance, to consider the implications for and the implementation in South Africa of the WCD Report



## **SOUTH AFRICAN MULTI-STAKEHOLDER INITIATIVE ON THE WORLD COMMISSION ON DAMS REPORT MULTI-STAKEHOLDER FORUM**

JOHANNESBURG: 23 July 2002

### **ANNOUNCEMENT AND CALL TO REGISTER**

On 23/24 July 2001, the Symposium on the World Commission on Dams (WCD) Report: *Dams and Development – A New Framework for Decision Making* was convened in Midrand, Gauteng. This was a multi-stakeholder forum to discuss the implications for South Africa of the report of the WCD. Wide ranging representation was present from government, NGOs, affected parties, sector professionals, academia and financing and research institutions. The overall consensus of the meeting was broad support for the seven strategic priorities outlined in the WCD Report that cover dams and their development. It was clear however that these priorities needed to be contextualised in the South African situation. A Co-ordinating Committee (CC) was convened to pursue the issue with two representatives chosen from each of the above sectors, with additional representation sought from agriculture and labour.

The CC is preparing a draft Scoping Report that will analyse the issues around the strategic priorities and their associated guidelines as they specifically relate to the Southern African situation, identify those that might be contentious, identify any specific studies or research that is needed and recommend the way forward for the initiative. In the shorter term the CC is working towards presenting a meaningful report during the World Summit on Sustainable Development (WSSD) to be held in Johannesburg in August 2002.

A meeting of the multi-stakeholder forum will be held on Tuesday 23<sup>rd</sup> July 2002 with the 22<sup>nd</sup> reserved for consultations and information sessions in sectoral interest groups.

The purpose of the multi-stakeholder forum is to take the Initiative forward by:

- Being briefed on the Dams and Development Project that is under the auspices of the United Nations Environment Programme (the multilateral follow-up to the WCD);
- Receiving clarification on the draft Scoping Report;
- Further debating the issues raised by the WCD Report in a southern African context;
- Finalising and approving the Scoping Report, which will give direction to the CC in the next phase of its work and will be presented during the WSSD;
- Reviewing the form and mandate of the Initiative;
- Nominating persons to sit on the CC that will take the process forward.

The multi-stakeholder forum will be an inclusive event with any stakeholder invited to participate. Thanks to a sponsorship from Rand Water there will be no charge for attendance. Delegates who lack resources for travelling and subsistence may apply to the CC for assistance. Space is however limited and the CC will allocate spaces so as to balance representation between the identified sectors.

On request to the address below you will be sent a copy of the Steering Committee Report (on the process) and an application form for registration and will be kept informed of the Initiative's progress. The Scoping Report will be sent when completed to registered delegates. You are encouraged to register immediately as space is limited.

Secretariat	
Cathy Sepeng C/o Development Bank of Southern Africa PO Box 1234 1685 Halfway House, South Africa	Tel +27 11 313 3615 Fax +27 11 313 3086 catherines@dbsa.org

The SA Initiative on the World Commission on Dams Report was established by a multi-stakeholder group representing NGO's, affected communities, government, utilities, private sector and research and finance, to consider the implications for and the implementation in South Africa of the WCD Report





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# WATER

## Resource Management

### Strategic advantages

Empowering people to become key players in the management of South Africa's most limited resources

### Course presenters

The course is presented by leaders in the field from the University of Pretoria, the CSIR and other industrial partners.

### Course schedule

26 April 2002:

- Control of biofouling and biocorrosion in industrial water systems

20 and 21 June 2002:

- Water conservation and demand management

23 and 24 September 2002:

- Water supply and sanitation

### Course fee:

R1500 per person per course (cancellation fee: R250 within 14 days of starting date). R 1250 per person for two or more delegates from the same company. The fee includes training material as well as teas and lunch. Accommodation and travel arrangements must be arranged by individuals. Course fees must be paid before commencement of the workshop

### Contact details;

Prof TE Cloete  
Head: Department of Microbiology and Plant Pathology  
University of Pretoria  
Tel: (012) 420-3265  
Fax: (012) 420-3266  
tecloete@postino.up.ac.za

CE @ UP  
Anneke Kruger  
University of Pretoria  
Tel: (012) 420-5026  
Fax: (012) 362 5285  
anneke.ce.up.ac.za



**CONTINUING EDUCATION**





# Joint European - Southern African international conference

**Pesticides in non-target agricultural environments: environmental and economic implications**

**January 21-23, 2003  
University of Cape Town, South Africa**

## THEME

Both Europe and Africa are experiencing intensified agricultural development and the inevitable environmental pressures that result. At the same time there is a growing need for 'environmentally friendly' products. Good examples are the fruit and wine industries in South Africa, where competition for world markets requires specialisation and diversification of cropping systems but there is also a need to harmonize production systems with the increasing ecological demands of consumers. It is thus anticipated that ecotoxicological assessments and risk mitigation strategies leading to environmentally acceptable meth-



ods of crop production will become increasingly important.

## THE MAIN OBJECTIVE

of this conference is to bring together scientists, agriculturalists and representatives of government and industry to discuss the various issues, including methods for assessing the effects

of exposure to agricultural pesticides, strategies for risk management, and the economic implications of pesticides in non-target terrestrial and aquatic environments. The situation in southern Africa as a developing region will be of particular interest but delegates from elsewhere in the developing and the developed world are encouraged to participate.

**The conference is to be structured according to the following main topics:**

- pesticide exposure: monitoring and predictive approaches
- ecotoxicological effects at different scales: terrestrial and aquatic individuals, populations and communities, biomarkers, modeling
- risk assessment: policies, risk management and mitigation, probabilistic approaches
- economic implications: links between production processes and consumer needs, resource economics, socio-economic aspects and certification systems

Invited speakers from academia, governmental organisations and industry will cover the different topics in a series of keynote lectures.

*If you are interested in attending, please send proposed titles, indication of interest or any queries to:*

pest@botzoo.uct.ac.za or visit our web-site at:  
<http://www.tu-bs.de/conference-CPT>

The second announcement will be distributed in June 2002 and will call for papers and posters as well as containing information about registration, accommodation and costs.

## DATES & DEADLINES

**June 15, 2002** - 2nd announcement, call for papers, on-line registration

**September 1, 2002** - Deadline for abstract submission and early registration

**October 1, 2002** - Notification of abstract acceptance

**January 21-23, 2003** - Conference at University of Cape Town, South Africa

## CONTACT DETAILS

Local organisers of the conference may be contacted at:

E-mail: pest@botzoo.uct.ac.za • Fax: +27 21 650 3301

or telephone: Jenny Day (Cape Town, South Africa):

Tel: +27 21 650 3635/6 • <http://www.uct.ac.za/depts/zoology/fru/mainindex.html>

Ralf Schulz (Braunschweig, Germany):

