Incorporating the Water Research Commission's SA Waterbulletin

THE WATER WHEEL

Your water knowledge hub

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South African Youth Water Prize: Alien Buster Goes To Stockholm

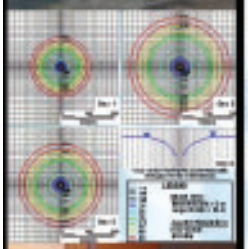
Irrigation Talk: Fresh Vegetables From Grey Water

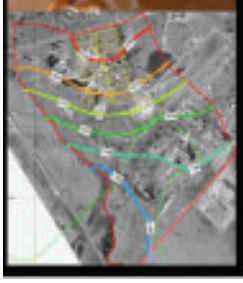
Municipal Water: Big Savings Through Leakage Reduction











JMA (Jasper Müller Associates) was founded on 1 October 1988, as a 1 man Professional Practice, specializing in environmental geohydrology. It has since grown into one of the biggest geohydrological specialist firms in South Africa, and currently employs 17 people, 9 of which are professionally qualified, and registered, earth and environmental scientists with SACNASP.

Jasper Müller Associates CC

"at the edge of ground water innovation"

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Main photo: The Orange-Riet irrigation canal at Jacobsdal.

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East Cape Research Institute Goes Global

The Institute for Water Research (IWR) at Rhodes University in Grahamstown has been well-known for many years as a leading innovator in the fields of freshwater ecology, hydrology and water quality, as well as community outreach. The Institute has been prominent in teaching, research and consultancy, as well as in the development of new environmental policies for water management in South Africa. In recent years, members of the Institute have been in regular demand in other countries, to present research findings, run courses and help with problem solving. In the past 18 months Institute researchers have made 18 visits to countries as diverse as Norway, Japan, South Korea, Switzerland, the USA and Australia, all at the invitation of the host countries.

Now members of the Institute are taking up senior positions in other countries, not in order to leave South Africa, but to use their experience and skills on the global stage, while increasing the opportunities and resources for training and research here.

O'KEEFFE

The current Director of the IWR, Professor Jay O'Keeffe, will be going to Holland at the end of September, to take up a position as UNESCO WWF Professor of Freshwater Ecosystems at the UNESCO Institute for Water Education (IHE) in Delft (UNESCO is the United Nations Education and Science Organisation, and the WWF is the World Wildlife Fund). The IHE specialises in research and training in freshwater for developing countries. Professor O'Keeffe's responsibilities will be to build up the IHE's capabilities in freshwater ecology, and to initiate and support training and research projects in developing countries. "I have indicated to the IHE that I would like to continue to make Southern Africa the focus of my activities, since this is where my experience is", says Prof O'Keeffe. "The philosophy at the IHE is to initiate projects, train local personnel, and hand over responsibility to the host country. South Africa provides an ideal platform for these types of project, because there are already institutions such as the IWR, with the expertise and capacity to take on training and research projects. I shall be aiming to build on that capacity, and to access resources that will make the IWR and other research centres more effective."

PALMER

Professor Tally Palmer has spent the past few years developing a very successful water quality research centre within the IWR. She is presently the Director of the Unilever Centre for Environmental Water Quality, which is sponsored by the Unilever Foundation, and specialises in assessments of the environmental effects of changing water quality in South African freshwater ecosystems. She has recently accepted the post of Director of the Institute for Water and Environmental Resource Management at the University of Technology, Sydney, in Australia. IWERM has research groups in ecotoxicology, waste water engineering, geohydrology and plant-water relations. Tally hopes to forge strong links between IWERM and the IWR. "Over the past five years we have built the Unilever Centre into one of the largest water quality training and research facilities in the country. I am confident that the Centre is now a fully self-sustaining organisation, and I hope to provide it with fresh opportunities at a global scale. The work we have

Back: Mrs Lil Haigh, Prof Denis Hughes & Dr Nikite Muller
Front: Profs. Tally Palmer and Jay O'Keeffe

done on salinity impacts in South Africa are relevant in Australia, and well as in developing countries in the rest of Africa and south-east Asia."

Prof O'Keeffe will take up his new Chair in Holland at the beginning of their academic year in October, but will be returning to visit South Africa in December and April next year. Prof Palmer will take on the UTS Chair at the beginning of 2005. The Institute will be looking for new researchers to join the team of Prof. Denis Hughes (Hydrology and interim Director), Mrs. Lil Haigh (Wetlands) and Dr. Nikite Muller (Environmental Water Quality). "To replace Jay and Tally, we are looking for enthusiastic researchers who will join us with new ideas and lots of energy" said Prof. Hughes. "The core team of senior research staff will provide the continuity, and we hope that Jay and Tally will be a link to new opportunities for expansion of existing activities". It is a credit to the strength and profile of fresh water research in South Africa, and particularly in the Eastern Cape, that local researchers are sought after by top-flight research organisations world-wide.

CSIR Warns Against Fluoride in Water

Richard Davies from the *Pretoria News* reports that the Council for Scientific and Industrial Research warned recently about plans to add fluoride to South Africa's drinking water, saying it posed a possible health risk to people with HIV and Aids, as well as those suffering from malnutrition.

According to the report, Bettina Genthe, a water analysis expert with Environmentek, a business unit of the CSIR, briefed Parliament's water affairs portfolio committee and said recently enacted legislation prescribed the addition of fluoride to water to stop tooth decay.

She said: "We've got a number of factors which affect the health impact of fluoride in this country - one of these is that malnutrition makes fluoride more toxic than it is to people who are well nourished.

"So this is a factor we would have to consider before going ahead and adding fluoride to the water supply."

There was also the potential danger of fluoride compromising people's immune systems.

In an obvious reference to the Aids pandemic, Genthe said "a large percentage of the population in South Africa already have a compromised immune system; this (fluoridation) just adds more fuel".

"Maybe we shouldn't be going at it in this particular way. There is no doubt that fluoride is good for teeth, and it protects against decay ... but water fluoridation might not be the best way of achieving this protection," she told MPs.

Speaking after the briefing, Genthe said fluoridation was "potentially a problem" for people with HIV.

"It's potentially a problem; we're not 100% sure. Not on humans specifically, but in the test tube ... it appears to be that fluoride can be toxic at very low concentrations to immune system cells."

However, it was very difficult to prove a link, because other factors had first to be eliminated.

"The animal studies and the cell studies are showing that there's a potential problem, and we haven't proven it yet."

However, she would rather "err on the side of safety".

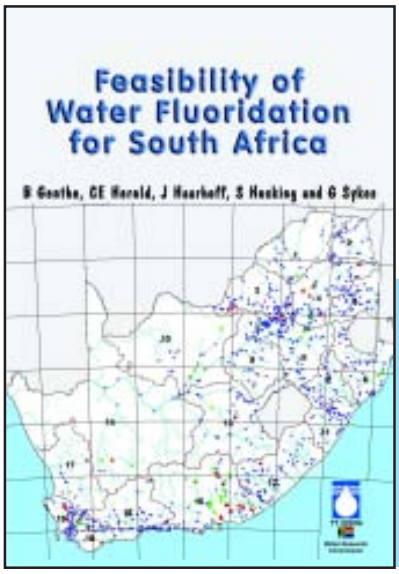
"If we think something is potentially harmful or toxic, especially with malnourished people. I think we need to hold off.

"The benefits of protecting people's teeth compared to potentially affecting their whole body ... I don't think it's the right way to go, until we know more. There's too many gaps in the scientific data," she said.

Asked if the CSIR was planning to issue a warning to municipalities, advising them to hold off on plans to fluoridate their water, Genthe said the council's views were contained in a report by the Water Research Commission, which had been available since the beginning of the year.

As far as she knew, none of South Africa's municipalities had started adding fluoride to their drinking water systems.

WRC FLUORIDE REPORT



This report, published by the Water Research Commission, will assist water providers in South Africa as they continue to grapple with the practical aspects of implementing water fluoridation. It deals with the medical and dental issues of fluoridation, as well as environmental issues, technical issues, economic, social and legal issues associated with the problem.

Copies of the report (TT 222/04) are available free of charge from the WRC, Private Bag X03, Gezina, Pretoria 0031. Tel: 012 330 9015. Fax: 012 331 2565. E-mail: orders@wrc.org.za

Environmental Water Quality in Water Resources Management

Everyone and everything depends on water for life, well being and economic prosperity. Water is so important and is used in so many ways that if it is over-exploited, we risk damaging our very life-source. Over-exploitation of water results mainly from using too much water from our water resources, and then returning too much effluent and water containing waste.

The National Water Act recognises that water resources are part of the integrated water cycle. Closely connected to this water cycle is the use that people make of these various sources of water. The Act promotes protection of all of these water resources specifically so that there will be enough good quality water for present and future generations to use.

The implementation of the Act is captured in a three-tiered "Environmental Water Quality management" approach. Both ecosystems and water users have specific and individual water requirements. Managing water quality and quantity for ecological and human uses requires more detailed attention both to ecosystem health and the requirements of human water users. In this regard, ecological toxicity assessments as well as biological monitoring are playing an increasingly important role in water resource management.

There are methods to set objectives that will result in different levels of ecosystem and human health protection. These objectives are termed "ecospecs and userspecs". These eco- and userspecs objectives are then integrated into Resource Quality Objectives.

It is a mistake to think that aquatic ecosystems are always more sensitive to changes in water quality than the water used by domestic, agricultural and industrial users. Therefore, a detailed and proper understanding of the three-tiered approach to environmental water quality is crucial. This leads to a better understanding on how to manage our water resources in order to increase the environmental and social benefits derived from them.

This three-tiered Environmental Water Quality management approach has been recognised as a tool that can be of great benefit to people in all fields of water management – government, municipalities, industries, commerce, NGO's, consultants and the private sector.
In other words, it is accessible to any person that has an interest in the management and conservation of our water resources. In this regard, Labhouse (Pty) Ltd (Bryanston) and EcoMonitor cc (Kempton Park) has formed a joint venture to develop, prepare, print and present course material to interested participants.

COURSE

The first course, held during June, was attended by 21 participants, which ensured lively participation. After the certificate ceremony, participants confessed a much better understanding of how water quality and toxicity interacts with biological processes and how all of this fits into both the environmental management and legal frameworks.

The next and last course for this year will be held from 17-19 November 2004. Course participants are encouraged to bring a water sample from their workplace or own environment for chemical and toxicological analyses. These results will be workshopped against the background of the course contents, thus allowing the participants to better understand and make more informed decisions about their environmental water quality.

For more information, please contact Pieter van Eeden at 011-972-5298, 083-379-4419 or pieter.vaneeden@absamail.co.za.

The Environmental Water Quality Class of June 2004.

Water Demand Management Training in Zambia

Pilot presentation of the Guideline Training Module for Water Demand Management for Municipal Water Supply Agencies successfully conducted in Lusaka, Zambia 19-23 July 2004.

Thirty-six participants drawn from nine southern African countries recently attended the first-ever regional presentation of the water demand management Guidelines Training Module for municipal water supply agencies.

The workshop, which took place at the conference facility of the Holiday Inn in Lusaka, Zambia from 19-23 July 2004, was organised by the World Conservation Union, also known as IUCN, and facilitated by the Training and Instructional Design Academy of South Africa (*TIDASA*) and the Botswana-based Centre for Applied Research. A local water demand management expert from the University of Zambia, School of Mines, co-facilitated the training.

The water demand management guidelines training module for municipal water supply agencies is an outcomes-based, learner-friendly training module that is primarily based on *Building Awareness and Overcoming Obstacles to Water Demand Management: Guideline for Municipal Water Supply Agencies,* one of a series of water demand management guidelines developed by the World Conservation Union (IUCN).

The water demand management Guidelines Training Module for municipal water supply agencies and the water demand management Guidelines are products of Phase II of the SADC regional water demand management project undertaken by the World Conservation Union (IUCN) with support from its donors, the Swedish International Development Agency (SIDA) and the International Development Research Centre (IDRC). Additional input to the water demand management Guidelines Training Manual for municipal water supply agencies was gleaned from the country studies, research projects, analytical papers, and the Postgraduate Training Module developed during phases I and II of the same World Conservation Union (IUCN) initiative.

Participants and facilitators from nine SADC countries attended a course on water demand management in Zambia.

The Lusaka Water and Sewage Company worked closely with the World Conservation Union (IUCN), *TIDASA* and the Centre for Applied Research, co-facilitating sessions, providing case study information, and organising field visits in and around Lusaka that illustrated some of the typical challenges and benefits of water demand management in the southern African municipal context.

The participants (mainly top and middle level managers from Botswana, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe) were selected from a pool of sector professionals according to criteria of geographical representation, gender and racial equity, and professional background.

The resulting group brought their rich diversity of backgrounds, qualifications and experience to bear on the common water demand management issues and problems experienced by municipal water supply agencies, adding greatly to one another's learning experience throughout the course. Participants committed themselves to an intensive week of facilitated sessions, field visits, and evening work sessions balanced with opportunities for social relaxation, provided by Lusaka's restaurants and night spots.

Each group of participants selected a target city or water supply organisation for which information had been provided by the facilitators or by the participants themselves. They developed tailored implementation plans that outlined the background, needs, constraints, benefits and key performance indicators for the water demand management strategies they proposed.

The impact of the training, not only on the participants but also on their workplaces and the sector as a whole, will be determined in the medium term by a survey that will focus on determining the extent to which the participants have been able to share or put into practice their improved water demand management knowledge within their organisations and wider spheres of influence.

The World Conservation Union (IUCN) is keen and willing to support similar further training and the formation of a fledgling water demand management network within SADC member states and beyond, and together with the International Development Research Centre, the Swedish International Development Agency, *TIDASA*, and Centre for Applied Research invite you to

make suggestions on strategies or opportunities for further training and networking in water demand management.

If you have ideas for further training, would like to become part of the network, or need more information about the module or any other aspect of water demand management, please contact:

IUCN-SA
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Fax:+27 (0) 12 342 8289
Contact (SA): Michael Raimondo, Project Coordinator
Cell/Mobile:+27 82 290 0197
E-mail: michael.raimondo@iucn.org
Website: www.iucnsa.org.za/WDM.htm

A certificate of attendance is presented to Ms Ngabo Muleba by Dr Daniel Nkhuwa.

Site visit to the Iolanda waterworks, Kafue river, Zambia.

POST BAG Letters to the Editor

(E-mail: jand@wrc.org.za)

NEW SANCIAHS COMMITTEE

Denis Hughes from the Institute for Water Research, Rhodes University, writes:

As your readers will be aware, the SANCIAHS Committee looks after the interests of South African hydrological scientists and specifically serves as the contact point for international communications from the International Association of Hydrological Sciences and the IUGG. Earlier this year there were several calls for nominations to establish a new SANCIAHS Committee (including one through *The Water Wheel*). While I admit that part of the problem may have been some confusion about dates, the outcome of these calls was a resounding silence! We received no nominations at all.

Given that we need to maintain the Committee and that some existing members were not available in the future, I decided to ask which existing members were prepared to continue and to suggest some other names of people who may be prepared to participate. The result is that the following people constitute the new SANCIAHS Committee, who will hold office until the next SANCIAHS Symposium (Gauteng 2005, look out for announcements in *The Water Wheel*). At that symposium I will call for the IAHS membership in South Africa to ratify the new committee and for nominations for the Chairman and National Representative (I currently hold this position). The Committee members are:

Peter Ashton (CSIR)
Jean Boroto (GWP)
Renias Dube (WRC)
Denis Hughes (IWR, Rhodes University)
Graham Jewitt (BEEH, University of KZN)
Wageed Kamish (Ninham Shand)
Simon Lorentz (BEEH, University of KZN)
John Ndiritu (Civil Engineering, WITS)
Roger Parsons (GW Consultant)
Roland Schulze (BEEH, University of KZN)

One of the main tasks of SANCIAHS is to organise the National Hydrology Symposium, held every two years and I would encourage all hydrologists, water resource engineers and scientists from related disciplines to support this symposium. John Ndiritu is leading the organisation of the 12th symposium (Gauteng, 2005) and I am sure that further information and the call for papers will be available in the near future.

Guidelines Training Module

Water Demand Management for Municipal Water Supply Agencies

After holding a highly successful training intervention in Lusaka, Zambia in July 2004, IUCN is offering a five-day training course on Water Demand Management (WDM) for municipal water supply agencies. The training is presented in consultation with ***TIDASA*** and CAR.

This outcomes-based, learner-friendly training course is aimed at middle and top-level professionals involved in municipal water supply. A generic four-unit module forms the basis of the learning experience, complemented by structured activities, field visits, case studies and examples.

Key concepts covered include:

- WDM in context
- The need for WDM in integrated water resource management
- Municipal WDM
- WDM options and benefits
- Developing a WDM plan, objectives and target setting

WDM experts from ***TIDASA*** and CAR will tailor the course to meet your needs by consulting with designated members of your organisation. One of the main outputs of the training course is the development of a realistic WDM plan for a municipal water supply agency. A further important facet of this course is the post-training support of participants through their addition to the IUCN WDM network.

The generic training package includes:

- Client consultation and research prior to the training intervention
- A customised field trip guide
- A 350 page full-colour training manual
- A CD-ROM containing the WDM training manual, PowerPoint presentations, resource material from the IUCN WDM Project for southern Africa, Phases I and II, other references, and video clips
- Pre and post-training evaluation
- A certificate of attendance

For more information about this module or any other aspect of WDM, please contact

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IUCN The World Conservation Union

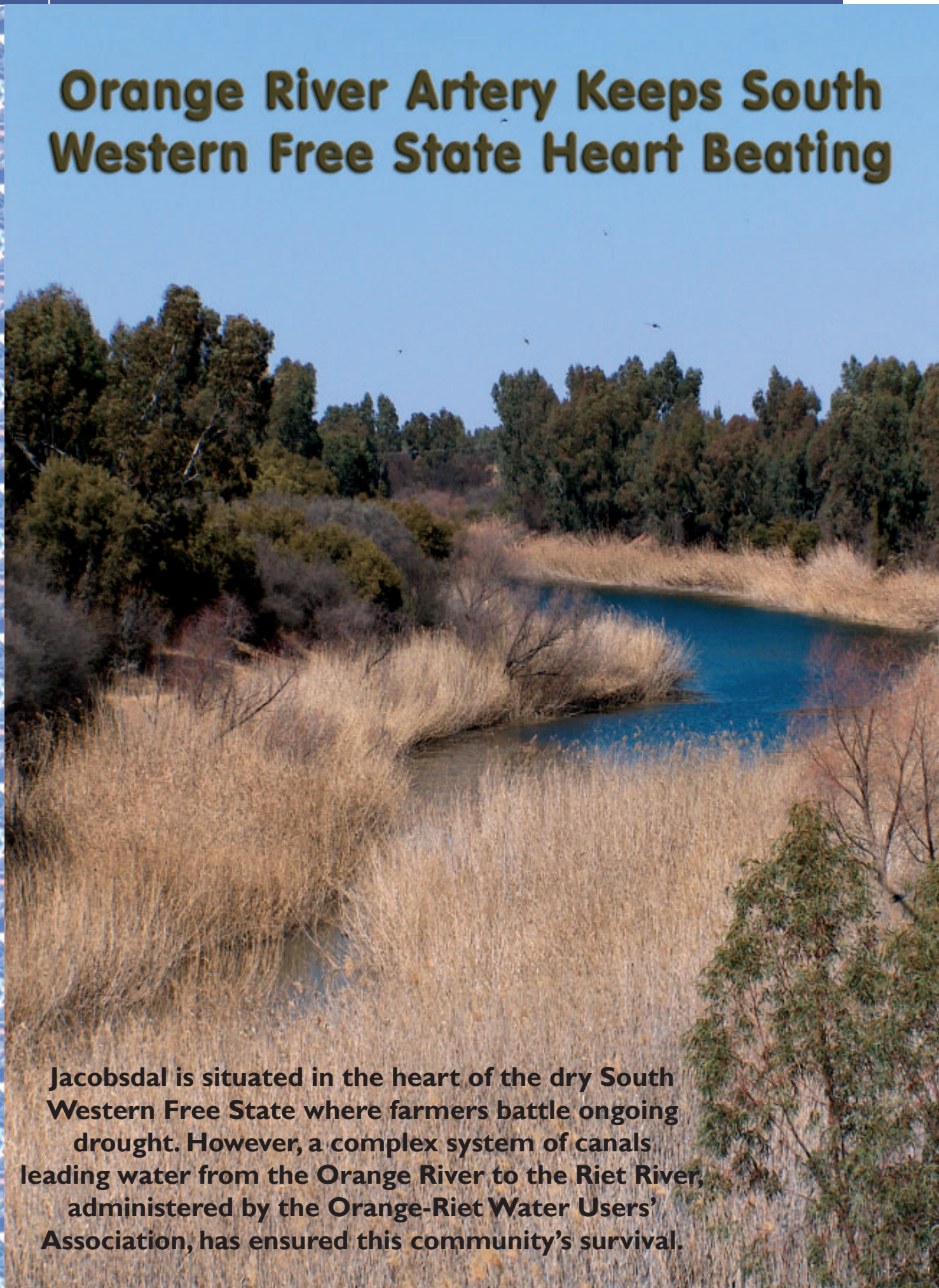
Tidasa Training and Instructional Design Academy of South Africa

Centre for Applied Research

Sida

IDRC CRDI

Orange River Artery Keeps South Western Free State Heart Beating



Jacobsdal is situated in the heart of the dry South Western Free State where farmers battle ongoing drought. However, a complex system of canals leading water from the Orange River to the Riet River, administered by the Orange-Riet Water Users' Association, has ensured this community's survival.

Ria and Daan Wilke were desperate. It was 1981, six years since they packed up their full-time jobs in Kuruman to farm on the banks of the Riet River near Jacobsdal, and the weather wasn't playing along. All the dams were dry, making it impossible to keep their lucerne, wheat and onion crops alive. All around them farmers were trying to make ends meet, pay their workers, feed livestock and support their families.

The close-knit community of Jacobsdal in the South Western Free State was on the brink of collapse as the economy suffered in the worst drought in living memory.

"There was nothing we could do," says Mrs Wilke, "there was just no water."

Relief came from an unexpected quarter. Dr Henegan van Graan, principal of the Panorama School in Saundershoogte, went on a massive recruiting drive for young pupils and, with government support, he was able to offer desperate farmers and business people temporary jobs as teachers. The local chemist and lawyer taught alongside farmers and their wives working for government salaries that would ensure the survival of their community and their farms until the rains came.

Eventually Van Graan had 1 300 young pupils and 50 staff – most of them drawn from the farming community. Despite their plight the farmers and townsfolk were no motley crew and the education department named Panorama's staff the most qualified teachers in the country.

"It was an unbelievable time of hopelessness softened by wonderful comraderie," remembers Mrs Wilke, herself a qualified teacher. Daan, her husband was a geologist and taught accounting, science and religious studies to the older children while she was inspanned to teach sub A.

When the rivers started flowing again the men went back to the land but many of their wives stayed on, some for years, continuing to teach the children who Dr Van Graan had insisted come to school.

GUARANTEED SUPPLY

For the farmers their sojourn as teachers was temporary relief. They knew that if they were to secure their future and their farming investments they needed a guaranteed supply of water to avoid another agricultural catastrophe.

With the determined support of farmer Kobus Nel (current chairman of the Orange-Riet Water Users' Association) the Riet River Farmers' Union succeeded in winning a subsidy for the farmers who couldn't irrigate. They also managed to have the Orange-Riet Canal approved – which would, at last, guarantee a steady supply river water to the Riet River Settlement.

Nic Knoetze, Chief Executive Officer of the Orange-Riet Water Users' Association, picks up the story. "From 1987 the Orange-Riet canal began supplying Orange River water (out of the Van der Kloof Dam) to the Riet." (After the Gariep Dam the Van Der Kloof is the second largest storage reservoir in South Africa with a capacity of 3 200 million m^3).

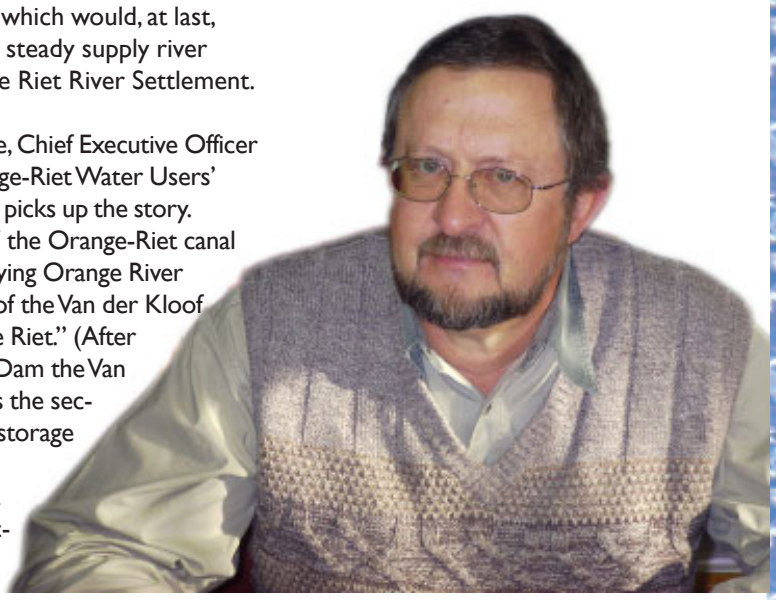
"The Modder River farms continued to take water released from the Krugersdrif Dam 67 km from Bloemfontein. This relieved pressure on the Modder River guaranteeing a more steady supply to those farmers."

Since 1945 farmers in the five subregions of the Riet River Scheme had taken water from the Kalkfontein Dam (upstream on the Riet) but there just wasn't enough to go round.

"The river was under strain serving the needs of farmers upstream while the Riet River Scheme farmers were coming off second best."

VAN DER KLOOF DAM

Today this is the system that the farmers rely on for water. Water is released from the Van der Kloof Dam on the Orange, travels through



Nic Knoetze, Chief Executive Officer of the Orange-Riet Water Users' Association

Wine grapes are cultivated in the area.

Water travels by gravity towards the Riet River.

a 13,6 km and 18 m wide "Main" canal to the Scheiding Pumping Station where it is pumped 47 m up before being released into the 112 km long Orange-Riet Canal. Once in the canal the water travels by gravity towards the Riet. In the Riet River Canal System the water is transported to farmers via 185 km of smaller canals, 54 km of drainage canal, and 103,4 km of river. It is stored in two weirs and five balancing dams with a capacity of 2 300 000 m^3.

The Van der Kloof Dam remains the major supplier of water to the extended Riet River Settlement (8 045 ha) as well as to farmers irrigating 3 970 ha along the Orange-Riet Canal.

The Orange-Riet Canal and the upgrading of the Riet River canals were finally completed in 1992 at a cost of R138 and R96 million respectively.

For the farmers still recoiling from the harsh dryness of the 1980s the new canal system brought hope and optimism but disaster was far from over.

FLOODS

In 1988, just a year after water began flowing through the canal, the rivers turned on the community again. This time heavy rains brought floods and farmers watched helplessly as years of labour on the lands washed away.

Martie and Chris Steenkamp had been farming on the banks of the Riet for 17 years – and this was the second time they had watched the river turn from a bubbling brook into a raging torrent.

"The first flood was in 1977 and we were caught totally off guard," says Martie, "the army warned us the river was coming down but we never expected the devastation that followed."

The farmers hoped the Kalkfontein Dam would hold back the floodwaters but eventually, when the risk that the dam wall would break became too great, the river was sent into flood.

Then the Steenkamps raced against the clock to get workers and livestock to higher ground. "There was no time to worry about material belongings," she says, "When the water came it was with a roar."

She remembers a man of 93 who wouldn't evacuate his home in Ritchie because he refused to believe the river would cause that much damage.

"He had lived there all his life and never know the river to flood that dramatically." Soldiers eventually carried him out of his home.

With his family safe farmer Chris Steenkamp returned home to help a farm worker, Frans, rescue the

More than 185 km of smaller canals transport water to individual farms.

last of the livestock. The two of them (and the family dog) escaped with their lives by driving the tractor through the rising flood waters.

When Martie returned to the farm cupboards were lying upturned in the bedrooms, mud covered everything and the floorboards of her farmhouse were ripped out.

In 1988 when the army once again told Martie the river was coming down again she was better organised. This time the family got most of our things out before the water rose. Nevertheless the flood was devastating and, yet again, the farmers had no choice but to start again.

"Both times we suffered terribly," says Martie.

Flood and drought are always at the back of farmers' minds yet the Orange-Riet Canal has, at least, guaranteed a steady supply of water without which many would not have survived. In the 17 years the canal has been in operation water restrictions have been introduced only once when water allocation was reduced to 50%. For this to happen the Van der Kloof Dam level has to drop below 35%.

At full capacity the Orange-Riet Canal can transfer 370 million m^3/a. The annual water requirement of irrigators supplied by the canal is 186,8 million m^3. Altogether the canal serves 371 farmers (including Ritchie) irrigating a total of 17 000 ha of cropland. (In Ritchie 75 farmers work just 98 ha).

COMPLEX SYSTEM

The Orange-Riet Water Users' Association, under Knoetze's guidance, administers and maintains this complex system of water transfer. The three Irrigation Boards (Scholtzburg, Ritchie and Lower Riet) with the two Government Water schemes (Riet River settlement and Orange Riet canal) amalgamated to form the Orange Riet Water Users' Association (ORWUA) that took over the operation and maintenance of the water system in 2001.

"The Orange-Riet Canal changed the way we farmed in this part of South Africa. "Water is the life blood of any community and it is the sophisticated system of canals that make up the Orange-Riet scheme that has ensured Jacobsdal remains a thriving agricultural centre at the heart of our country," says Knoetze.

For the two women, Ria Wilke and Martie Steenkamp, the rivers have shaped their lives. Both their families continue to work the land alongside the Riet enjoying the beauty of a remote part of South Africa.

"All we can pray is that the stream remains steady and that neither flood nor drought return to devastate our lives."

SEMINAR SERIES:

LEAKAGE REDUCTION & WATER DEMAND MANAGEMENT: PRACTICAL APPLICATIONS

ONE DAY INTENSIVE SHORT COURSE

PRESENTERS:

Ronnie McKenzie (WRP (Pty) Ltd)
Willem Wegelin (WRP Pty Ltd)
Basil Bold (Sensus Metering Systems)
Tim Waldron (CEO - Wide Bay Water - Australia)
Tim will only be present at the Cape Town, East London and Pietermaritzburg venues.

CONTENTS:

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

- **Background and concepts of component-based leakage management;**
- **Understanding your system and sectorising;**
- **Sizing of meters and meter management;**
- **Logging and the interpretation of minimum night flow results;**
- **The various WRC models and how they can be used to assist water suppliers in reducing their non-revenue water (SANFLOW & BENCHLEAK);**
- **Development of a WDM strategy;**
- **Concepts of and practical implementation of pressure Management;**
- **Examples of practical WDM Interventions - case Studies from South Africa and Australia**

AGENDA:

The seminars will start, at 08:30 and conclude at 17:00. There will be three refreshment/discussion breaks of 30, 60 and 30 minutes respectively.

VENUES:

Northern Cape: **Kimberley - 8 November 2004**
Gauteng: **Johannesburg - 10 November 2004**
Western Cape: **Cape Town - 16 November 2004**
Eastern Cape: **East London - 17 November 2004**
KwaZulu-Natal: **Pietermaritzburg - 19 November 2004**

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

COST AND PAYMENT:

The cost of attending the seminar is R1 368 per person (including VAT). This will cover all training material including digital copies of all the latest WRC Demand Management software and manuals. A full set of training notes will also be provided in hard copy format based on the powerpoint presentations. In addition, an electronic version of the latest Water Demand Management Cookbook recently developed by the presenters for the United Nations & Rand Water, will also be provided. Coffee will be provided together with a buffet style lunch.

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 WRP (Pty) Ltd:

Account Name:	WRP (Pty) Ltd;
Account No.:	013011340;
Bank:	Standard Bank;
Branch:	Brooklyn;
Branch Code:	01-12-45-12;
Reference:	WDM Seminar & Name of Attendee/s.

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SOUTH AFRICAN WATER RESEARCH COMMISSION

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Kindly complete the registration form and return it to WRP (Pty) Ltd via:

- Fax at **(012) 346-9956**;
- Email at **caryns@wrp.co.za**;
- Mail at **PO Box 1522, Brooklyn Square, 0075.**

REGISTRATION FORM

Title:
First name:
Surname:
Company/Organisation:
Position:
Tel No.:
Fax No.:
Email address:

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

☐ Cape Town ☐ Pietermaritzburg ☐ Johannesburg
☐ Kimberley ☐ East London

For additional enquiries please contact:

Mrs Caryn Seago (coordinator)
Tel No.: (012) 346-3496
Fax No.: (012) 346-9956
Email: caryns@wrp.co.za.

Attendance can be confirmed by forwarding your bank deposit slip to the fax number provided above.

Big Savings Through Leakage Reduction as Part of Water Demand Management

The wise old saying: "Waste not, want not" is gaining pre-eminence in the management of South Africa's (and the world's) piped water supply. Particularly in water-scarce countries like ours, but even in water-rich countries where urban reticulation imposes significant costs on utilities and consumers, the losses caused by dripping taps and weak points in the mains network which burst when the water pressure rises, can be ill afforded.

Inside the Khayelitsha water pressure management and control chamber.

Fortunately, a highly cost-effective technology has been developed over the past decade to reduce urban water leakage. A South African engineering company retained by the Water Research Commission (WRC) to address this problem – namely WRP (Water Resource Planning and Conservation), based in Pretoria – has taken the technology to new heights of international acclaim.

A series of intensive one-day short courses is scheduled by WRP for November this year – in East London, Johannesburg, Kimberley, Cape Town and Pietermaritzburg – to inform local authority leaders, policymakers, water supply managers, financial managers and product manufacturers of the very significant savings attainable through leakage reduction and water supply management (See advertisement on page 14).

LEAKAGE REDUCTION THROUGH PRESSURE CONTROL

WRP Managing Director, Dr Ronnie McKenzie says one of the many water demand management (WDM) intervention measures available to water suppliers is that of leakage reduction through pressure management in the reticulation system. Normally, water pressures increase at off-peak times, such as at night when few people and industries are using water. The increased pressure causes dripping taps to drip faster, and causes weak points in the mains network to burst. The resultant loss of water is significant. The implementation of advanced pressure control was first introduced to South African water suppliers in the mid-1990s by Dr McKenzie through a Water Research Commission project. This technique helps to reduce water losses by monitoring water pressures – sector by sector in the town or city concerned – and reducing off-peak pressures to a level which is adequate for users who require water at such times, but which does not stress worn tap washers and weak points in the mains system.

Quantification of the savings thereby achieved depends upon the size and character of the consumer environment concerned, and on

factors such as the age and technical standard of the water reticulation system. The WRC PRESMAC Model was developed to assist water suppliers in understanding the relationship between leakage and pressure as well as assessing the potential savings that can be achieved through pressure management. While pressure management is not effective in every situation, it can be very successful in certain cases.

An extreme example of water saving, which is recognised by international water management experts as the most technologically advanced and successful in the world, and which is regularly visited by them to see it in action, is the water pressure management system designed by WRP for Khayelitsha, a large and rapidly-growing township in the Cape Town metropole, which was commissioned in 2001.

In an area serving 600 000 people (up by 100 000 on the half-million residents when the system was installed), it saves 9 million cubic metres of water a year. The Convenor of Planning and Policy for Water Services in the Unicity of Cape Town, Mr Heinrich Mostert, converts this into financial returns, as follows: "Conservatively, it saves us R30 million per year. The cost of installing the water pressure management system was just over R2 million inclusive of preliminary studies – so the payback time was just one month. What a return on investment!"

He added: "With R2 million of ratepayers' money at stake, we were brave in going for such a big project all at once. But having embarked on it, we had no options – it simply had to be successful. The result speaks for itself!"

".....The cost of installing the water pressure management system was just over R2 million inclusive of preliminary studies – so the payback time was just one month. What a return on investment!"

In physical terms, the project saves 1 000 cubic metres per hour – enough water to fill an Olympic-sized swimming pool every two hours; 24 000 cubic metres – the capacity of an average urban concrete distribution reservoir – per day; while the 9 million cubic metre annual saving equals the capacity of a medium-sized reservoir/dam – a significant consideration in a part of South Africa where erratic rainfall necessitates periodical urban water restrictions.

NATIONAL WATER POLICY

The opportunity offered by water demand management technology to achieve meaningful savings is in line with South Africa's present national water policy. It represents a clear departure from the previous approach of resource development to meet growing water demands, to one of water conservation.

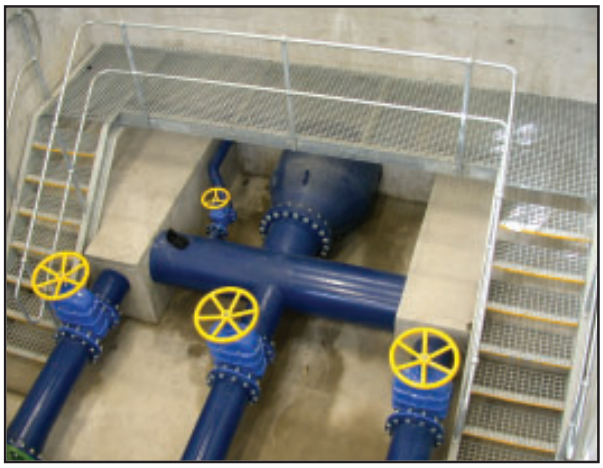
A paper on recent developments in water demand management in South Africa, by RS McKenzie and JN Bhagwan (of WRP and the WRC respectively) points out that the country's increasing water demands cannot be sustained indefinitely. If the growth in demand is not curbed, the country will face a serious water crisis during the present century. Water conservation had thus become a major issue, supported by numerous new initiatives from the Department of Water Affairs and Forestry as well as the Water Research Commission. The aims were to curb the growth in demand through education and more efficient use of the available resources.

The paper goes on to say that many proposed water supply augmentation schemes could be postponed for several years if the growth in demand could be trimmed by only a few percent – a target that is certainly achievable. The savings associated with delaying new water transfer schemes are so large that the measures needed to achieve the delays are not only environmentally attractive but also very cost effective.

Another paper by the same authors, on leakage management, reports that the Water Research Commission has initiated and supported numerous projects in recent years in support of government legislation to encourage efficient water usage. Some very sophisticated software was available locally and internationally, but was out of the financial reach of smaller municipalities. The WRC had therefore focused on providing low cost software solutions to help water suppliers understand and manage their non-revenue water.

THE BABE METHODOLOGY

The new low cost models were based on the Burst and Background Estimate (BABE) methodology developed for the UK water industry in the early 1990s. The BABE approach was introduced to South Africa in the mid-1990's through a series of courses and seminars presented by Dr McKenzie and Mr



The Khayelitsha community was involved at each stage of the construction of the water pressure control chamber and was continually informed of progress and possible water shortages. Not one incidence of vandalism or theft was reported.

Allan Lambert (founder of BABE) at the request of the WRC.

The methodology and concepts have been widely accepted by most water suppliers in the country through the efforts and initiatives of the WRC, and South Africa is now regarded as one of the key players in this field worldwide.

SHORT COURSE

The forthcoming intensive one-day short course on leakage reduction and water demand management, to be presented in five strategic centres in November, is a "must attend" for local government councillors, policymakers, water supply managers and financial managers, and product manufacturers in the water supply industry.

It is proposed to publish abridged information on the various WRC leakage reduction and water management models in the next issue of *Water Wheel*.

The course is to be hosted by WRP (Water Resource Planning and Conservation) in association with Rand Water, Umgeni Water, the Department of Water Affairs and Forestry, the Water Research Commission, City of Cape Town, Buffalo City Municipality and Sensus Metering Systems. The main presenters will be Ronnie McKenzie and Willem Wegelin of WRP, and Basil Bold of Sensus Metering Systems.

It is proposed to publish abridged information on the various WRC leakage reduction and water management models in the next issue of *Water Wheel*.

Improving Municipal Wastewater Management in Coastal Cities

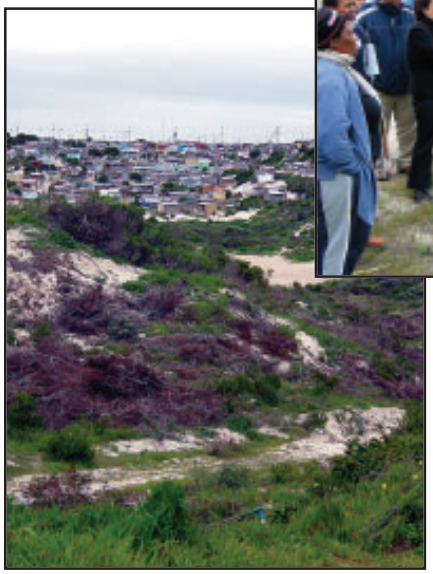
The Khayelitsha residents must have thought this the strangest 'township tour' they'd ever encountered. Instead of a group of snap-happy foreign tourists visiting their homes, markets and shebeens, this rather studious-looking bunch were only interested in their toilets!

The tour was part of a five-day training course on "Improving municipal wastewater management in coastal cities", presented by UNESCO-IHE Institute for Water Education and the UNEP/GPA Co-ordination Office, both based in the Netherlands. The International Ocean Institute at the University of the Western Cape - as an existing member of the UN/DOALOS Train-Sea-Coast Programme - facilitated the South African presentation of the course, and arranged the field trip to Khayelitsha.

Participants expecting to be given a tour of high-tech wastewater treatment facilities were in for a humbling experience as they learned about the pros and cons of various dry sanitation systems, such as Enviroloos and UDTs (urine diversion toilets), which are being tested in the township. Even more sobering were the areas with no sanitation facilities whatsoever, forcing

Left: *About 30 people attended the training course on "Improving municipal wastewater management in coastal cities", held at the University of the Western Cape in August.*

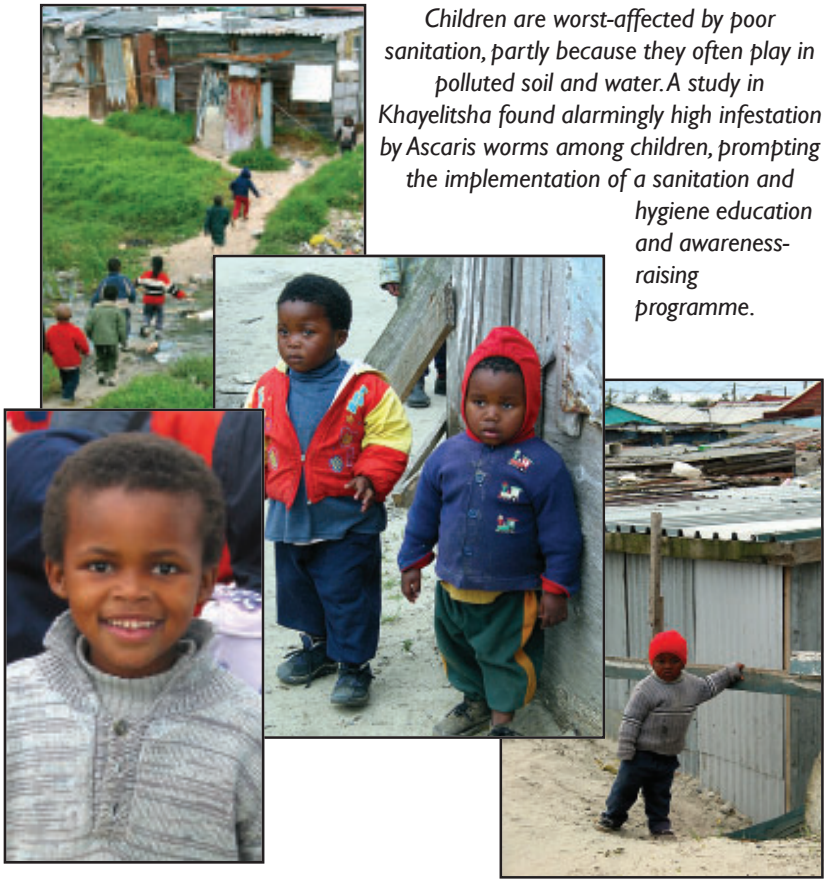
Top*: Course participants interview a municipal engineer as part of a stakeholder consultation exercise.*



Top*: Solonzi Mzamo, an environmental health practitioner for the City of Cape Town, led the field trip to Khayelitsha. He explained that this dunefield* ***(left)*** *acts as an ablution area for the adjacent community.*

Top*: Khayelitsha is a sprawling township, made up of informal settlements as well as low-cost housing.*

Dr Erik de Ruyter van Steveninck, of UNESCO-IHE Institute for Water Education, presented the course.



Children are worst-affected by poor sanitation, partly because they often play in polluted soil and water. A study in Khayelitsha found alarmingly high infestation by Ascaris worms among children, prompting the implementation of a sanitation and hygiene education and awareness-raising programme.

residents to use coastal dunefields or river corridors for open-air ablutions.

The field trip was ideal for illustrating the need to 'think outside the box' in managing wastewater, particularly for scenarios where flush toilets are not a feasible option, at least in the short term.

"Most participants have an engineering background, so in principle they know the technical aspects of sewerage systems," says Erik de Ruyter van Steveninck, the course presenter. "We don't go into all the detail of modern technologies, but instead try to teach them a different concept – how to approach wastewater management and develop project proposals that will address existing problems."

NO CHARGE

The training course was offered at no charge, with participants only expected to cover their travel and accommodation costs. More than 20 people from around South Africa - mostly from civil engineering firms, local authorities and Department of Water Affairs and Forestry Head Office - took advantage of this opportunity. Another six people from Mozambique, Sri Lanka, Turkey and the Philippines were sponsored to attend the course as well as a follow-up 'train the trainers' session, so that they will be able to present the course in their own countries in future.

The course is designed to improve the capacity of project managers at city level to design, finance and implement projects; identify and use appropriate technologies; involve local stakeholders, and communicate and co-operate effectively with other institutions.

"Capacity-building in wastewater management is a pressing issue almost everywhere," says Robert Bechtloff, the UNEP-GPA programme officer, "and regional consultative processes identified the need for practical training."

"We try to provide realistic, fundable solutions for wastewater treatment, taking operation and maintenance into context."

COASTAL CITIES

Why the focus on coastal cities? Nearly half the world's population lives within 100 km of the coastline, placing enormous pressure on the nearshore marine environment. Discharge of inadequately treated sewage into the sea not only threatens human health and coastal ecosystems, but may also have an economic impact if it compromises coastal industries such as fisheries, aquaculture and tourism.

"Most of the course is equally applicable to upland areas though," remarks Erik, "because whatever you do in inland catchments might ultimately impact on the coast."

The field trip took in the toilets of Khayelitsha, allowing participants to compare different dry sanitation systems.

The course comprises three main modules. The first covers objective oriental planning, when participants learn how to undertake logical analyses of problems, objectives, options and stakeholders.

"Using case studies, we force participants to find out - in a systematic way - the real cause of an identified problem, and what should be addressed to resolve it," explains Erik.

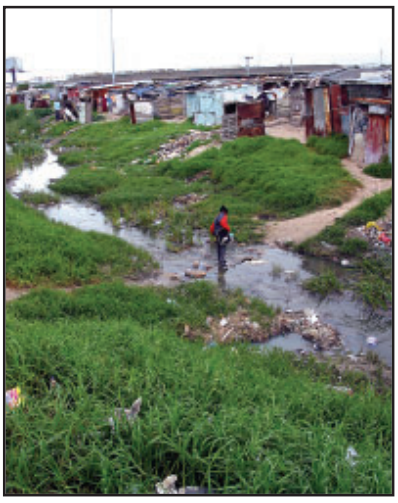
"Next we provide some background information on current approaches to wastewater management, and potential alternatives. We like to change the thinking of the 'hard' engineer by showing that there are alternatives that are often more cost-effective and sustainable. Waste is in fact a valuable resource, which is just in the wrong place at the wrong concentration at the wrong time! We should strive to re-use its nutrients, water and organic matter, with the objective of getting more efficient wastewater treatment in a more cost-effective and sustainable way."

"The third module focuses on presentation techniques, because it's important to be able to 'sell' your proposal to others, and convince them that it's the way to go."

GUIDELINES

The training course builds upon the *Guidelines for Municipal Wastewater Management*, a joint UNEP/WHO/HABITAT/WSSCC publication with support from UNICEF and UNESCO, covering approaches and policies, institutional arrangements, technological options and financing mechanisms for appropriate and environmentally sound wastewater management systems. The guidelines include checklists of recommended practices and procedures, as well as the following ten keys for local and national action on municipal wastewater.

- Secure political commitment and domestic financial resources
- Create an enabling environment at national and local levels
- Do not restrict water supply and sanitation to taps and toilets
- Develop integrated urban water supply and sanitation management systems also addressing environmental impacts
- Adopt a long-term perspective, tasking action step-by-step, starting now
- Use well-defined time lines, and time-bound targets and indicators
- Select appropriate technology for efficient and cost-effective



Much of the wastewater of coastal cities is not treated at all before it is discharged into rivers, and ultimately the sea.

UNESCO-IHE

The history of the IHE dates back to 1957, when it first offered a postgraduate diploma course in hydraulic engineering to practicing professionals from developing countries. Over the years, IHE developed into an international education institute providing a host of postgraduate courses and tailor-made training programmes in the fields of water, environment and infrastructure.

It also became increasingly involved in conducting applied research, implementing institutional capacity building and human resource development programmes, participating in policy development, and offering advisory services worldwide.

In November 2001, UNESCO's 31st General Conference decided to make IHE an integral part of the Organisation. By March 2003, the necessary treaties and agreements between the IHE Delft Foundation, UNESCO and the Netherlands Government were signed - and the new UNESCO-IHE Institute for Water Education was born.

UNESCO-IHE envisions a world in which people manage their natural resources in a sustainable manner, and in which all sectors of society, particularly the poor, can enjoy the benefits of basic services.

The mission of the Institute is to contribute to the education and training of professionals and to build the capacity of sector organisations, knowledge centres and other institutions active in the fields of water, the environment and infrastructure, in developing countries and countries in transition. For more information visit the website www.unesco-ihe.org

UNESCO-IHE
Institute for Water Education

UNEP-GPA

The Global Programme of Action (GPA) for the Protection of the Marine Environment from Land-Based Activities was adopted in November 1995, when 108 governments and the European Commission met in Washington DC, and declared their commitment to protect the marine environment from the adverse environmental impacts of land-based activities.

The United Nations Environment Programme (UNEP) was tasked with providing the secretariat, and established a GPA Co-ordination Office in The Hague, The Netherlands.

The GPA is designed to be a source of conceptual and practical guidance in devising and implementing sustained action to prevent, reduce, control and/or eliminate marine degradation from land-based activities.

The discharge of untreated wastewater was recognised as a major cause of marine pollution, so in November 2001 - at the first intergovernmental review of the GPA in Montreal - a Strategic Action Plan on Municipal Wastewater was adopted to promote concrete actions at both local and national levels. The plan is implemented through the UNEP Regional Seas Programme and aims to:

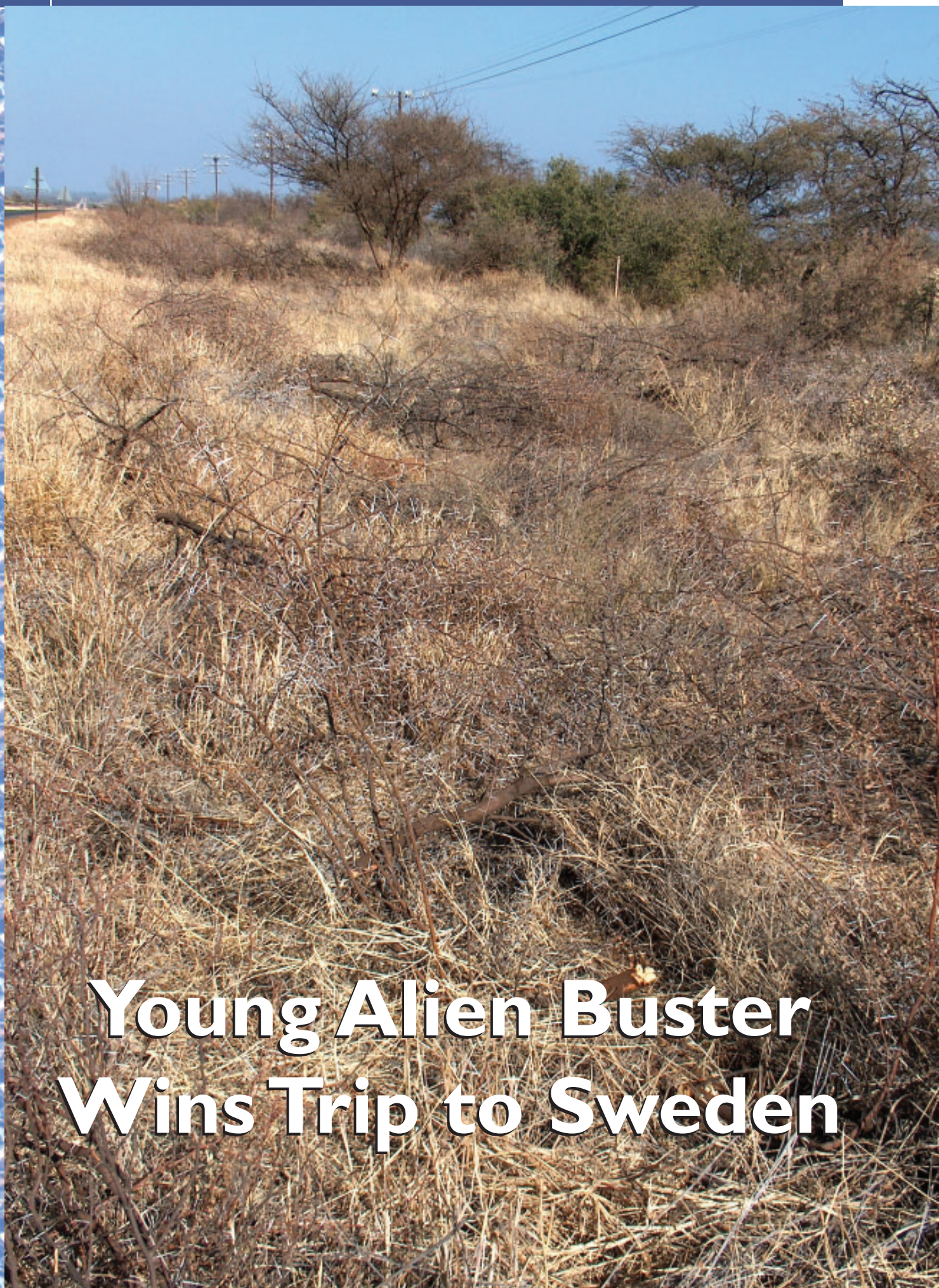
- seek consensus and commitment
- promote alternative solutions
- facilitate partnerships and regional co-operation.

Since technology transfer and capacity building is considered critical to global implementation of the plan, various guidelines, demonstration projects and training courses are being developed. For more information visit the website www.gpa.unep.org

UNEP GPA

use of water resources and consider ecological sanitation alternatives
- Apply demand-driven approaches
- Involve all stakeholders from the beginning and ensure transparency in management and decision-making processes
- Ensure financial stability and sustainability
  - Link the municipal wastewater sector to other economic sectors
  - Introduce innovative financial mechanisms, including private sector involvement and public-public partnerships
  - Consider social equity and solidarity to reach cost-recovery.

Both the Guidelines document and the course Training Manual can be downloaded from the website: www.gpa.unep.org/training.



Young Alien Buster Wins Trip to Sweden

"The greatness of any nation is measured by the way it celebrates its children and their achievements."

This saying was quoted by the Minister of Water Affairs and Forestry, Ms Buyelwa Sonjica, when she announced the winners of this year's South African Youth Water Prize at the Kathu High School in the Northern Cape. She said it was a privilege to witness the rise of a generation of young people "who will make South Africa stand shoulder-to-shoulder with other great nations of the world".

The national winner of the 2004 competition was Jacques Deacon, a grade 12 learner, from Kathu, with his invention, "Alien Buster 1-2-3". Runner-up prizes were won by Nokuthula Dubazane from KwaZulu-Natal for an environmental study on water, water pollution, wastage and sanitation in and around Ladysmith; Dean Butler from Mpumalanga for an investigation into the use of partially recycled sewerage water for crop irrigation; and Kirsty van den Bergh and Niveshni Maistry from Gauteng for their innovative design of a rural water purifier.

In her address Minister Sonjica stressed the importance of science and said South Africa's leaders and educators had a duty to encourage young people to study science "and especially studies in water for sustainable development – as water is central to the country's economic activity".

She said the South African Youth Water Prize formed part of the Department of Water Affairs and Forestry's School based water and sanitation education programme called the "2020 Vision for Water".

"The 2020 Vision for Water programme seeks to empower the youth with knowledge and water management skills and will enable them to participate in integrated water resource management and other environmental programmes.

"Through the 2020 programme our children learn about water and sanitation at an early age and on a daily basis. We are therefore instilling the values of water resource management into the future generations. These young people will in turn transfer this knowledge and skills to their parents and communities at large. Children are better placed to change the mindset and educate their parents that water is not only a gift from God, but also a scarce resource that should be conserved and protected."

The finalists in the 2004 South African Youth Water Prize. From left: Jacques Deacon from the Northern Cape, the overall winner who represented South Africa at the international Stockholm Junior Water Prize competition in Sweden with his invention, Alien Buster 1,2,3 – a device used for eradicating alien invasive plants; Niveshni Maistry and Kirsty van den Bergh runners-up from Gauteng, Nomxolisi Matyana, Director of the Department of Water Affairs and Forestry's 2020 Vision for Water programme, Nokuthula Dubazane, runner-up from KwaZulu-Natal and Dean Butler, runner-up from Mpumalanga.

CAREERS

The Minister said the 2020 Vision programme was used to stimulate the interest of youth in water resource management careers as well as promoting science, technology and research, and referred to the Water Research Commission's career guide – *Water @ Work* – which she recently launched in Grahamstown. She said this publication would "guide learners

The newly published career guide – Water@Work – available from the Water Research Commission in Pretoria.

Left: *Invasive Prosopis trees tend to form dense, impenetrable thickets that render the land useless for normal farming practices.*

Jacques Deacon, winner of the SA Youth Water prize, demonstrating his Alien Buster 1-2-3.

Labourers "fighting" invasives with the Alien Buster 1-2-3.

on the selection of careers in water resource management as well as within the water sector broadly".

Referring to the South African Youth Water Prize competition, the Minister said it was usually preceded by the provincial and national competitions and "culminates in the International Junior Water Prize, held in Stockholm, Sweden, annually.

"In this competition the learners identify water and sanitation related problems in their communities. The challenge for these young people is then to come up with solutions and innovations to solve those problems. This is what the South African Youth Water Prize is all about," she said.

ALIEN BUSTER

One of the most important water related problems for the community of the Northern Cape, where Jacques Deacon, the 2004 SA Youth Water Prize winner, lives, is the growing infestation of alien invasive vegetation, especially Prosopis trees and their adverse effect on the scarce water resources of the area.

The Northern Cape is the driest province in South Africa with a mean annual rainfall – at a quaternary catchment scale – of 226 mm and a mean annual runoff of about 4.5 mm. This lack of rainfall makes the province very dependent on ground water.

Today, groundwater resources in the province are threatened by alien Prosopis invasions which closely track underground water aquifers and suck the earth dry.

Jacques says the Prosopis trees have a deep and extensive root system that can reach water tables of 12 to 18 m and deeper. (The longest roots measured in the Arizona desert in the USA were 53 m). A mature Prosopis tree can use about 60 to 100 litres of water on a hot day, while water use per hectare, with dense stands, is estimated to be nearly a million litres per year.

PROPAGATION

He says until the 1960s government agencies actively encouraged the propagation of Prosopis trees, commonly known as Mesquite (or Suidwesdoring or Peulbome in the local language) in the arid northwestern regions of South Africa to provide shade, wood, fuel and animal fodder to farmers.

Great benefits were derived from these plantings and the campaign was thought to be a success. Unfortunately, the invasive potential of Prosopis trees –with their deep root systems, massive seed production and the absence of any natural insect enemies in South Africa – was not taken in to consideration and soon Prosopis became widely established throughout most of the drier regions of the country.

In the Northern Cape the first real notable invasion of Prosopis started after heavy rains in 1974. Since then, more than 1.8 million hectares of land have become infested.

Water is instrumental in the long-distance dispersal of Prosopis pods and seeds along seasonal water courses. From here the plants are spread onto the surrounding plains by domestic stock and wild animals feeding on the pods. Studies showed that for every one kilogram of pods eaten by sheep about 1 300 seeds are distributed. The trees tend to be multi-stemmed and form dense, impenetrable thickets that render the land useless for normal farming practices.

WORKING FOR WATER

The Department of Water Affairs and Forestry, through its well-known Working for Water programme, is leading the campaign to clear South Africa of invading alien plants. However, Jacques, with his prize-winning invention, Alien Buster 1-2-3, decided to add a little bit of impetus to the programme.

"The Alien Buster could be an important tool in the fight against invasive plants, especially Prosopis, and help save our scarce water resources in the area," he says.

Jacques' apparatus is a simple, easy to handle, multi-purpose, effective device, to eradicate alien Prosopis, by mechanical, biological or chemical means. It consists of a long pipe of adjustable length with a hook and a locking device at the one end and an umbrella at the other.

Mechanically, the Alien Buster can be used to harvest Prospis pods by hooking the apparatus onto a branch and then vigorously shaking the tree until all the dry, ripe seedpods drop to the ground.

Jacques says the umbrella protects the operator against the falling pods,

as well as against dangerous thorns, insects and snakes that often get shaken out of a tree.

Gathering Prosopis pods prevents the distribution of the seeds, while the treated and grounded pods make excellent animal feed that can fetch prices of R250 to R750 per ton.

For chemical control of the trees, Jacques plugs in the Alien Buster's nozzle, extension pipe and pump to spray herbicides on top of the trees.

He says in the Northern Cape chemical control of Prosopis trees involves the cut stump method – cutting down the trees and the then treating the remaining stumps with a mixture of the herbicide and diesel. This method, although effective, often leads to regrowth.

In his experiments with the Alien Buster, using a foliar herbicide application method, Jacques found that one week after he sprayed the tree with the herbicide Touchdown, the leaves turned yellow and started to drop. After three weeks the tree was completely dead. The tips of the branches were dry and could easily be broken off.

Once again, the umbrella protects the operator from poisonous sprays and dripping herbicide.

An area cleared of invasive vegetation and restored to its original condition.

The Department of Water Affairs and Forestry, through its Working for Water programme, is leading the campaign to clear South Africa (including the Northern Cape) of invading alien plants.

For the biological control programme for Prosopis two bruchid host-specific seed-feeding beetle species from the south-western USA, *Algarobius prosopis* and *Neltimius arizonensis* have been released in South Africa. These beetles can destroy up to 90% of seed embryos, but levels of damage are often minimal because livestock and game ingest most of the seeds soon after the pods fall to the ground, usually in January and February, and before the beetle larvae are able to fully colonise the pods.

Jacques' Alien Buster also has a biological control device for the release of seed-feeding beetles. He says his experiments showed that it was much better to release the insects in the top of the tree where they could fly straight to the seedpods and start working.

"A few insects were released near the ground on the stem of the tree and they were immediately attacked by ants. Only about 10% were able to escape and reach the top of the tree."

For the future, a research programme into the development of a myco-herbicide for Prosopis is in progress. This herbicide uses a suspension of fungal diseases spores to kill plants.

Jacques has employed two labourers to assist him with testing his Alien Buster in the field, showing that the use of the apparatus could be an important tool to create work for untrained, jobless people.

He now wants to adapt the Alien Buster (making it 1-2-3-4) by inverting the umbrella and fix it just below the hook. This will make it suitable for fruit farmers who could use the apparatus for harvesting nuts, avocados and pawpaws.

With all those newly won prize money safely in the bank that should be no problem for Jacques!

FOOD FROM USED WATER

Making the Previously Impossible Happen

The lack of gardening activities in so many rural villages is distressing. There is more than enough ground available, swept clean and baking in the hot sun. But who can grow vegetables without water? Finding water, carrying water, waiting for the turn at the tap dominates village life.

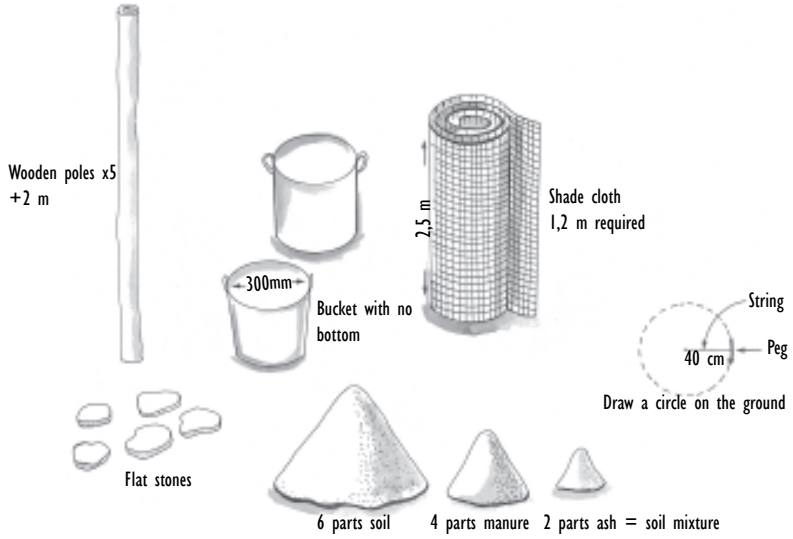
In a recent speech the Minister of DWAF identified explicit targets on which government will focus:

- The Department will ensure that in the next five years, all households will have easy access to clean running water.
- By December this year, the Department will provide clean and potable water to the 10th million South African since 1994.

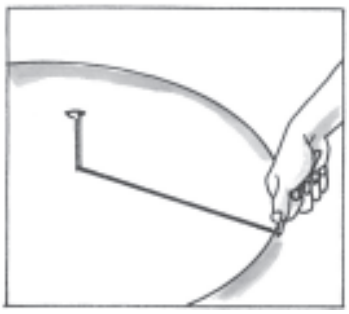
MAKING THE MOST OF THIS NEWFOUND SOURCE OF WATER

Of course this precious water is not intended for gardening and, in many cases, still has to be carried from the nearest standpipe in plastic containers. Despite this, many households have shown that this newfound source of water can be used for growing vegetables successfully. They save the water that has been used for washing clothes and utensils and feet, so-called grey water, and use it for gardening.

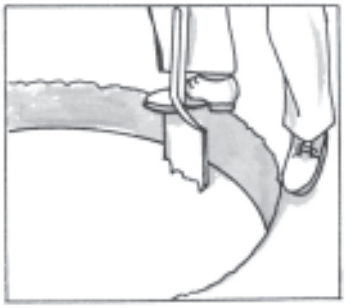
One of the most innovative and user-friendly ways of doing this is the "tower garden". It is not a new idea and South African developments are derived from what was seen in Kenya by a small group of people on a visit to assess treadle pumps. Vegetables are grown in a column of soil that fills a bag. Each day the available grey water is



Materials required for building a "tower garden".

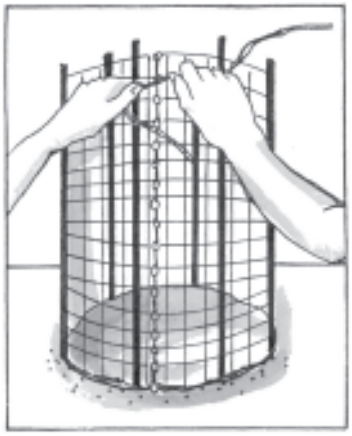


Mark out the circle - 40 cm for 2,5 m wide shade cloth.

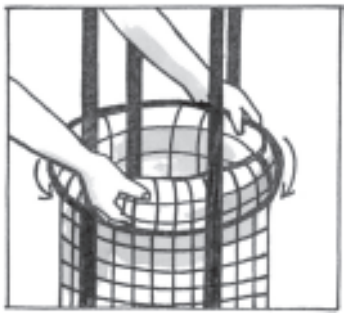


Dig out the bottom layer of the tower.

Plant the side poles or droppers firmly into the bottom.



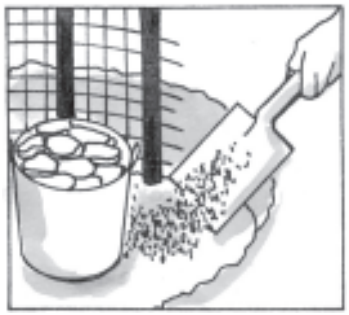
Wrap the shade cloth around the poles and tie the ends together to make a cylinder.



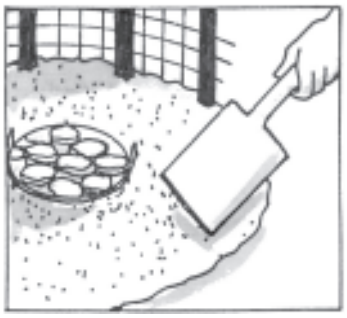
Roll the sides of the shade cloth cylinder down out of the way before filling.

Place the bucket (bottom removed) on the ground in the middle of the tower.

Pack stones carefully in the bucket to make sure that the water does not run through too fast.

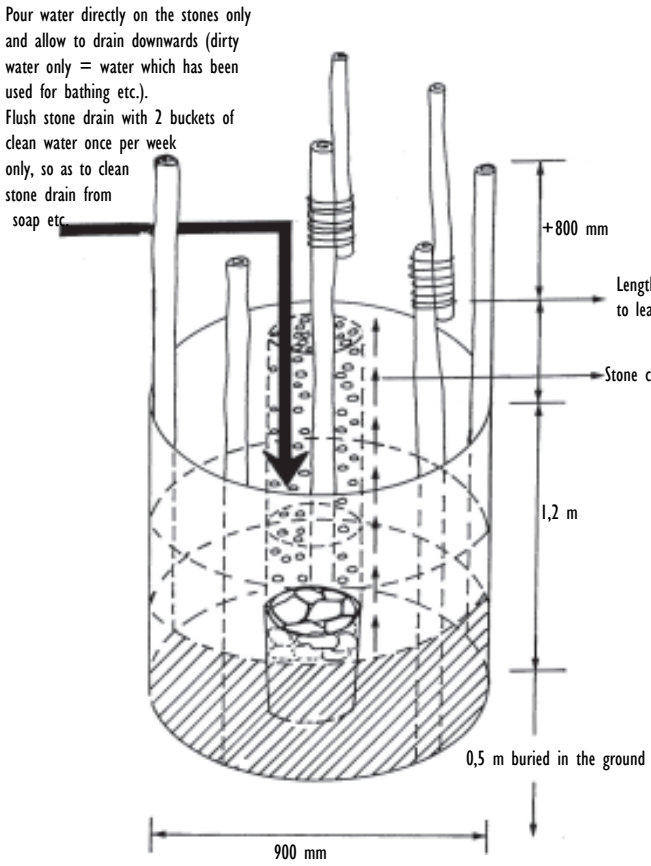


Backfill around the bucket with the soil mixture.



Dampen and smooth soil but do not compact.

Pull the bucket partially out, leaving the stones in position. Fill the bucket again with stones and backfill with soil. Repeat for each layer.

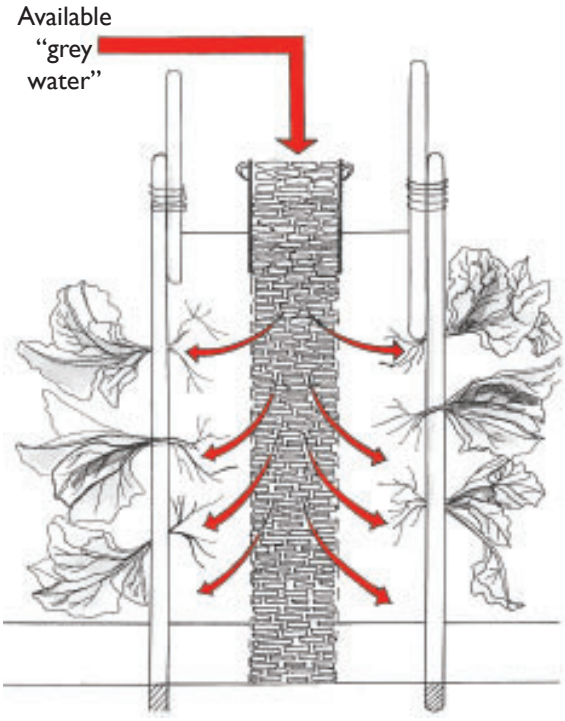


The final dimensions of the Tower Garden.

poured into the bag and the vegetables are planted in holes cut in the sides of the bag itself. The results speak for themselves but like all irrigation the user must master the tricks of the trade, nothing is as simple as it appears at first sight! Initially the housewives were sceptical, they didn't believe you could grow good vegetables successfully with soapy water! The answer to this problem is to clear the system out by pouring two buckets of clean water into the column each Saturday.

WHAT VEGETABLES CAN BE GROWN?

What vegetables can be grown? The towers are ideal for leafy crops typically the various varieties of spinach that are planted through the holes in the side of the shade net cylinder. Ideally the holes should not be one above the other but should be staggered diagonally providing more space for root development. Tomatoes and onions can be planted in the top layer and if crops require trellising this can be provided by extending the vertical uprights and joining them with wire or string. Where possible companion crops should be grown to facilitate biological control of diseases and pests, garlic and onions are useful in this regard.



The shape of the filling material in the stone column is very important for the even distribution of water through the soil in the tower.

An unexpected benefit is the way in which the vegetables have thrived in severe heat wave conditions that have proved too much for conventionally planted gardens. The reason for this is not quite clear. It may be the free air circulation, lower soil temperature or the better moisture status of the soil. It is not claimed that towers will be able to provide all the food a family needs but the contribution made to nutrition and eating pleasure is very considerable.

THIS IS LAZY GARDENING

Once people have become familiar with the towers they prefer to position them right at the back door so that it is easy to pour the wastewater into the tower. It is difficult to predict how much water will be required, only time can tell. If water forms a puddle around the bottom of the tower it is an indication that too much water is being applied and the obvious answer is to make a second tower! One of the main attractions of the method is that little labour or attention is required and this appeals to all busy housewives.

MAKING UP THE TOWER

The way in which the tower works is simple. The soil is contained by the shade cloth "skin" and surrounds a central stone packed drain. The purpose of the stones is to control the

Each day the available "grey water" is poured into the bag….

and the vegetables are planted in holes cut in the sides of the bag.

flow of water so that the soil in the tower is kept at the right water content for growth. The soil mix provides fertility.

The upright poles are not critical. Branch trimmings or fencing standards are suitable and where crops such as tomatoes are planted in the top layer of soil, extensions can be wired on to provide trellising. The selection of the cloth that forms the sides of the tower is, however, critical. All sorts of materials were tried initially in South Africa. In Kenya nylon gunny bags were used but were found to only last about two years. In South Africa sacking, as shown in some of the photographs, did not last the season. Black plastic sheets deteriorated rapidly in the sunlight. Shade netting proved to be far more durable but it was important to use nylon string or fishing line to join up the ends of the shade netting to form a cylinder as shown in the diagram.

Filling the tower with the soil is an art. The soil should be dampened to provide cohesion but not compacted. The water must be distributed evenly throughout the soil mass and will not penetrate the compacted areas. Similarly the stone filling is critical. When the first attempts were made in South Africa round stones were used and the water simply ran down the centre of the tower and did not filter through evenly into the soil mass. Packing flat stones, or building rubble, carefully solved the problem. It is possible to use smallish round stones provided they are so arranged and packed so that satisfactory water distribution is achieved.

The soil must be fertile and retain moisture and it has been found that a mixture of six parts of soil, four parts of manure and two parts of wood ash is satisfactory. It is likely that people will be able to develop appropriate soil mixtures utilising locally available material but experimentation will be required.

Tower gardens are in their infancy in South Africa but have the potential to make a real difference in areas where extreme climate and adverse circumstances have lead to household vegetable gardening being considered out of the question. The initial examples are in the Ndonga area near Queenstown in the Eastern Cape and there are two areas in Limpopo Province, both subject to hot arid conditions. One is the Nzhelele valley north of the Soutspansberg and the other Makuleke in the north east of the province.

Further information can be obtained from Johann Adendorff at (014) 717 3336, cell 0828594896 and Chris Stimie at (012) 842 4103, cell 0824694535.

The assistance given by Johann and Marie Adendorff, Chris Stimie and Gerhard Nel in providing information and photographs is gratefully acknowledged.

by Jonathan Spencer Jones

The deciduous fruit industry in the Western Cape is a major source of employment in the region and an important earner of foreign exchange for the country. Its future, however, could come under threat over the very resource on which it depends – water.

A 1997 survey of Western Cape fruit producers found that few (about one in every five) used scientific irrigation tools or programmes and that there was a widespread tendency to over-irrigate. This results not only in wastage of water, but also in excessive consumption of electricity as well as leaching of fertilizers and pollution of groundwater with potential longer-term consequences. With the current water resources expected to reach near maximum utilisation by 2012 and priorities for the use of water, under the revised Water Law Principles, going to ecological and domestic needs, there is growing pressure on the agricultural sector to optimise its water use.

Moreover it has been established that the growth, productivity and quality of horticultural crops are closely linked to their water status, and therefore the management of water status is important to achieve optimal production and the high fruit quality demanded by local and overseas consumer markets.

IRRIGATION SCHEDULING

Improved irrigation scheduling, in which the timing and duration of irrigation is pre-determined, could offer a possible solution. The timing of irrigation can be determined by procedures based on measured soil and/or plant parameters. Alternatively both the depth of application and timing may be estimated by procedures based on a water budget. In turn, this requires estimation of the evapotranspiration (i.e. The loss of water from the soil and from the tree leaves). Direct measurement of this is not always feasible on a large scale and in such cases it can be estimated by mathematical models utilising meteorological, soil and crop-related data.

As the existence of an automated weather station network in the region supports the feasibility to use a real-time irrigation scheduling model, Theresa Volschenk and colleagues Johanna de Villiers and Odette Beukes of the Soil Science Division of ARC Infruitec-Nietvoorbij at Stellenbosch have undertaken

an investigation of models for irrigation scheduling in Western Cape fruit orchards.

The ideal model for estimation of the water consumption of deciduous fruit trees should be able to predict accurately the water consumption for orchards of different crop and management combinations from daily meteorological data. Management variables include different combinations of planting density, tree training systems, summer pruning, clean cultivation, cover crops, mulching, ridging, terraces, wind breaks and crop density, while irrigation systems can result in wetting of either the full (e.g. flood, sprinkler) or part of the soil surface (e.g. micro, drip).

SWB MODEL

Against this background, the model selected for evaluation was the Soil Water Balance (SWB) model, which uses real time weather data along with crop and soil information, to assess the water flow in and between the soil, crops and surrounding atmosphere.

The SWB model combines an FAO-based crop factor model with a quasi-two dimensional cascading soil water balance model to predict crop water requirements on a daily time step for hedgerow tree crops from limited input data. The potential evapotranspiration (PET) is calculated from the internationally standardised FAO Penman-Monteith methodology, while the two components of the PET (potential evaporation and potential transpiration) are estimated using canopy cover. Above-ground energy is partitioned on a semi-empirical approach and a cascading soil water redistribution separates the wetted and non-wetted portion of the ground.

"The way in which this model simulates evaporation and transpiration has the possibility to address the wide array of management practices and irrigation methods employed in the deciduous fruit industry," Volschenk explains.

Input parameters to run the SWB model include crop planting date, latitude, altitude, maximum and minimum daily air temperatures, basal crop factors and duration of crop stages. The basal crop factor (K_{cb}) is defined as the ratio of crop evapotranspiration to the reference evapotranspiration (ET/ET_o) when the soil surface is dry but transpiration is occuring at the potential rate. The ET_o is the evapotranspiration from a reference surface, a hypothetical grass reference crop with specific characteristics, not short of water, and is calculated from weather data using the FAO Penman-Monteith equation. For the water balance component inputs include rainfall and irrigation amounts, the volumetric soil water content at field capacity and permanent wilting point and initial volumetric soil water content for each soil layer, as well as row spacing, wetted diameter, distance between emitters and the fraction of roots that are wetted.

No locally determined crop factors or K_{cb} values were available for deciduous fruit trees in the West-

De Rust Rosemary pear orchard.

Molteno Glen Packham's Triumph pear orchard.

Grabouw Farms Golden delicious apple orchard.

(All photographs courtesy of ARC Infruitec-Nietvoorbij)

Left:
Molteno Glen golden delicious apple orchard.

Right:
Field tests: Tensiometers and neutron probes.

ern Cape and these had to be determined. The duration of crop stages under local conditions also had to be established.

EVALUATION

According to Volschenk, a two-pronged approach was taken to evaluate the SWB model. First it was used to assess if the transpiration coefficient (K_t), which is a measure of the crop transpiration only, could be used in place of the basal crop coefficient (which includes transpiration as well as a residual soil evaporation component) in combination with measured soil water deficit to calibrate the model. Secondly, it was used to perform simulations and fit SWB-predicted soil water deficit to measured soil water deficit from orchards until the best statistical fit was obtained.

A series of six sites were selected for study, comprising two different cultivars of apples and four of pears in the Elgin district, and three cultivars of peaches in the Robertson and Ashton areas.

Transpiration coefficients were determined for Golden Delicious apples and Neethling peaches and it was found that these could not necessarily be used interchangeably with the model-derived basal crop coefficients. According to the statistical output parameters and/or visual fit there was reasonable agreement between the SWB-predicted and measured soil water deficit for six of the eleven study plots where the fitting procedure was used.

DRAWBACKS

A drawback of the model was that it could underestimate evaporation grossly for warmer areas where the tree canopy fraction exceeds the irrigated soil fraction.

Moreover, attempts to estimate the basal crop coefficient from easily measurable orchard parameters – the tree width and lateral spacing – proved unsatisfactory. However it was found possible to estimate K_{cb} from the measured leaf area, leaf density or the fractional interception of solar radiation by the tree, all of which require specialised expertise and equipment to determine.

It was also found that full bearing trees of early and mid-season cultivars had higher water requirements than predicted from previously published crop factors and Class-A pan evaporation. Producers thus should consider the higher seasonal irrigation requirements of these trees when managing irrigation water. The crop coefficients determined for use with ET_o for apple, pear and peach trees in this research project could prove to be valuable in this regard.

Volschenk concludes that the use of a model such as SWB, which utilises a dual crop coefficient approach (i.e. models evaporation and transpiration separately), has the potential to address some of the variability present in irrigation of orchards and to improve water management. However, further research is required on various aspects, such as assessment of a simple and practical approach to determine K_{cb} values and extending the model to accommodate separate water balances for trees and cover crops under full surface irrigation conditions.

With regard to the practical application of the model trained professionals are needed to collect input data and assist farmers in using the model. In the case of basal crop coefficients not being available, these can be estimated for apple and peach orchards from the fractional interception and from the leaf area for pears.

Critical limitations to using the model are possible lateral water movement into orchards on slopes and soil variability. In such cases direct measurement of the soil water content may become important. "Where lateral water flow into orchards is not a concern, real time irrigation models that are verified through measurements could aid in improved water management and the saving of limited water resources" says Volschenk.

SOUTHERN AFRICA & AFRICA 2004

WATER & SANITATION
SEPTEMBER 23 – 25

The WASH (Water, Sanitation and Health) Africa Fair will be held in Harare, Zimbabwe.
Enquiries: Institute of Water and Sanitation Development, 7 Maasdorp Avenue, Alexandra Park or Box MP 422, Mt Pleasant, Harare, Zimbabwe. Tel: +263-4-735017/26/35. Fax: +263-4-738120.
E-mail: warsh@iwsd.co.zw
Web: http://www.iwsd.co.zw

ENVIRONMENTAL MANAGEMENT
OCTOBER 5 – 7

A short course on environmental management will be held at the Post-Graduate Centre of the University of Pretoria.
Enquiries: Ms Anneke Kruger. Tel: (012) 420 5026. Fax: (012) 362 5285.
E-mail: anneke.ce@up.ac.za

GROUNDWATER
OCTOBER 11 – 14

A short course on model sensitivity analysis, data assessment, calibration and uncertainty evaluation will be presented at the University of the Western Cape.
Enquiries: Dr Shafick Adams, Groundwater Group, Department of Earth Sciences, University of the Western Cape.
Tel: 021-959 2637. Fax: 021-959 2438.
E-mail: groundwater@uwc.ac.za

WASTECON 2004
OCTOBER 11 – 15

The WasteCon 2004 Congress with the theme: Integrated Waste Management, will take place at the Sun City resort in North West Province.
Enquiries: Stan Jewaskiewitz, PO Box 79, Allen's Nek 1737, Gauteng.
Tel: 011 675 3462. Fax: 011 675 3465.
E-mail: iwmsa@iafrica.com
Website: www.iwmsa.co.za

FOG
OCTOBER 11 – 15

The 3rd international conference on fog, fog collection and dew will be held at the Commodore Hotel, Victoria and Alfred Waterfront, in Cape Town.
Enquiries: Prof Hannes Rautenbach, University of Pretoria.
Tel: 012 420 4111.
E-mail: hannes.rautenbach@up.ac.za

LARGE DAMS
OCTOBER 13 – 14

The 4th South African multi-stakeholder initiative on the World Commission on Dams (WCD) report will be held at the Rand Water Conference Centre in Johannesburg. The purpose of this forum is to discuss the draft report, make proposals for its finalisation and recommend its publication.
Enquiries: Cathy Sepeng, c/o Development Bank of Southern Africa, PO Box 1234, Halfway House 1685.
Tel: 011 313 3615. Fax: 011 313 3086.
E-mail: catherines@dbsa.org

SAFE WATER 2004
NOVEMBER 5 – 6

An international conference on safe water with the theme: "Safe water and health: Impact on rural communities and the role of industry and academia" will be held in Johannesburg.
Enquiries: Dr Victor M Ibeanusi, Director of Environmental Science Program, Conference Chair, Spelman College, Atlanta GA 30314. Tel: 404 270 5866.
E-mail: vibeanusi@spelman.edu

SOLIDS-LIQUIDS
NOVEMBER 8 – 9

The 2nd international symposium on Solid-Liquid Separation (SLS '04), organised by Minerals Engineering International, will be held at the Mount Nelson Hotel in Cape Town.
Enquiries: Dr Barry Wills.
E-mail: bwills@min-eng.com

WATER QUALITY
NOVEMBER 17 – 19

The third training course on environmental water quality in water resource management will be held in Bryanston, Johannesburg.
Enquiries: Mike Adams, LabHouse (Pty) Ltd., PO Box 344, Cramerview 2060.
Tel: 011 463 5760.
E-mail: mike@labhouse.co.za
Web: www.labhouse.co.za

GROUNDWATER
NOVEMBER 22 – 24

A short course on fractured rock aquifer assessment will be held at the University of the Western Cape.
Enquiries: Dr Shafick Adams, Groundwater Group, Department of Earth Sciences, University of the Western Cape.
Tel: 021-959 2637. Fax: 021-959 2438.
E-mail: groundwater@uwc.ac.za

PAN-AFRICAN WATER
NOVEMBER 29 – 30

A two-day conference on water management in Africa will be held at the Sandton Convention Centre in Johannesburg.
Enquiries: Register for the conference via the internet site: http://www.terrapinn.com/2004/water

2005

GROUND WATER
MARCH 7 – 9

The 2005 biennial ground water conference – "Ground Water: Stretching your Vision" will be held at the CSIR Conference Centre in Pretoria. Call for Papers.
Enquiries: The Secretariat (Conference Planners), PO Box 82, Irene 0062.
Tel: 012 667 3681. Fax: 012 667 3680.
E-mail: confplan@iafrica.com
Web: www.gwd.org.za

SUB-SAHARA TRADE SHOW
MARCH 16 – 18

Water Africa 2005 Sub-Sahara trade show and exhibition will be staged in Dar es Salaam, Tanzania together with a seminar programme in conjunction with the Ministry of Water & Livestock Development.
Enquiries: Jacqui Hepworth, ACE Event Management, Johannesburg.
Tel/Fax: 011 705 1648. Cell: 083 626 5882.
E-mail: jhepworth@mweb.co.za
Web: www.ace-events.com

WASTEWATER TREATMENT
AUGUSTUS 9 – 12

A conference on the "Sustainable management of residues emanating from water and wastewater treatment" will be held at the Sandton Convention Centre in Johannesburg.
Enquiries: Dr Heidi Snyman
E-mail: hsnyman@golder.co.za

OVERSEAS 2005

URBAN WATER
MARCH 14 – 18

A conference on the efficient use and management of urban water supply will be held in Santiago, Chille.
Enquiries: Francisco Cubillo – Scientific Committee Chairman.
E-mail: scientific@efficient2005.com
Web: www.efficient2005.com or in South Africa – Mr Johannes Buckle (Rand Water).
Tel: 011 682 0814.

WATER RESOURCES
APRIL 11 – 13

The third international conference on water resources management will be held in Algarve, Portugal. The conference will present the most recent technological and scientific developments associated with the management of surface and sub-surface water.
Enquiries: Conference Secretariat: Amy D'Arcy-Burt. Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton, SO40 7AA. Tel: 44 (0) 238 029 3223. Fax: 44 (0) 238 029 2853.
E-mail: adarcy-burt@wessex.ac.uk

SALINITY
APRIL 25 – 28

A meeting of the International Salinity Forum will take place in Riverside, California, USA.
Enquiries: Dennis Neffendorf, 501 West Felix Street, PO Box 6567, Fort Worth, TX 76115. Tel: +1 8175093225. Fax: +1 817 509 3271.
E-mail: dennis.neffendorf@ftw.nrcs.usda.gov
Web: http://www.waterresources.ucr.edu

WASTEWATER TREATMENT
MAY 29 – JUNE 2

The 2nd IWA conference on instrumentation, control and automation for water and wastewater treatment will be held in Busan, South Korea.
Enquiries: ICA 2005 Secretariat. Ms Elle Kwak. 1213 Ocean Tower, 760-3 Woo1-dong, Haeundae-gu, Busan, South Korea 612-726. Fax: +82(0)51 7405160.
E-mail: ica2005@pusan.ac.kr

WASTEWATER TREATMENT
JUNE 2005

The 3rd leading-edge conference on water and wastewater treatment technologies will take place in Sapporo, Japan, and will be focused on advances and developments in water and wastewater technologies. Call for papers.
Enquiries: IWA: Alliance House, 12 Caxton Street, London SW1H 0QS, UK. Tel: +44 (0)20 7654 5500. Fax: +44 (0)20 7654 5555.
E-mail: water@iwahq.org.uk
Web: www.iwahq.org.uk

ACTIVATED SLUDGE
JUNE/JULY 2005

A conference on microorganisms in activated sludge and biofilm processes will take place at the Gold Coast, Queensland, Australia.
Enquiries: Linda Blackall, Department of Microbiology, The University of Queensland, St Lucia, 4072, Queensland, Australia. Tel: +61 7 336 54645. Fax: +61 7 33654620.
E-mail: blackall@biosci.uq.edu.au

WATER ECONOMICS
JULY 8 – 10

An international conference on Water Economics, Statistics, Benchmarking and Finance will be held in Rethymno, Crete, Greece.
Enquiries: Konstantinos P Tsagarikis. Department of Economics, University of Crete, Rethymno 74100, Greece.
Tel: +30 28310 77433/ +306 945 706431.
Fax: +30 28310 77406.
E-mail: iwa@econ.soc.uoc.gr
Web: www.soc.uoc.gr/iwa

WASTEWATER TREATMENT
JULY 17 – 20

The 4th activated sludge population dynamics specialist conference – Microbial population dynamics in biological wastewater treatment will be held at the Hotel Watermark, Surfers Paradise, Queensland, Australia.
Enquiries: Professor Linda Blackall, Advanced Wastewater Management Centre, The University of Queensland, St Lucia 4072, Australia.
E-mail: aspd4@uq.edu.au
Web: http://www.awmc.uq.edu.au/aspd4

URBAN DRAINAGE
AUGUST 21 – 26

The 10th international conference on urban drainage will take place in Copenhagen, Denmark.
Enquiries: Peter Steen Mikkelsen.
E-mail: 10icud@er.dtu.dk
Web: http://10icud.er.dtu.dk

ANAEROBIC DIGESTION
AUGUST 31 – SEPTEMBER 2

The 4th international symposium on anaerobic digestion of solid waste will take place in Copenhagen, Denmark.
Enquiries: Conference Secretariat, BioCentrum-DTU, Building 227, Technical University of Denmark, DK-2800 Lyngby, Denmark. Tel: +45 45256175.
Fax: +45 45883276.
E-mail: info@adsw2005copenhagen.dk

RIVER BASINS
SEPTEMBER 6 – 8

The third international conference on river basin management, including all aspects of hydrology, ecology, environmental management and rivers, flood plains and wetlands will be held in Bologna, Italy.
Enquiries: Rachel Green, senior conference co-ordinator, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southhampton SO40 7AA. Tel: 44(0) 238 029 3223.
Fax: 44 (0) 238 029 2853.
E-mail: rgreen@wessex.ac.uk

IRRIGATION
SEPTEMBER 10 – 19

The 19th International congress on irrigation and drainage with the theme: "Use of water and land for food and environmental sustainability" will be held in Bejing, China.
Enquiries: Chinese National Committee on Irrigation and Drainage, No 20 West Chegongzhuang Road, Beijing 100044, People's Republic of China. Tel: +86 10 6841 5522/ 6841 6506.
Fax: +86 10 6845 1169.
E-mail: cncid@iwhr.com
Web: http://www.icid2005.org

WASTEWATER TREATMENT
SEPTEMBER 18 – 21

A conference on nutrient management in wastewater treatment processes and recovery will be held in Krakow, Poland. International experts will deliver state-of-the-art lectures followed by a set of paper and poster presentations selected from the call for papers.
Enquiries: Adam Kalucki, Lemtech Consulting, Szpitalna 40, 31-024 Krakow, Poland.
Tel: +48 124294031. Fax: +49 12 4294065.
E-mail: adamk@lemtech.krakow.pl

OFF-FLAVOURS
OCTOBER 2 – 6

The 7th symposium on off-flavours in the aquatic environment will be held in Ontario, Canada.
Enquiries: Christina Collard, c/o St Lawrence River Institute of Environmental Sciences, 2 Belmont Street, Cornwall, Ontario, Canada K6H 4Z1. Tel: 613 936 6620 ext 222.
Fax: 613 936 1803.
E-mail: info@riverinstitute.com
Web: http://www.riverinstitute.com/conferences/off-flavours

WASTEWATER RECLAMATION
NOVEMBER 2005

The 5th international symposium on wastewater reclamation and recycling sustainability will take place on Jeju Island, Korea.
Enquiries: Prof S Kim, Water Reuse Technology Centre, Kwangju Institute of Science and Technology, 1 Oryong-dong, Buk-gu, Gwanju 500-712, Korea.
Tel: +82 629702436. Fax: +82 629702434.
E-mail: iskim@kjist.ac.kr

PIPELINE DESIGN COURSE
8 – 12 November 2004
University of Pretoria

The course will focus on the practical applications of pipeline design. The course has been structured over 5 days. Aspects that will be covered range from the basic theory of pipeline design, installation of pipes, design and selection of pipeline components and valves, optimization of pumping systems and the introduction to various applicable design software packages. Practitioners will lecture, enhancing the contribution to current day knowledge. A number of practical sessions have also been included to acquaint participants with the application of the gained knowledge.

Who should attend?

The focus in this course will be on the practical application of pipeline design. The theoretical knowledge required will be discussed and designs will be demonstrated using numerous examples. The objective of the course is to ensure that the participants leave with the confidence to design pipe systems in practice. Planners, designers and managers of pipelines and water infrastructure, will benefit from the course.

Course contents

Day 1	**Pipeline hydraulics**	Pipe flow theory, losses calculation and hydraulic analyses; Economic analysis; Life cycle analysis and optimization of systems; External protection of pipelines. Afternoon practical session using applicable software such as: EPANET, ASTPM and GA Utility Programs
Day 2	**Pipeline and pipe component design**	Material selection, pipe class determination; Crotch plate, collar and wrapper design; Surge analyses. Afternoon practical session using applicable software such as: Structural design, Simplified surge analyses and other utilities.
Day 3		Structural analysis of pipes; Selection of laying and backfilling procedures; Valve selection, positioning and working (Isolating, Non-return, Control and Air valves; Thrust block and anchor block design; Valve chamber layout design. Afternoon practical session using applicable software such as: CANDE, Vent-O-Mat Utility Programs, Thrust block design.
Day 4	**Pumping system design**	Pumping principles and pipeline characteristics; Type of pumps and pump selection; Pump stations layout; Design of sumps and super structures; Developments to improve the inlet conditions for pumps. Afternoon practical session.
Day 5	**Pipeline installation, testing and operation**	Asset management of pipe systems – a planning perspective. Pipeline testing; Refurbishment of steel reinforced concrete pipes; Internal protection of pipelines; Development of alternative internal protection technologies (Alternative liners); Local application and development of trenchless technologies; Control strategy, monitoring and maintenance; Data acquisition and system control.

The following reputable practitioners and academics will share their experiences during the course:

Me Michelle Govender, Mr Nic Trebicki, Mr Pieter Reynecke and Mr Edwin Varkevisser from Rand Water, Mr Willem van der Westhuizen from SULZER, Dr Mark Webb from SSIS, Dr Riaan Wolhuter from the University of Stellenbosch, Prof Fanie van Vuuren and Mr Marco van Dijk from the University of Pretoria.

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Cost of course

Normal daily fee: **R1250** per day
Discounts for:
- Organizations sending more than 3 participants per day
- Attending at least 3 days of the course
- Attending the entire course (5 days)

For full brochure and entry form contact the program coordinator or download from the following web site: **http://www.up.ac.za/academic/civil/divisions/water/pipelinedesign.pdf**

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