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Newsletter of the Water Research Commission

October 2003



Do you need this?

The WRC has at its disposal a solid phase extractor (a Zymark Auto Trace SPE Workstation) that was used on one of its projects to extract organic pollutants from aqueous solutions. If an individual (researcher, project leader, etc) or an institution would like to borrow this equipment, please contact Mr Jay Bhagwan on
tel: 012-3309042
e-mail: jbhagwan@wrc.org.za.

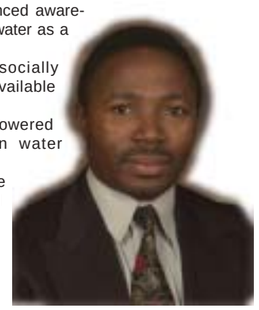
Cross-Cutting Domains

Water and Society

Objectives:

The domain aims to facilitate and integrate WRC research and development initiatives which promote:

- Healthy perceptions and balanced awareness of key issues relating to water as a scarce and shared resource
- Water services which are socially acceptable, affordable and available to all
- Communities which are empowered to participate effectively in water institutions
- Ready access to water for the poor, women, the youth and the disabled



Dr Sizwe Mkhize
Head: Water and Society

Thrusts:

- Water as a shared resource
- Social needs for water services
- Gender and other limitations regarding access to water
- Poverty alleviation

Water and the Economy

Objectives:

The domain aims to facilitate and integrate WRC research and development initiatives which:

- Demonstrate the applicability of economic principles in the water field
- Provide sound knowledge and support to matters relating to water and the economy

Mr Meiring du Plessis
Head: Water and the Economy

Thrusts:

- The value of water to different sectors of the economy
- The economic advantages and disadvantages of water resource development
- The use of economic instruments to effect behavioural change regarding water utilisation
- The use of economic instruments to promote equitable and efficient water allocation and distribution

Water and the Environment

Objectives:

In support of a broader understanding of the inter-linkages of the hydrological cycle in relationship to the environment, and in order to facilitate sustainable development practices and environmental sustainability, the objectives of this cross-cutting domain are to:

- Better understand the impact of various land uses on the different components of the hydrological cycle and subsequent risk to environmental functioning
- Assist in developing environmental governance systems that are appropriate to SADC circumstances. This needs to include understanding issues that will hamper environmental governance
- Understand impacts of policy on the water environment, by investigating and recommending integrative and co-operative mechanisms to bridge the various legislative frameworks and policy directives

Dr Heather Mackay
Head: Water and the Environment

Thrusts:

- Environmental governance systems for water in the environment
- Biodiversity protection
- Environmental functioning and governance systems

Water and Health

Objectives:

The domain aims to facilitate and integrate WRC research and development initiatives which:

- Develop appropriate techniques, technologies and systems for monitoring of potentially harmful pollutants in water
- Obtain adequate understanding of the origin, survival and persistence of, and inter-relationships between, microbial, chemical and other biological and toxic pollutants in water
- Assess the impacts of pollutants on human, animal and aquatic health by performing epidemiological investigations and developing health-risk assessment tools
- Investigate the effects of the environmental change on health
- Develop scientifically sound educational material on health, hygiene and the effects of/and prevention of pollution and the relationship between these
- Provide guidance for appropriate communication, awareness-building and management strategies

Ms Annatjie Moolman
Head: Water and Health

Thrusts:

- Microbial water quality and associated diseases
- Chemical quality of water and associated diseases
- Safeguarding public health

Water Research Commission

ISSN 1683-9730

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In This Edition

Waste Buster!

Susan (Sue) Jessica Barclay is a petite lady who is passionate about tackling the mammoth task of waste minimisation in the textile as well as the metal finishing industries. Sue epitomises the modern South African woman: industrious, innovative, creative and passionate. Since joining the Pollution Research Group (PRG) in 1993, Susan has been project leader on 4 WRC-sponsored projects. The PRG, which is headed by Prof Chris Buckley, is based at the University of Natal, Durban.

Sue's work hinges on making role-players in industry as well as local authorities aware of Cleaner Production (CP) in all its ramifications. As far as the textile and metal finishing industries are concerned, Sue has worked relentlessly at demonstrating and creating an awareness of benefits of CP as opposed to end-of-pipe approaches. Her programme has included comprehensive campaigns, the organising of seminars, holding of workshops and other educational activities. The concept of Waste Minimisation (WasteMin) Clubs was initiated by Prof Buckley and Sue occupied the proverbial driving seat in steering the concept to a stage where its popularity is growing in leaps and bounds.

It comes as no surprise that this enterprising young lady won the prestigious Women in Water Award in the category "Researcher under 35 years old", and was, furthermore, nominated for Women of the Year Award 2003. When I asked Sue about her plans for the future, she said, "I am passionate about what I am doing presently and I'd love to continue with this work. It is rewarding to see my work bearing fruit. I am in the process of registering a Closed Corporation (CC) and I want to act as a consultant and work with the PRG as well as with other organisations and provide training courses to promote CP in industry."

Sue acknowledges that her achievements were made possible by the team effort of the PRG: the dedicated students as well as the persistent support from Prof Buckley. "I felt honoured that my efforts have been recognised. A few years ago, CP was unheard of, but today it is a buzz word in the industrial sector." Once again, the foresight of the WRC was acknowledged in the equation. "I am extremely grateful to the WRC for funding my projects and affording me the opportunity to make a difference where it really counts- environmental protection, water saving as well as cost savings."

And what a difference: On 22 August 2003 the *Mail & Guardian* announced the winners of The Greening the Future Awards. Berg River Textiles won the award in the category: Companies/Organisations with the most improved environmental practices. A large amount of this work stemmed from the Danaida Cleaner Textile Production Project- the project co-ordinator was none other than Sue Barclay.

Is there more to do? "Yes, much more," says Sue. Whilst the larger concerns have embraced the concept of CP, the Small, Medium, and Micro Enterprises (SMMEs) need to get on board and Sue is convinced that in a few years (with her passion and commitment) this sector will join hands with other organisations and also benefit from cost savings as well as prevention of environmental degradation. "One frustration

Susan Barclay flanked by the Minister of Water Affairs and Forestry, Mr Ronnie Kasrils (right), and Dr Steve Mitchell (WRC) (left) at the Women in Water Awards held on 14 March 2003

is getting role players in industry to change their mind sets. Of course, initially it takes time and effort, but the benefits are gigantic." Her *modus operandi* involves the use of case studies to prove that CP is effective and show how it impacts on the broad concept of sustainability.

The WRC's investment in projects relating to CP has certainly yielded impressive returns, with the success of WasteMin Clubs being a good example. Guides on setting these up and appropriate training materials have also been developed. In 2002 a WasteMin guide for the textile industry was published, which Sue uses as part of her CP training course for the textile sector. June 2002-June 2003 saw Sue becoming involved as project Co-ordinator for the DANIDA Cleaner Textile Project. This project was a huge success for Sue and had spinoffs for the WRC: "The WRC projects also benefited when outputs from this project were merged with existing WRC knowledge."

Greg Steenveld, Research Manager at the WRC who works closely with Sue, confirms her leading role in managing the pilot WasteMin Clubs and in developing a systematic methodology for initiating and sustaining such clubs. "In all her activities, the commitment and initiative shown by Sue have been key factors in the success of these projects."

Sue's work began with two pilot WasteMin clubs in KwaZulu-Natal (!998-1999). Since then the concept has snowballed and today there are at least 20 clubs operating mainly in Gauteng and the Western Cape. Companies that participate in these clubs have reported financial savings of between 1 and 7% of annual turnover. Savings quantified by by the two pilot WasteMin Clubs (20 companies) amounted to R13 m. per annum. Over one million litres of fresh water has been saved per annum by these companies, and greenhouse gas emissions were also reduced due to less energy consumption. When asked about how South Africa compares in the international arena, Sue said, "Our environmental Acts and Bills are progressive and, as far as the textile and metal finishing industries are concerned, I have no doubt that we are making good progress."

(continued on p 2)

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(from p 1)
An active mind like Sue's never lets up. This innovative thinker suggests that schools and households should also get involved in the CP mix.

So how does a diminutive woman handle a male-dominated industrial environment? "Surprisingly, the men react well to me and are interactive and co-operative. The down side is that they sometimes fail to take me seriously or they ensure that they verify some of the things I say. However, I don't view my being a woman as an issue. The results bear testimony to this."

Raising two young children (5 and 7 years old respectively) can be a daunting task, especially so when juggling between parent, researcher, mentor (1 M.Sc. and 4 M.Sc.(Eng) students), author/co-author (15 published research papers and 42 conference proceedings) and workshop co-ordinator- resonsibilities that would intimidate most individuals.

Sue, your work and that of the PRG, is a magnificent example of teamwork, dedication and perseverance. The WRC lauds your efforts in this vital area.

The WRC @ the Sasol TechnoX

The Sasol TechnoX was held in Sasolburg from 13-20 August 2003. A total of 56 exhibitors displayed a kaleidoscope of scientific marvels to school learners from all over the country. The WRC was also an exhibitor. A model of a catchment area as well as a fog collection model were on display. The organisers provided the WRC with 4 "Techno Buddies" who assisted in demonstrating various water concepts: rivers, condensation, precipitation, wetlands, dams, lakes, cloud formation and fog collection.

Furthermore, certain publications were distributed: *Archimedes: Water for Life*, *Your Water Rights*, *The Water Wheel* and the popular publication *"Some, for All, Forever - Water Ecosystems and People* (TT 176/02) which outlines various water concepts in an easy-to-understand format. This guide contains information on the National Water Act, river health, wetland conservation and a host of related topics.

The WRC made an impression on the learners as well as the educators and parents who visited the exhibition stand.

"Techno Buddy" Elvis explaining the fog collection model to school learners

Award for Student Paper

The Mine Water Division of the Water Institute of Southern Africa (WISA) will award a prize of R7500 for the best mine water management-related paper presented by a *bona fide* registered student at the WISA Biennial Conference 2004. It is hoped that such a prize will encourage students studying in appropriate fields to contribute to the advancement of knowledge related to enhancing the management of water at mines in Southern Africa. Papers dealing with any branch of science that could contribute to advancing the mining industry's capacity for dealing effectively with mine water-related issues that impact on the natural environment or any component of the engineered water cycle associated with mining will be eligible. The announcement of the winning paper will be made at the Gala function of the conference.

For more information contact:

WISA
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WRC Annual Report

The latest WRC annual Report (2002-2003) is available. If you would like a copy, please contact Yuven on 012-3309053 or e-mail him at yuveng@wrc.org.za. You can also download the document from the website www.wrc.org.za.

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What's New

Report No 1032/1/03 (Contractor: McCracken Solar Stills (Pty) Ltd)
Cost effective solar still units for drinking water provision in remote, rural areas of South Africa: A case study and implementation guidelines

An affordable and simple-to-operate solar distillation unit for the provision of potable water from brackish or sea-water sources, was successfully developed. The unit is able to provide water for drinking and cooking purposes to single households and small communities. It derives from the re-design of an international unit, in order to make it more affordable and applicable to South African rural conditions. Single household solar still units have been evaluated in the far Northern Cape, and a community system, consisting of 15 single units in parallel, is in operation at Kerkplaas in the Karoo. This latter system now supplies desalinated water to a community of 40 people.

Report No 1097/1/02 (Contractor: University of Witwatersrand)
Operationalising multi-party strategic adaptive management (SAM) of the Sabie River

The project sought to achieve a working relationship between the main parties involved in managing the Sabie River. It was the first attempt at co-ordinating water management around the issue of "the reserve" for the Sabie River in particular. This project made significant contributions to the Kruger Park management system and conservation managers are far more able to respond to river management problems as a result. Consequently, the project has been an important contributor to a new resource and conservation management system which is recognised internationally as an innovative application of modern thinking.

Report No 743/1/02 (Contractor: University of Pretoria)
The health impact of waterborne viruses and methods of control in high risk communities

In this project, during extensive analyses of raw water sources, viruses were sometimes detected despite the absence of coliform bacteria, enterococci and somatic or F-RNA coliphages. These results suggest that indicators of faecal pollution fail to indicate the potential presence of viruses in waste water and polluted water environments. Furthermore, viruses were detected in treated drinking water supplies which met generally accepted quality limits for heterotrophic plate counts, total coliform bacteria, enterococci, and somatic and F-RNA coliphages. This suggests that conventional indicator tests also have shortcomings for assessing the presence of viruses in treated drinking water supplies.

Report No 1088/1/03 (Contractor: Ninham Shand (Pty) Ltd)
Dealing with tunnel ageing

This project provided a reliable hydraulically-based methodology with which ageing of concrete-lined tunnels and the associated decrease in hydraulic capacity can be predicted. The ageing mechanisms associated with sliming and soft water corrosive conditions were investigated in laboratory and field studies aimed at better understanding ageing processes in large diameter conduits such as water transfer tunnels.Results facilitate the timeous phasing in of new schemes when tunnel ageing decreases the hydraulic capacity and provide information on remedial measures which could be implemented to reverse or contain the tunnel ageing process. Tunnel design and operation guidelines were also developed to limit tunnel ageing.

Report No 947/1/02 (Contractor: University of the Free State)
The economic impact of changing water quality on irrigated agriculture in the Lower Vaal and Riet Rivers.

This project focused on developing and applying models to determine the financial and economic viability of irrigation farming in the Lower Vaal and Riet Rivers. The relationship between changing water quality, soil conditions and crop production was evaluated. The project also sought to determine the impact on yield, crop choice, agronomic and water management practices and expected income and costs. One of the outcomes of the project was to develop models for typical farms in different river reaches and to apply these models to test the outcome of alternative scenarios regarding internal salinity management practices and external policy measures.

Report No 1243/1/03 (Contractor: Rhodes University)
Development of integrated biosorption systems for the removal and/or recovery of heavy metals from mining and other industrial wastewaters, and determining of the toxicity of metals to bioremediation processes

This project sought to provide a means of cost-effective treatment of heavy metal containing effluents, both for the removal of metals to reduce environmental pollution and to facilitate effective disposal of such effluents, and for the possible recovery and recycling of metals in certain instances. Furthermore, it aimed to provide a technology for the potential reuse in industrial operations of water that is currently disposed of. A further outcome of the project was the evaluation of the potential toxicity of heavy metals to micro-organisms such as bacteria and algae used in bioremediation processes.

Report No 1167/1/03 (Contractor: CSIR)
Treatment of landfill leachate from hazardous and municipal solid waste

This project concentrated on developing Electro Dialysis (ED) and Reverse Osmosis (RO) process technology for the treatment of hazardous industrial leachate with high Total Dissolved Solids (TDS) and high organic concentrations. There was also a need to develop RO process technology for the treatment of hazardous municipal leachate with low TDS and low organic concentrations. The leachates were characterised and their biodegradability was determined. The fouling potential of the leachates for ED and RO membranes was also determined.

Report No. 918/1/03 (Contractor: ARC)
The potential of aquatic *Pythium* species for the biological control of *Cladophora Glomerata* in irrigation schemes in South Africa

The focus of this project was to investigate the efficacy of selected organisms to control *Cladophora Glomerata* under laboratory and field conditions as well as to investigate the mass production, viable and practical formulations for application of, and the optimal dosage rates of the selected organisms. The host range of the selected organisms to ensure crop safety had also to be determined. Studies on the effect of temperature, pH and copper on the regrowth, zoospore production and zoospore mobility of *Pythium* isolates were also conducted. Finally, studies on the use of *Acacia mearnsii* bark for control of algal growth were carried out and factors influencing the integration of the use of *Pythium* with other existing control methods were investigated.

Other New WRC Reports:

1030/1/03: **The evaluation of alternative disinfection processes for the removal of protozoan oocysts and cysts and other micro-organisms in the treatment of final wastewater (Umgeni Water)**
999/1/03: **Evaluation of predictive models for pesticide behaviour in South African soils (Economic Protect Evaluation)**
1021/1/02: **The gender dimension of the water policy and its impact on water and sanitation provision in the Eastern Cape: The case of the Peddie district (University of Fort Hare)**
1234/1/03: **Evaluation of the application of natural isotopes in the identification of the dominant streamflow generation mechanisms in TMG catchments (CSIR)**
1014/1/01: **The development and co-ordination of catchment fora through the empowerment of rural communities (Rhodes University)**
1191/1/03: **Microbial characterisation of activated sludge mixed liquor suspended solids (University of Pretoria)**
900/1/03: **A decision support system for the controlled release of saline mine water during flood conditions in the Witbank Dam catchment (Wates, Meiring & Barnard (Pty) Ltd and Ninham Shand (Pty) Ltd)**
1062/1/03: **Principles and processes for supporting stakeholder participation in integrated river management (CSIR)**
1001/1/03: **Rehabilitation of contaminated gold tailings dam footprints (Pulles, Howard & De Lange)**
1068/1/03: **Occurrence in water sources of *E. coli* 0157:H7 and other pathogenic *E. coli* strains (University of Pretoria)**
925/1/03: **The impact of introducing treated water on aspects of community health in a rural community in KwaZulu-Natal (Umgeni Water)**
928/1/03: **Molecular characterisation of F-RNA coliphages in South African water sources (University of Pretoria)**

Reports can be ordered at orders@wrc.org.za