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Newsletter of the Water Research Commission

In This Edition



Sky's the Limit

As a young woman in the new South Africa, Marilyn Govender has achieved a lot, with the promise of achieving even greater heights. This twenty-something young lady commenced her career in 1998 when she worked for a year at the Department of Hydrology now referred to as Bioresources Engineering and Environmental Hydrology (BEEH) at the University of KwaZulu-Natal in Pietermaritzburg. She worked as a researcher for Prof. JC Smithers on a rainfall study project funded by the WRC. "This first year of independent research was my stepping stone from my academic mindset into the career world," says Govender.

In 1999 she was fortunate to be awarded a bursary from the CSIR to complete her Honours in Hydrology as a full-time student through BEEH. "In December 1999 I began working at the CSIR, Pietermaritzburg office as an intern. In January 2000 I was appointed as a permanent researcher in Pietermaritzburg under the management of Mr Jan Bosch. Since then I have worked on various research projects of national interests, many of which involved the analysis and modelling of hydrological processes at catchment scales. In 2002 I completed my Masters degree in Hydrology through BEEH, UKZN under the supervision of Prof RE Schulze and Dr PJ Dye on the analysis of streamflow patterns of small catchments towards improved parameter estimation of streamflow predictions using the ACRU Model (WRC Report No. 1193/1/02)."

In 2003 Marilyn embarked on a new and exciting research direction in the Mines Woodlands project led by the University of Witwatersrand, AngloGold Ashanti and the CSIR. This study afforded her the opportunity to study towards her doctorate through the Animal, Plant and Environmental Sciences (APES) department at the University of Witwatersrand. The doctorate, which she plans to complete in 2006, involves the investigation of plant water stress of existing trees in the highveld mining areas of Southern Africa using remote sensing technology.

"My involvement with the WRC began in 2002 when I worked on the analysis of streamflow patterns of small catchments towards improved parameter estimation of streamflow predictions using the ACRU Model. Since then I have worked on various projects together with my colleagues from the CSIR. In 2006 I will be starting a two-year project towards improved classification of landcover in Southern Africa using hyperspectral remote sensing imagery. It is a project that I am passionate about and it has lots of promise for the WRC and for South Africa."

Marilyn is impressed with the WRC and its role as South Africa's water knowledge hub. "The WRC can be seen as one of the most important funding and research organisations in Southern Africa which promotes research and capacity building in our country. The WRC is a central core unit through which knowledge is created, utilised and disseminated."

Ms Govender draws inspiration from her family: her mother, brother and sister, and recently, her husband, Mevelin. Every successful student and researcher achieves success through the support of good mentors. In Marilyn's case they are Prof Roland Schulze, Mr Jan Bosch and Dr PJ Dye.

"As a teenager, I knew then that I wanted to excel and complete my tertiary education at well-renowned institutions in South Africa. The last 11 years of my life have been demanding. However, my academic achievements over the years far out-weigh the sacrifices I have made as young individual in a changing South Africa."

Renias Dube, Research Manager at the WRC, who works closely with Marilyn says, "Marilyn, the WRC is proud of your perseverance and your consequent success. We are sure that for you, the sky is the limit. We look forward to interacting with you in the future."

Dr Kfir Honoured

Dr Rivka Kfir, CEO of the WRC, was one of the recipients of the Tuks Alumni Awards held at the University of Pretoria in November 2005. This award is the highest award that an alumnus of Tukkies or an outstanding achiever can receive from fellow alumni. Since 1974, this award has been presented to alumni who have excelled. Dr Kfir was one of nine recipients of this prestigious award. You may read Dr Kfir's resume on the WRC website www.wrc.org.za

***Left**: Dr Rivka Kfir with her award*

***Bottom**: Dr Kfir with seven of the other recipients of the prestigous Alumni awards*

Another Cog Added to the WRC Financial Machinery

Helena Oberholster joined the WRC in October 2005 as a Financial Officer. This enthusiastic young lass hails from Paarl. As a tenacious and industrious individual, Helena completed her articles with a small auditing firm in Paarl whilst studying towards her B-Compt degree on a part-time basis.

Thereafter, she joined Strydoms Inc., a small auditing firm in Pretoria, before landing at the WRC. It seems like Helena is here to stay, although she is still an ardent WP rugby supporter! "The WRC is a reputable water knowledge hub and I intend applying my theoretical accounting knowledge to try and refine the financial processes that are already in place at the WRC. The people at the WRC are warm, friendly and supportive," says Helena.

When she is not juggling figures and balancing the books, Helena takes delight in relaxing with friends, enjoying football matches, movies and, of course, WP rugby.

Helena, the WRC welcomes you to its growing family. We hope that your stay will be a long and rewarding one.

Welcome Eiman

Eiman Karar joined the WRC in October 2005. She has thirteen years of experience ranging from plant ecology, natural resources management technical involvement to management expertise. She commenced working for Umgeni Water in 1996, worked for the Department of Water Affairs & Forestry (DWAF) from 2001 until she joined the WRC.

Ms Karar hails from Sudan. She obtained her B.Sc. and her M.Sc. at the University of Khartoum. She arrived in South Africa in 1996 and completed a Project Management Diploma at Varsity College. She intends completing her PhD shortly.

To Eiman, South Africa is her second home. "There are lots of parallels between Sudan and South Africa: both countries have had periods of struggle for self-determination, wide-spread poverty and a huge gap between the poor and the affluent classes, diversity within the country and more than a hundred local dialects. Added to that is a country with lots of colour and a rich cultural heritage," says Eiman.

Eiman enjoys keeping fit by visiting the gym, swimming, playing badminton and squash and she also likes reading. Eiman, the WRC welcomes you and your expertise.

The WRC @ the Rainwater Harvesting Festival

The WRC was an important role player at the Rainwater Harvesting festival in Botshabelo, Free State Province on 6 December 2005. Farmers and the community provided entertainment and shared lessons on best practices in In-Field Rainwater Harvesting. Dr Andrew Sanewe, Research Manager at the WRC, presented certificates of commendation and certificates of merit to members of each village. Prizes were presented to the top 3 villages. The project empowers this poor rural community to produce vegetables for their own consumption as well as for sale to local markets. The festival was also broadcast on SABC 2 and SABC 3. It was also broadcast on SABC radio in at least 5 languages.

***Top**: Community members in a festive mood at the festival*

***Above left:** Community members at the festival*

***Above right:** Dr Sanewe presenting certificates*

***Bottom**: Dr Sanewe with recipients of certificates*

***Bottom**: Celebrating Rainwater Harvesting*

WRC – A Winner!

The University of KwaZulu-Natal awarded its Platinum Award to the WRC for funding research projects. The WRC funded approximately 50 research projects to the value of R7.7 million over the past ten years. Dr Gerhard Offringa, Research Manager of KSA: Water Use and Waste Management accepted the award on behalf of the WRC.

What's New

Report No 1310/1/05 (Contractor: Pulles, Howard & De Lange)
Development of criteria for the design of fishways for South African rivers and estuaries

This is the second of three projects addressing very specific questions on the need for fishways, their design and location. A product of the series will be a tested set of guidelines on the design, location, monitoring and other aspects around fishways. This report covers the situation assessment of fishways (provision, enabling legislation, effectiveness and design). Regarding design, the vertical slot fishway appears to be the most suitable for rivers which are subject to large variations in flow. This report presents an inventory of the known fishways in the country. This report has a detailed assessment of design criteria based on the needs of the non-salmonid fish indigenous in the country.

Report No 1414/1/05 (Contractor: University of the Free State)
Environmental water requirements in non-perennial systems

The South African National Water Act (NWA) (Act 36 of 1998) requires that the environmental reserve be determined for each significant water body before water licences may be issued. Methods currently available for the determination of environmental water requirements for South Africa's rivers are based on perennial rivers, but about two-thirds of South Africa has non-perennial rivers. Non-perennial rivers are more variable than perennial rivers, and may function differently. The non-perenniality makes them ecologically more fragile and so alterations to their hydrology may have far reaching effects. It is important that methods are developed to assess the environmental water requirements for non-perennial rivers with acceptable confidence. Following a review of the international literature, three case studies were done to assess the suitability of existing methods for the estimation of environmental water requirements for use on non-perennial rivers. A number of existing feasibility studies was also reviewed to identify areas where current methods may be refined.

Report No 926 & 1253/1/05 (Contractor: University of Stellenbosch)
The development and validation of bio-assays to detect estrogenic and anti-androgenic activity using selected wild-life species

This study recommended that screening and testing methodology be developed or optimized, *in vitro and in vivo* bioassays as well as analytical methods for the specific detection of suspected Endocrine-disrupting contaminants (EDCs) in the aquatic environment and consumer products. This research programme represents a first attempt to utilize local endemic vertebrate species as bio-indicators investigating the potential of specific biomarkers such as the hepatic produced yolk precursor, vitellogenin (Vtg) to determine environmental estrogenic activity. Furthermore, this programme also successfully highlighted the use of biomarkers related to the male androgenic system as well as the sex determination and differentiation developmental systems. In addition, the potential of using the functional involvement of the thyroid endocrine gland in the early developmental and metamorphosis programme in amphibians as biomarker system for studying the interaction with the thyroid systems proved valuable. The bioassays developed and validated through these projects using endemic animal species contribute towards the greater objective to eventually establish a batter of EDC screening bioassays. This allows for assessments on wild populations as well.

Report No 1261/1/05 (Contractor: University of Pretoria)
Regional model development for simulating atmospheric behaviour and rainfall over southern Africa

The main objectives of this project were to improve the simulation of water-related variables over South Africa by applying a sophisticated regional-scale atmospheric model and, simultaneously, to equip SA and African scientists with knowledge and skills to develop, maintain and use atmospheric models. The research was conducted in collaboration with model developers at the CSIRO in Australia. Many model runs, interspersed with frequent exchanges of results and progressive improvement of model code, eventually resulted in greatly reduced model biases and much improved simulation of atmospheric circulation and rainfall over South Africa. In the quest for improvement in the model dynamics, a unique non-hydrostatic kernel was developed by the local research team in South Africa. This development was used as a guideline for making C-CAM non-hydrostatic at the CSIRO. It also established a sustainable basis for model development in South Africa, both institutional and human related. The achievements of this project, including the building of sustainable bilateral research collaboration, improvements in model dynamics, successful verification of simulations using the improved version of C-CAM and knowledge transfer workshops involving atmospheric scientists from SA, the CSIRO and other African countries, all translate into the region having a greatly enhanced capacity and confidence in its ability with regard to atmospheric modelling.

Report No 1398/1/05 (Contractor: University of Pretoria)
Origin, fate and clinical relevance of water-borne pathogens present in surface waters

The scope of this project was to investigate the possible sources, survival and clinical relevance of selected water-borne pathogens in a rural and peri-urban area, and to investigate the environmental factors and social determinants that contribute to the transmission of such diseases. The information provided by this study could form the basis for the development of appropriate catchment management and intervention strategies to reduce the health risk to various water users. The project aimed to create a better understanding of the fate and/or clinical relevance of selected parasites (*Cryptosporidium*) and bacteria (*Salmonella* and *Vibrio cholerae*) in fresh water environments. Based on the study it seems unlikely that cryptosporidiosis is commonly transferred from animals to humans in the South African context. The high percentage of the human genotype (80%) observed in the cases investigated suggests the importance of person-to-person contact and human sewage contamination of drinking water, recreational water and food sources, as a means of spreading the parasite. The results of the present study have revealed that *Salmonella* was prevalent in environmental and clinical samples examined. Strains isolated from human stools, water, sediments and food were phenotypically and genetically correlated which provide evidence for the epidemiological link between environmental reservoirs and human infection in an endemic area. This confirms that water and food could be important sources of human salmonellosis in rural areas. The identity of *Vibrio cholerae* stains isolated from the Vaal Barrage catchment area were confirmed with this PCR (polymerase chain reaction) technique and thereafter a selection of these strains were typed with Amplified fragment length polymorphisms (AFLP). A number of socio-economic factors could be correlated with high cumulative infection rate (CIR) percentages in the district councils (DCs). They included traditional households, no sanitation or the use of bucket system, the use of river water for household purposes and the lack of refuse removal. This again stresses how the lack of basic services exposes communities to the risk of infectious disease and increase their overall vulnerability.

Report No 1158/1/05 (Contractor: PRG, UKZN)
The application of pinch analysis for water and effluent management

This report follows on and complements WRC Report No. 851/1/03 entitled *The Application of Pinch Analysis for the Rational Management of Water and Effluent in an Industrial Complex*. The present project report presents additional case studies, with some further theoretical developments. The project objectives were to develop the technique and promote its application to the specific problems associated with management of industrial water and effluents in the RSA, and to enhance the capacity in the RSA for undertaking pinch analysis studies by training people in educational institutions, industry and government. The case studies showed that the historical pressure to conserve water in South Africa have already resulted in the introduction of water-saving measures in many industries. The case studies examined however resulted in a number of possible strategies being identified for improved industrial water management, on a case-specific basis.

Report No 1358/1/05 (Contractor: ARC)
Situation analysis of problems for water quality management in the lower Orange River region with special reference to the contribution of the foothills to salinization

The Orange River Replanning Study, indicated potential for water quality related problems in the Lower Orange WMA, particularly in the river reach between Boegoeberg and Onseepkans, where 35 000 ha of land is irrigated. Grapes (60%) and cotton (20%) constitute the main crops. Although the irrigation water quality is still of acceptable quality, research in the Breede River Valley indicated that grapevines are more sensitive to salinity than suggested by international guidelines. DWAF predicts a 25% increase in salinity by 2030, while anecdotal evidence points to the irrigation of higher lying foothill soils as salinity sources. Grape producers expressed concern about salinity issues. This study analysed the existing information and utilised satellite imagery and field surveys in selected areas, with the aim of evaluating the present situation and identifying likely future trends regarding water quality and soil salinity management in the area, and identifying the need for policy development and research, in order to protect soil and water resources. Specific management actions are recommended to limit water quality deterioration and soil salinization. Different actions are proposed for national government, local authorities, local extension services and farmers. The proposed management actions focus on reducing unnecessary leaching and improving drainage management. These recommendations provide valuable guidance to the Northern Cape Department of Agriculture concerning the technology transfer and other actions they need to initiate to manage the situation.

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

WRC participates in showcasing SA Science and Technology Solutions

US journalists at the presentation at the WRC

The International Marketing Council of South Africa (IMC) hosted six top journalists from the USA who were tasked with reporting on progress in science and technology (S&T) in South Africa. Shattering stereotypes about South Africa was a primary goal of the IMC.

As part of this programme the WRC presented a two-hour presentation session where innovative water research projects were discussed on 8 November. The efforts of WRC Directors and Research Managers were remarkable, given the fact that they were required to compress comprehensive information into fifteen-minute presentations. The WRC made a huge impact on the journalists. They were: Cheryl Pellerin, Roger Bate, Charles Schmidt, Dan Drolette, Gunjan Sinha, Graham Collins, Simon Barber (South Africa) and Graeme Addison (South Africa).

The WRC @ International Workshop

The WRC formed part of the Workshop on International Scientific and Technological Co-Operation for Sustainable Development held at Pilansberg on 21-22 November. Dr Kevin Pietersen and Dr Rivka Kfir attended the workshop. Dr Kfir chaired one of the sessions. The WRC also exhibited at this event.

Delegates at the DST-OECD

The workshop had two main objectives:

- To identify good practices in international science and technology co-operation, especially between Organization for Economic Co-Operation and Development (OECD) and developing countries, aiming at fostering capacity-building in science and technology, at facilitating effective diffusion of scientific knowledge and technology transfer, and at developing knowledge infrastructure and networks, in order to meet sustainable development objectives at national and global levels. Such good practices include highlighting concrete and efficient solutions that have been implemented in the areas of water and energy.
- To consider possible indicators of good practices in international science and technology co-operation for sustainable development and methodologies to evaluate international science and technology co-operation initiatives.

The WRC @ the International Symposium on Ecosystem Governance (ISEG)

Delegates at the WRC stand at ISEG

The ISEG was held at Pilansberg on 10-13 October. The main objectives of this symposium were to:

- Unpack governance through specialists exchanging ideas on the topic
- Develop a research agenda on ecosystem governance
- Compile a book on governance based on the manuscripts submitted for the symposium.

Dr Steve Mitchell, a Director at the WRC, delivered a talk entitled “Role of Rresearch in Informing the Governance Process”. The WRC also exhibited at the ISEG and WRC reports were in great demand.

Farewell – Dr Green

Dr George Green was the guest of honour at a function at the WRC on 8 December. Guests included his family, WRC Directors and Research Managers, project leaders who worked closely with him as well as friends.

***Left**: Mrs Bev Green spoke about her life with Dr Green*
***Above left**: Prof Pegram delivering his address on Dr Green*
***Above right**: Some of the guests at the function*