

S4 waterbulletin

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WATER SUPPLY

Study on the increasing financial risks of regional water boards

IRRIGATION

New tool for irrigation management

COMMUNITY WATER

Researcher looks at gender issues in rural water projects

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4TH WISA-MTD SYMPOSIUM AND WORKSHOP

25-28 March 2001
Stellenbosch, South Africa



WISA-MTD invites you to attend the 4th Biennial Symposium and Workshop to share in the exciting and innovative science of membrane development.



The aim of symposium and workshop is to provide an opportunity for contact and information exchange about new developments, operational experience and application possibilities of this fast-growing technology.



The workshop will be conducted by Prof Tony Fane of the UNESCO Centre for Membrane Science and Technology, University of New South Wales, Australia.

SYMPOSIUM

The symposium theme is **Membranes - Science & Engineering**.

Topics to be addressed are:

- membrane & module development
- membrane process development
- membrane reactors
- electrochemical membranes
- pilot and scaled applications
- process engineering
- fouling abatement
- modelling

ENQUIRIES

For further information please visit the symposium website: www.sun.ac.za/mtd/ or contact:

Dr EP Jacobs
Institute for Polymer Science
University of Stellenbosch
Tel: (021) 808 3178

or

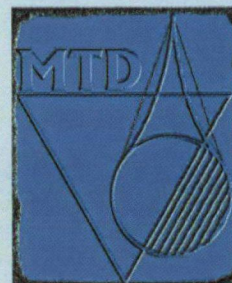
Dr G Offringa
Water Research Commission
Tel: (012) 330 0340

WORKSHOP

The theme of the workshop is **Membranes - Art, Science & Engineering**

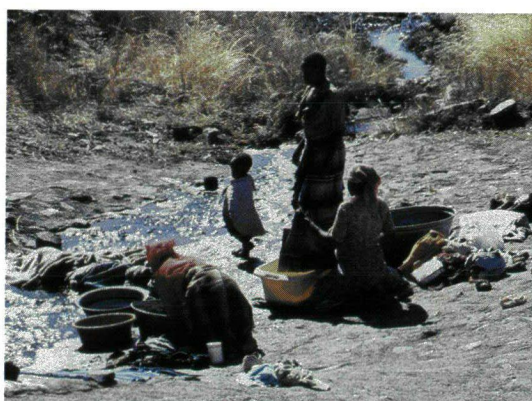
The workshop presentations by Prof Tony Fane will focus on:

- Introduction of membrane science and technology
- Basic principles of performance
- Engineering aspects of membrane systems
- Membranes in water and environmental applications.





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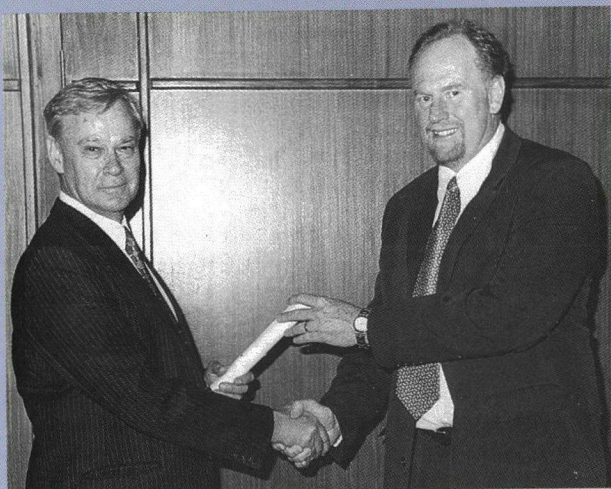
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Cover: Weavers' nests on the banks of the Roodeplaats Dam. (Photo: Helene Joubert)

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Research in the spotlight



Mr Piet Odendaal, the main speaker at the Stander evening, receives a certificate of recognition from Dr Ralph Heath, incoming President of WISA.



Dr Janine Adams, outstanding scientist and speaker at the Stander evening, receives a certificate of recognition from Dr George Green, acting Executive Director of the WRC.



Dr Jacques Theron, an emerging young scientist and speaker at the Stander evening, receives a certificate of recognition from Dr George Green, acting Executive Director of the WRC.

The biennial Stander Memorial Lecture evening was held under the auspices of the Water Institute of Southern Africa (WISA) and the Water Research Commission (WRC) in October at the CSIR, Pretoria.

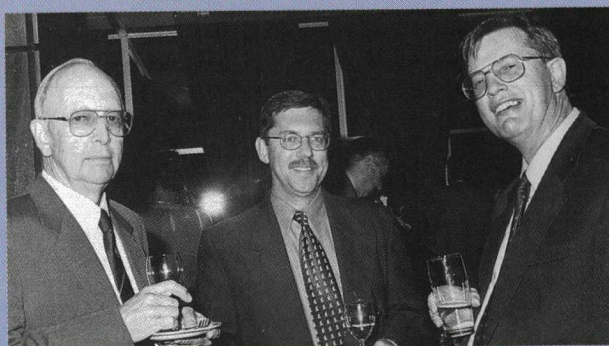
In addition to honouring the late Dr GJ Stander as a visionary and leader in the field of water research, the Stander evening creates an opportunity to recognise an accomplished researcher or leader in water research and to encourage outstanding young scientists. A distinguished veteran in water research is invited to present the main lecture of the evening, while the WRC traditionally sponsors lectures by two young scientists who have made exceptional contributions to WRC-funded research.

This year Dr Janine Adams and Dr Jacques Theron shared the stage with Mr Piet Odendaal, the recently retired Executive Director of the WRC.

ODENDAAL

Mr Piet Odendaal has had a long career in the water field and was executive director of the WRC for 15 years. Presently he is still serving as president of the International Water Association (IWA). With his comprehensive knowledge of the world of water and experience of research he ably presented a broad perspective on water research and the way ahead. His lecture "The changing face of water research" explored the nature and necessity of holistic or integrative research, a principle which is progressively being recognised in the domain of water management and research. He said that South Africa could pride itself on the progress that has been made with the integrated approach in both water management and water research.

"A few years ago the WRC embarked on a programme approach to water research, in parallel with the traditional project approach. There are various advantages to this approach from the holistic point of view. Instead of dealing



Mr Danie Bosman, former Chief Executive Officer of WISA, Prof Eugene Cloete of the University of Pretoria and Dr Herman Wiechers, representing Wiechers Environmental Consultancy, discuss the main lecture of the evening.

at the Stander evening

with a problem in a fragmented way, a well-structured programme comprising of a suite of projects can proceed, with helicopter vision, to address a problem in its totality. It is also an ideal strategy to promote interdisciplinary and inter-institutional research."

In conclusion Odendaal said that business as usual, with one dimensional approaches, will multiply water crises and totally undermine the sustainable use of water resources.

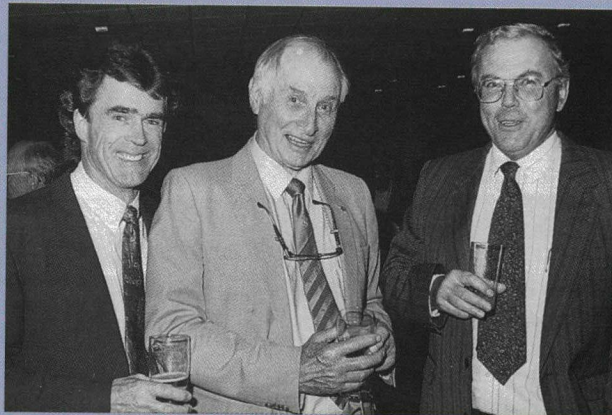
Dr Adams is a lecturer in Botany at the University of Port Elizabeth and very much involved in estuarine research. Among her achievements are the development of a decision support system for the freshwater requirements of estuarine plants and a botanical importance rating system for estuaries. These tools are used in freshwater requirement or "ecological reserve" studies for estuaries, as required by the National Water Act.

Dr Adams' presentation "Freshwater flowing to the sea is not wasted: the importance of South Africa's estuaries" gave the audience an overview and understanding of the important function and value of estuaries. Her talk highlighted the various estuarine types in South Africa and the fact that freshwater river flow is essential to maintain both the biotic diversity, productivity and functions of these complex and important ecosystems.

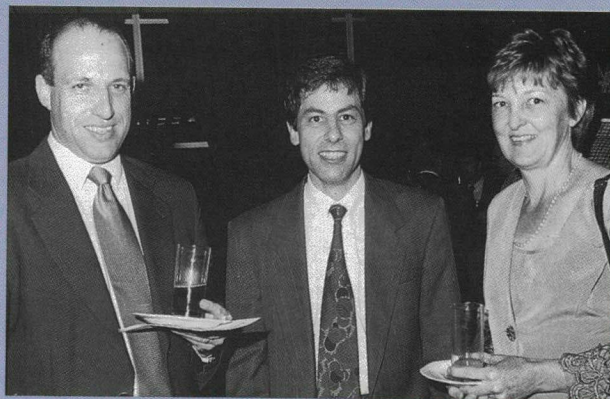
Dr Jacques Theron is a senior lecturer in Microbiology at the University of Pretoria. His research straddles the field of molecular biology of micro-organisms and environmental microbiology. Amongst others his research focuses on the use of molecular biology techniques to develop diagnostic tools for detecting pathogenic micro-organisms. He is presently project leader of a multi-institutional WRC research project on the occurrence of emerging viral, bacterial and parasitic pathogens in source and treated water in South Africa.

Dr Theron's presentation on addressing the challenges of

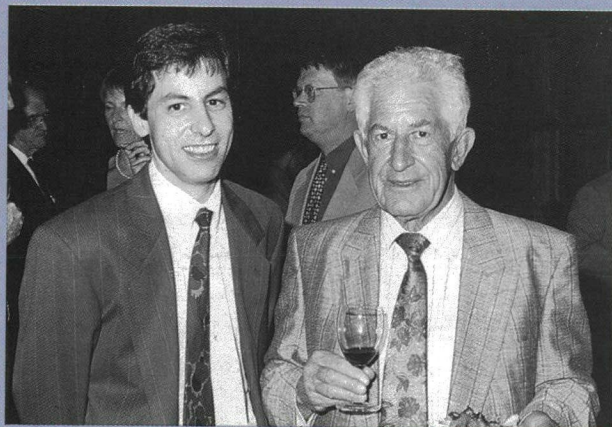
emerging waterborne diseases gave the audience a glimpse at the problems associated with waterborne pathogens, and the present research and development of molecular-based diagnostic tests for use as rapid monitoring tools. His talk illustrated the great strides being made in this highly specialised field of research.



Mr Bill Rowlston of the Department of Water Affairs and Forestry, Dr Gerrit Botha, and Dr Steve Mitchell of the WRC.



Mr Fanus Venter and Dr Jacques Theron, both from the Department of Microbiology and Plantpathology at the University of Pretoria with Annatjie Oelofse of the WRC.



Dr Jacques Theron (left) one of the speakers at the Stander evening with his father, Mr Jack Theron.

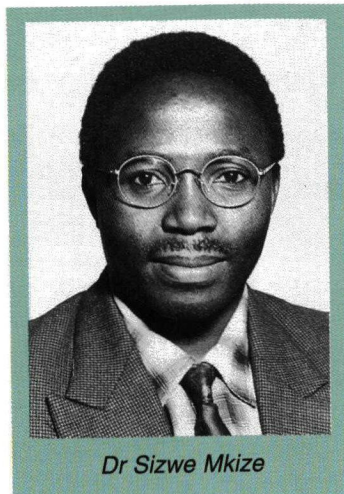


A group of attendees at the Stander evening.

New Research Manager appointed at WRC

Dr Sizwe Mkize has been appointed as research manager in the field of agricultural water management at the Water Research Commission. Before joining the WRC he was active in agro-industrial and natural resource development. He says that his training and experience in agriculture, encompassing irrigation, horticulture, post-harvest technology, soil science and mechanics, all contribute to his multi-disciplinary approach to agricultural development and natural resource management.

He was born and raised at Pietermaritzburg in KwaZulu-Natal. He started his career as a laboratory assistant for a pharmaceutical company and part of his job was to keep records of water quality. In 1985 he enrolled at the University of Fort Hare and completed a BSc (Agric) degree in horticulture. He started with post-graduate studies while working part time as an agricultural advisor in small-scale farmer development. In 1989 he



Dr Sizwe Mkize

received a scholarship and took hold of the opportunity to study in the USA. He holds an M Sc (Horticulture and Plant-physiology) from the Pennsylvania State University. On returning to South Africa he continued his post-graduate studies at the University of Pretoria. He was awarded a PhD (Soil science and Plant

nutrition) in 1994. Dr Mkize has a special interest in the soil-plant-atmosphere- water continuum.

He was head of the Specialist Services of the KwaZulu-Natal Finance and Investment Corporation during the period 1994 to 1996. Apart from giving agricultural and irrigation advice, he was also involved in potable water projects for rural communities, and an advisor to the communities about possible water supply options and water policy. Subsequently he worked for the KwaZulu-Natal Training Trust as project co-ordinator.

His understanding of technical, economic, developmental and environmental issues led him to establish the firm Qiniso and Associates as agro-industrial development consultants.

Sizwe and his wife Nomfuzo have two boys. He admits that he enjoys watching sport, particularly soccer.

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Non-members	R 280.00
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Submission of **water research** **proposals** to the **Water Research Commission (WRC)**

The Water Research Commission is extending an invitation to research organisations and individuals to submit water research proposals to the WRC on or before 30 APRIL 2001.

Please note that no late submissions will be accepted.

Proposers are encouraged to make use of the electronic proposal submission system implemented by the WRC, which allows research proposals to be submitted via the Internet.

The system has proved to be effective, resulting in considerable time savings. Although preference is given to electronic submission, researchers without access to the Internet may, as in the past, submit a hard copy proposal (together with its wordprocessor file on diskette) by hand, post or courier. Guidelines for hard copy submissions are available on request.

The electronic proposal submission system will be in place by the end of January 2001 on the WRC's web site: <http://www.wrc.org.za>

Should you be interested in making a submission, please access the WRC web page for further details. Guidelines for the completion of the electronic submission system, as well as information about entering research proposals will also be available from the WRC's web site. Should you encounter problems with the Internet submission, you are welcome to contact Ms Martha Pretorius at the WRC - Tel (012) 330-0340 or e-mail:



mpretorius@wrc.org.za

All proposals received on or before the deadline will be considered jointly after 30 April 2001. Following this date, if necessary, the WRC research manager concerned will liaise with the proposer of a project in order to clarify any vagueness that may exist in the proposal, and to finalise it. Hereafter proposals will be subjected to an intensive evaluation procedure. Successful proposals will be tabled for approval at a WRC Board meeting and thereafter referred to the Minister of Water Affairs and Forestry for confirmation of the approval. Those submitting research proposals should note that during the evaluation process, the proposals may also be tabled before a Coordinating Committee comprising of experts in that particular field, or sent out for peer review.

Researchers are encouraged to approach the WRC research managers for information on strategic research plans in specific fields of water research and to discuss potential research proposals with them prior to submission of the proposals.

Early submission of research proposals will be welcomed.



Analysing surface irrigation water rights transfers

The Water Research Commission has published the results of an economic analysis of surface irrigation water rights transfers in selected areas of South Africa (WRC report 870/1/99).

The researcher and author of the final report to the Commission, RM Armitage of the Department of Agricultural Economics at the University of Natal, says that South Africa is a semi-arid country with limited and variable water resources, and increasing competing demand for water. In the past, resolving water scarcity was directed to the development of additional supplies. The institutions that evolved for water management were based largely on a commitment to the construction of large storage and conveyance facilities, with the aid of significant public subsidies. This water management situation is no longer rational since conflicts among water users are escalating as water needs outstrip the natural availability of water. The water scarcity problem requires management institutions that reflect the ultimate economic scarcity of water, and allocate limited water supplies among various competing demands in a flexible manner. Markets are indeed the classical economic institution for allocating scarce resources efficiently and flexibly, and the promotion of an irrigation water market in South Africa could provide for an improvement in the efficiency in allocation of water resources. This is particularly relevant to the agricultural sector, which is the single largest consumptive user of water, and is accordingly considered to be the primary source to meet growing demand through water savings.

Armitage says that existing institutions governing water use prevent the efficient allocation of water and do not pro-

vide individual economic agents with incentives to invest in water conservation or technology. Under these institutional arrangements, water has not been considered an economically scarce resource because water rights were not transferable among users. This non-transferability eliminated the attachment of an opportunity cost to water, providing users with incentive to overuse water. Within this context, the motivation for the development of a water market is to improve the efficiency and equity of water allocation. Transferable water rights would provide users with the incentive to conserve on water use and transfer water to higher valued uses. Water users with a low use value will have the incentive to use water economically and sell or lease some or all of their water right to a higher valued user. Higher valued users will in turn have incentive to buy or lease water rights in order to expand their operation. In this way, efficiency in water allocation is improved as willing water users with insufficient supply are able to access unwanted water, and equity is improved as voluntary transactions benefit both parties.

Armitage says that a number of legal, economic and institutional criteria determine the efficiency of a water market in allocating water. The primary focus of this study was to compare these criteria with the existing characteristics of the water market in the Orange River in the Free State and the Northern Cape and the uMhlatuze River in KwaZulu-Natal, highlighting the efficiency advantages of

this system. Secondly, the principles laid out in the new water laws were critically evaluated according to these criteria, and according to the existing water economies on both rivers. The possible efficiency losses and investment constraints faced by farmers through such a policy are highlighted.

Two survey questionnaires have been designed for the purpose of this study. Questionnaire A relates to farmers who have bought or sold any river water rights in the past, and Questionnaire B relates to farmers who have river water rights, but who have not sold any of their river water rights or bought any additional river water rights. The questionnaires were designed to elicit information on the farmers' existing river water rights, the details of any water market transactions, specific farm details, and their perceptions regarding the new water law.

RESULTS

This study found that a market for "outer land" water rights emerged along the Lower Orange River in 1994 and was driven by the desire of large-scale table grape producers to expand their operations. "Outer land" water rights sold for an average price of R3378.89/15000m³/ha. The market was however not fully developed since no inter-sectoral trading was permitted, nor had market transfers of canal water or conserved water developed. A possible reason for this is that farmers prefer to retain conserved water for water supply security. No temporary water transfers had taken place, which

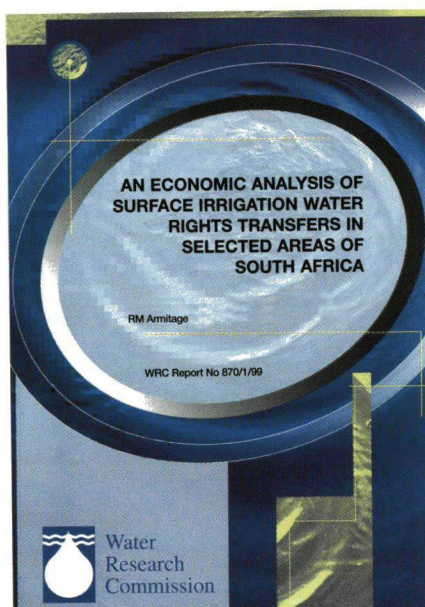
may be explained by the high fixed costs involved in transporting the water to the "outer land" and developing this land, and the high fixed transaction cost of hiring a lawyer in the transfer process.

Trading emerged despite a significant extent of bureaucratic regulation imparted on the water market. A number of institutional arrangements facilitated the development of the market. Many farmers with "outer land" water rights found it uneconomic to develop this land for irrigation purposes, generating a bank of unused water rights that expedited the subsequent reallocation of this water through the market. "Outer land" water rights were completely specified in the unit of measurement and had a high-implicit reliability. Irrigation rights also enjoyed high priority. This created certainty in what was being traded and predictability in the outcome of the reallocation process. "Outer land" water rights were transferable between irrigation properties, and legally sanctioned by government from May 1989. However, before individual transfers could proceed, a number of bureaucratically determined conditions had to be satisfied. As a result, water transfers were not simple voluntary trades between two parties, but rather negotiated transfers between the two parties and bureaucratic authorities. The controlled allocation environment in which water rights were allocated ensured that water rights were wholly enforceable and secure.

DWAF

The administrative function performed by the regional Department of Water Affairs and Forestry office was central in the successful establishment and functioning of the market. The transfer process specified by the Department of Water Affairs and Forestry was clearly defined and well understood. It was, however, guided heavily by bureaucratic regulation, and farmers had to prove that any land for which an application had been filed to purchase water rights, was suitable to irrigation. Transaction costs arising from these elaborate bureaucratic conditions imposed on transfers may have been unnecessarily high. The supervising and recording function of the Department of Water Affairs and Forestry was important in maintaining the correct chain of command over water rights. In addition the Department of Water Affairs and Forestry performed an important role as

provider of market information. Finally, since no return flow had been calculated and implemented for water rights, transfers were achieved without the otherwise necessary adjudication processes.



Within the Nkwaleni Valley water allocation is highly regulated and well controlled. Farmers place a weekly order for water and all pump meters are calibrated and monitored monthly. Irrigation water rights on the uMhlathuze River have a low implied-reliability resulting from the variability in river flows, and frequent restrictions on irrigation water extraction. No water market activity had occurred in the Nkwaleni Valley. Forty-one percent of sample farmers stated that they would like to purchase water rights at present, while no survey farmers stated that they would like to sell or rent out any water rights at the present time. The majority of respondents believed sufficient demand for water exists in the Nkwaleni Valley to facilitate a water market. However, 41 percent of respondents believed a water market could not function successfully because no tradable margin of water would exist. Fifty percent of respondents believed market trading of water rights could take place because most properties required water to develop uncultivated land, and following a switch to more efficient irrigation technology in response to continually increasing water charges, conserved water could be sold or rented out.

Demonstrated demand by farmers in the Nkwaleni Valley to establish a water market seems unlikely. Potential market

development is founded on a significant number of potential buyers and high and rapidly increasing demand for water by downstream urban uses. However, market potential appears to be constrained by the lack of any willing sellers. A number of reasons may explain this. Crops produced by potential buyers in the Nkwaleni Valley are not vastly more profitable than crops produced by Non-buyers. Transaction costs may exceed the difference in value of water to the potential buyer and seller. Farmers may wish to retain surplus water for security against drought. Finally, farmers appear to be using all their water and may be unwilling to sell water rights for land they have already developed, as this would involve sacrificing the development cost of the land. Farmers in the Nkwaleni Valley pay a pro rata levy for each cubic metre of water used up to their maximum water allocation, and any unused water is temporarily reallocated to industry. Political resistance to the development of a water market may develop from industrial users who are currently reallocated unused agricultural water without having to compensate the farmer.

Copies of the report entitled **An economic analysis of surface irrigation water rights transfers in selected areas of South Africa** (WRC report 870/1/99) are available free of charge in South Africa from the Water Research Commission, PO Box 824, Pretoria 0001. (Overseas price: US\$ 20, via surface mail).

The
SA
Waterbulletin
wishes all their
readers a
prosperous
2001

Research show trading of water rights can increase water use efficiency

The results of a study into the subject of how conflicting water uses could be reduced or turned into market competition, with water used more efficiently, are available from the Water Research Commission in the form of a final report entitled **An econometric and institutional economic analysis of water use in the Crocodile river catchment, Mpumalanga province, South Africa** (WRC report 855/1/99).

The report was prepared by R Bate, R Tren and L Mooney from the Cambridge Centre for the Study of Institutions and copies are available free of charge in South Africa from the Water Research Commission, PO Box 824, Pretoria 0001. (Overseas price: US\$10, via surface mail).

The researchers say that to improve economic efficiency in the allocation of water it is essential to know the economic value that users place upon water.

"The usual method for achieving this is to base valuation on the unit market price, which is often absent from most water allocation frameworks. However, substantial trading of water use rights has occurred on the Crocodile River catchment, hence the revealed preferences of many farmers as to the value they attribute to water is manifest."

These trades are analysed in detail in the report and it is shown that the net present value of trades is approximately three to four fold greater than the price paid in water rates by farmers. The researchers demonstrate that trading has led to a significant increase in effi-

ciency, with gains from trade being at least R12 million.

"Given that there has been only a marginal change in use of the water (from one irrigated activity in one part of the catchment to another irrigated activity in another part) it is assumed that there has been no increase in externalities.

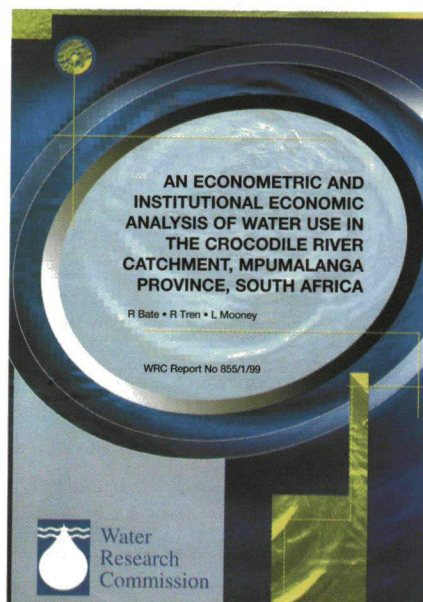
water rights to include non-agricultural users. In this way, they say, water conflict in South Africa could be turned into market competition, as it has been in Chile.

CROPS

The second part of the study draws on the net back analysis of various crops' use of water in the catchment. Various prices for water are compared with the estimates of an activity's economic revenue and cost data and the researchers conclude whether irrigated crops can pay the full economic price and continue to make profit.

Provisional conclusions from the research are that water was misallocated (even within farming) on the Crocodile River catchment and that tariff prices would need to be much higher to recover the costs of water provision. Water trading can improve this allocation inefficiency. The results also show that in future avocados and grapefruit are likely to be grown at the expense of other crops such as sugar, if tariffs increase. The researchers say that if policymakers determine that total water use be the basis of water allocation, then irrigated agriculture may provide a more profitable alternative use to forestry.

"While increasing water tariffs is necessary, it is not a sufficient condition for achieving efficient water use. Trading of water rights will increase efficiency. However, removing security over water rights will decrease flexibility and the ability to trade and hence efficiency," the researchers conclude.



Drawing on the figures for the value of water in various uses, gains from these trades are estimated by the researchers. Given the evidence from other semi-arid regions where trading has been discussed or enacted, such as Israel and Chile, the authors briefly discuss the possibility of extending the trading of



The Blackheath Water Treatment Works in the Western Cape.

Understanding the increasing financial risks of regional water supply service providers



In South Africa the role of regional water supply service providers, typically water boards, is changing. Historically they have been established with the primary function of supplying large urban centres with bulk water. Their emphasis has thus been on developing and running large, technically complex systems. Most importantly, they have generally been selling bulk water to financially strong municipalities who paid their accounts.

This is said in a report by the Palmer Development Group to the Water Research Commission on financial planning for water supply service providers.

With the new imperative to rapidly increase the provision of water services to all South Africans, these regional service providers are facing new challenges. Their bulk supply systems are being extended to serve smaller settlements with weaker local economies; they are being required to provide retail services in some cases, and to allocate resources to the support of the retail water services providers they supply.

With this changing role such service providers are being exposed to increasing financial risk and it is essential that

these risks are understood so that the viability of the organisations are not unduly threatened. In order to assist in assessing such risks, the Water Research Commission has funded a project which is centred on the development of a financial model which allows the financial position of regional water supply service providers to be investigated over a relatively long term.

THE MODEL

The model is referred to as the "Regional Water Supply Services Model". Its structure and format are similar to other investment planning models which have been developed by the Palmer Development Group for the Water Research Commission and the Development Bank of Southern Africa. The key focus of the model is on financial viability and sustainability of the regional water supply service provider. It is designed as a financial planning tool with a central objective of providing financial inputs into business planning.

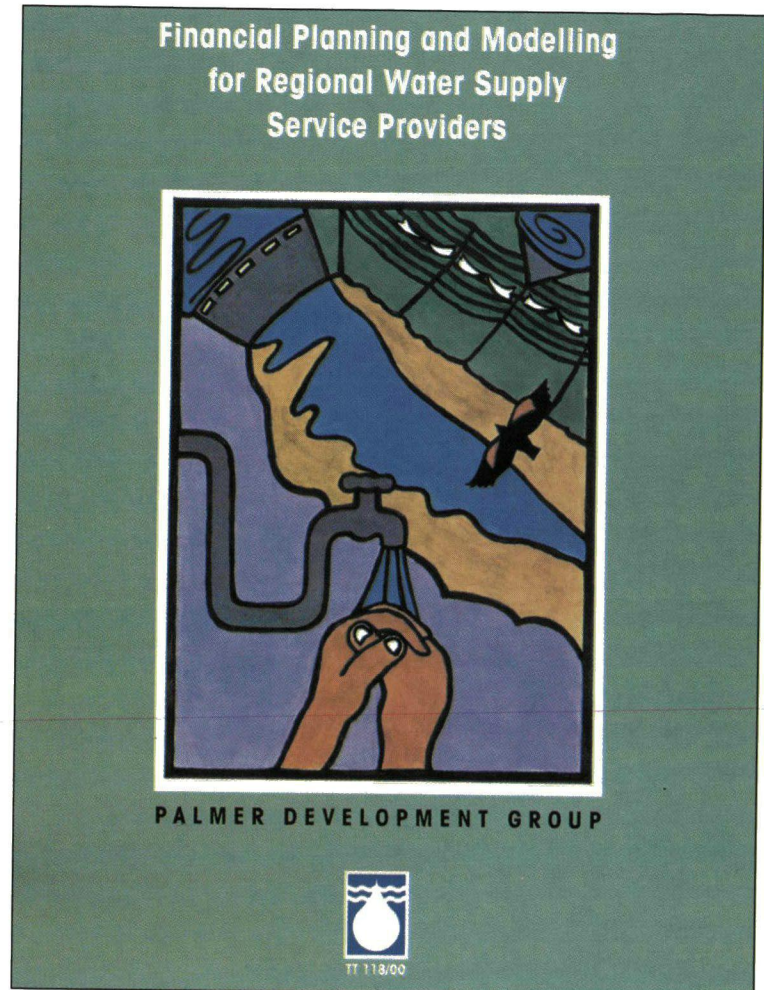
The model links decisions made with regard to the service level provided to consumers to water demand and hence to the cost of providing the service. This, in turn, is used to calculate tariff trends which can be used to assess whether the type of service offered is affordable. The implications of expanding systems to accommodate new consumers can be assessed.

MANUAL

A manual is provided with the model to provide an understanding of the model and facilitate the use of the model. It outlines the aims of the model and describes the structure and philosophy behind the model among other things. The manual is intended to provide detailed guidance to users of the model and help them achieve sufficient competency using it.

CASE STUDIES

To test the working of the model two case studies were undertaken as part of the Water Research Commission project, namely, Lepelle Northern Water and Bloem Water. These two water boards provide bulk water to areas with substantially different retail customers and thus they provide useful contrasts of the conditions under which regional water services providers function.



In each case sufficient data was collected to set up the form of the model and undertake preliminary runs of the model. A full set of results, including demand projections, service level coverage and financial statements for a 10-year period is produced. However, it needs to be recognised that the resources available for the case studies have been limited and there has not been the time to engage water board staff in the running of the model. Thus the results of the case studies cannot be used for actual planning decisions.

KEY FACTORS

The modelling process applied to the two case study areas has allowed key factors influencing the viability of regional water services providers to be identified and their relative impact assessed. These factors include those that cannot be changed, such as physical aspects and retail customer profile, and those that can be influenced, such as planning, institutional arrangements and access to capital.

CONCLUSIONS

The case studies have demonstrated that the Model can be applied successfully to water boards as a tool to assist them with planning and to assess the viability of their operations. The comparative results for the two water boards chosen as case studies demonstrate the considerable difficulties which those regional water supply service providers with a large proportion of rural customers confront. Lepelle Northern Water will face a major challenge to maintain the viability of their operations with a rapidly expanding rural client base. Bloem Water, on the other hand, has a largely urban client base which puts them in a stronger position.

Copies of the report entitled **Financial planning and modelling for regional water supply service providers** (WRC report TT 118/00) are available free of charge in South Africa from the Water Research Commission, PO Box 824, Pretoria 0001. Overseas price: US\$ 15 (via surface mail).

Gender issues in water projects researched

It is a recognised fact, world wide, that projects that take human factors into consideration are more likely to succeed than those who do not, says researcher L Duncker of Environmentek, CSIR, in a report to the Water Research Commission. The report entitled *Strategies for Empowerment of Women in Water Supply and Sanitation Projects*, documents the research done on gender issues in rural water and sanitation projects.

Gender differences are found at all levels of society in South Africa. While there are no legal restrictions on women's rights, their traditional African culture does not allow them equal access to information and decision-making in water resource management. Traditional forces within the family and society result in women making hardly any formal decisions in matters affecting themselves and their children outside the home. In public matters that impact directly on women, such as water and sanitation, hygiene education and the protection of the environment, the decisions are taken by men, says the researcher.

AIM

The main aim of the research was to determine the needs of both men and women regarding the roles and responsibilities of the women in water supply and sanitation projects, in order to formulate guidelines for the empowerment of women in such projects.

RESULTS

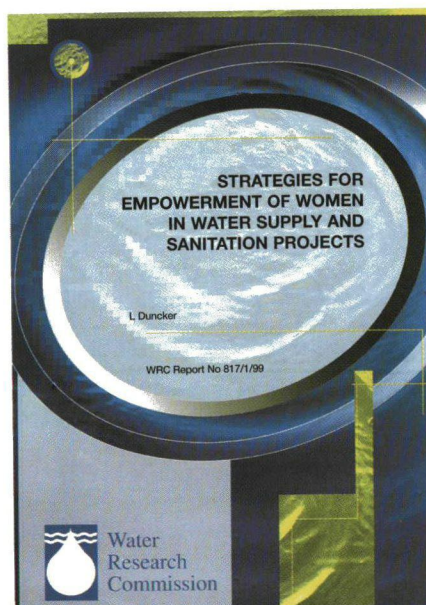
The research was conducted in rural villages in the Northern Province and the Eastern Cape by way of interviewing processes. The following conclusions were drawn from the data gathered:

Decision-making

In all the villages where the research was done, the men played the promi-

nent role and were seen by both men and women as the leaders and decision-makers. In most instances the men's occupation of key decision-making positions were due to the perceptions that women did not have the ability to manage projects or make decisions.

However, women were not entirely excluded from making decisions during project planning and implementation. The men consulted the women whenever a decision had to be made, but the involvement of the women was very informal and unobtrusive.



Culture

Cultural norms and values played a major role in the participation and decision-making processes in the villages. Men were regarded by the community as superior to women. This belief led to men feeling uncomfortable when women were allowed to participate in meetings and in the decision-making on a formal basis. However, in communities where traditional norms were not very strong, the people were more flexible regarding the participation of women in

water and community projects.

Roles

The women showed a tendency to push the men to the fore when interaction had to take place with people from outside the community. They preferred the men to deal with outsiders as men were seen by the community as more educated and capable of handling the situation. The focus of women and girls was on the household, while men and boys focused on training outside the home.

Education

Literacy and education were highly valued by the community members, both male and female. However, more men were literate than women. Women who were educated were more confident about participating in the projects and decision-making processes. However, these women were not completely successful in overcoming the encultured values and traditions of gender roles and positions in the community. Women who did take the initiative to participate were often treated disrespectfully by the men, which led to the women withdrawing.

Where husbands were migrant workers and away from home it created an opportunity for the women to prove that they were capable of making valid decisions and managing projects on their own, therefore forcing recognition from the men in the community.

Women's involvement

The research showed that in the villages where the men managed and took the lead in the water supply and sanitation projects, women who were on the committees usually served as secretaries or ad hoc members, with limited or no decision-making powers. In these projects there was no marked difference with regard to delivery of the water or sanitation service. However, there were problems regarding the involvement and



The focus of women and girls in traditional villages is mainly on household chores and children.

commitment of the community, with a very low willingness to take ownership and responsibility for the service.

In villages where women performed key roles such as chairperson or treasurer on the committee, those women were active and respected in the community before the project started. The women by nature shared information and kept the community informed about the project progress. This led to the acceptance of the project by the community, which is necessary for the sustainability of the project.

□ Barriers

According to the report water supply and sanitation projects did not necessarily empower women in the communities, but it did create an opportunity towards empowerment. The women's own attitude and lack of confidence in their abilities created a barrier, which was exacerbated by the attitudes of the men.

Although traditional cultural norms and

values were voiced as a barrier, it was noted that there is a process of cultural change as demonstrated by the expressed willingness of the men to allow the women to make decisions and participate in the management of services and projects.

Illiteracy among village women also played a role. Furthermore time constraints as well as the lack of resources such as money and transport for village women to attend meetings and training courses etc. are mentioned in the report as barriers to empowerment.

STRATEGY

An extensive strategy for the empowerment of rural women in the field of water supply and sanitation is proposed and discussed in the report. The strategy includes aspects such as policy and training, as well as communication on gender issues, gender awareness programmes and workshops. The researcher says that gender awareness programmes for the rural areas should grow

and develop into empowerment programmes for both the men and women in the rural areas.

The empowerment workshops should make it clear to both the men and women that empowerment is about effective gender balance in decision-making.

The benefits of the empowerment of women should be discussed with the men and women in the community and linked to the effect empowered women will have within their community in terms of job creation, quality of life and the sustainability of projects.

The report **Strategies for empowerment of women in water supply and sanitation projects** (WRC report no 817/1/99) is available, free of charge in South Africa, from the Water Research Commission, PO Box 824, Pretoria 0001. E-mail: library@wrc.org.za (Foreign orders: US \$15 per copy, via surface mail.)

The Water Research Commission has released a report which provides a basis for assessing the impact of water resources development in the Sabie River catchment on the physical characteristics of the Sabie River, and hence on the biotic response of the river.

The report, entitled **Geomorphological change models for the Sabie River in the Kruger National Park** (WRC report 782/1/00), was compiled and written by AL Birkhead, CS James, KH Rogers and AW van Niekerk, from the Centre for Water in the Environment at the University of the Witwatersrand, in conjunction with GL Heritage, at the Department of Geography, University of Salford, Manchester.

The authors say that the main objective in the study was to identify and quantify the flow resistance components on the Sabie River and to predict their effects on local hydraulic variables under different flow conditions. The overall aim was achieved through the identification of a spatial flow resistance hierarchical structure within the Sabie River (i.e. representative reaches, channel types, morphological units, cross-sections and distributary channels), an evaluation of the different methods for evaluating flow resistance, the establishment of hydraulic monitoring networks, the quantification of flow resistance at various spatial scales, and the compilation of appropriate guidelines.

REPORT

The report says the ability to predict morphological adjustments rests on the quantitative description of the underlying processes of hydraulics and sediment dynamics. The investigations of these fundamentals are described in Chapters 1 to 4 of the report, while the models developed to simulate morpho-

logical behaviour at appropriate scales are presented in Chapters 5 to 7.

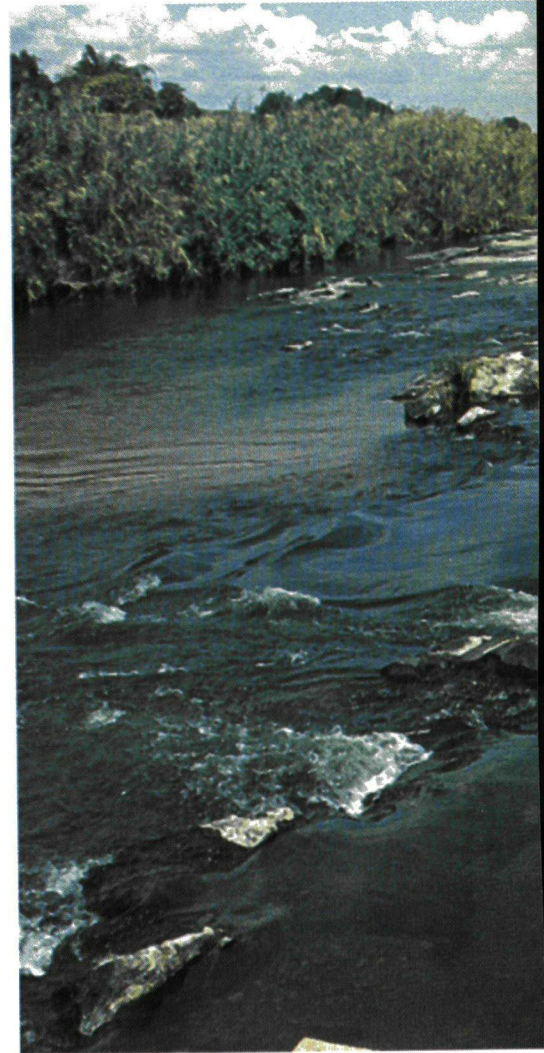
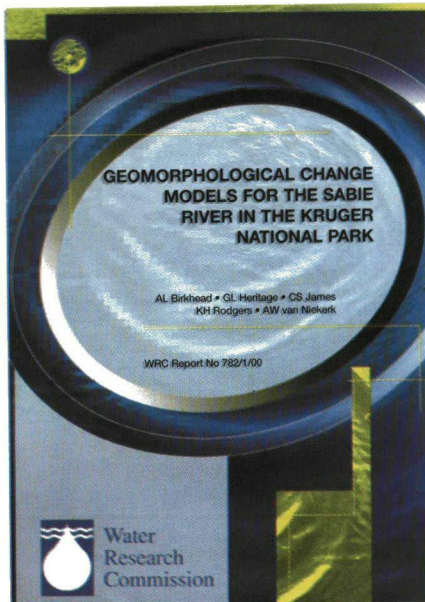
According to the authors the flow regime in temperate systems is dominated by low-magnitude high-frequency flow events. Across the flow regime it is these flows that are considered to be responsible for the bulk of potential sediment movement within the system. In contrast, semi-arid systems often display a more extreme flow regime influenced strongly by high-magnitude short-duration flow events. This can displace the dominant discharge (i.e. that which most influences the channel morphology) away from the low flows towards the less frequent flood events. Chapter 2 of the report describes an investigation of the frequency and effective-

ness of sediment transport along the Sabie River.

Existing geomorphological studies have addressed the movement of non-cohesive medium grained sand deposits within the Sabie River system, since this fraction is primarily responsible for morphological activity within the active channel. Cohesive fine-grained sediments, however,

occur as large-scale consolidated deposits within the incised macro-channel, being typically deposited as clay drapes following large flood events. A study of the potential for eroding consolidated sediments by infrequent large-magnitude flow events, characteristic of semi-arid flow regimes, is described in Chapter 3.

The most recent and extensive study concerning channel flow resistance along the Sabie River was undertaken by researchers in 1997. The hydraulic information generated by this project was limited by the hydrological regime to low and intermediate discharges. A large flood experienced by the Sabie River in February 1996 provided an opportunity to collect additional high flow hydraulics data and an extended



The Sabie River flowing through the Kruger National Park.

Geomorphological change models for the Sabie River in the Kruger National Park



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hydraulics data set is presented in Chapter 4. The researchers say these data are integral to every aspect of this research project, and "indeed are essential to any study along the Sabie River requiring a translation of discharge into local hydraulic conditions".

SEDFLO

Chapter 5 of the report describes the development, calibration and verification of a sediment flux and storage model (SEDFLO) for the Sabie River. Historical data derived from aerial photographic records covering 56 years (1940 to 1996) were used to calibrate and test SEDFLO. Chapter 6 describes the application of SEDFLO to model the dynamic sediment storage response of the Sabie River within the Kruger National Park to changes in the flow and sediment regimes for different sce-

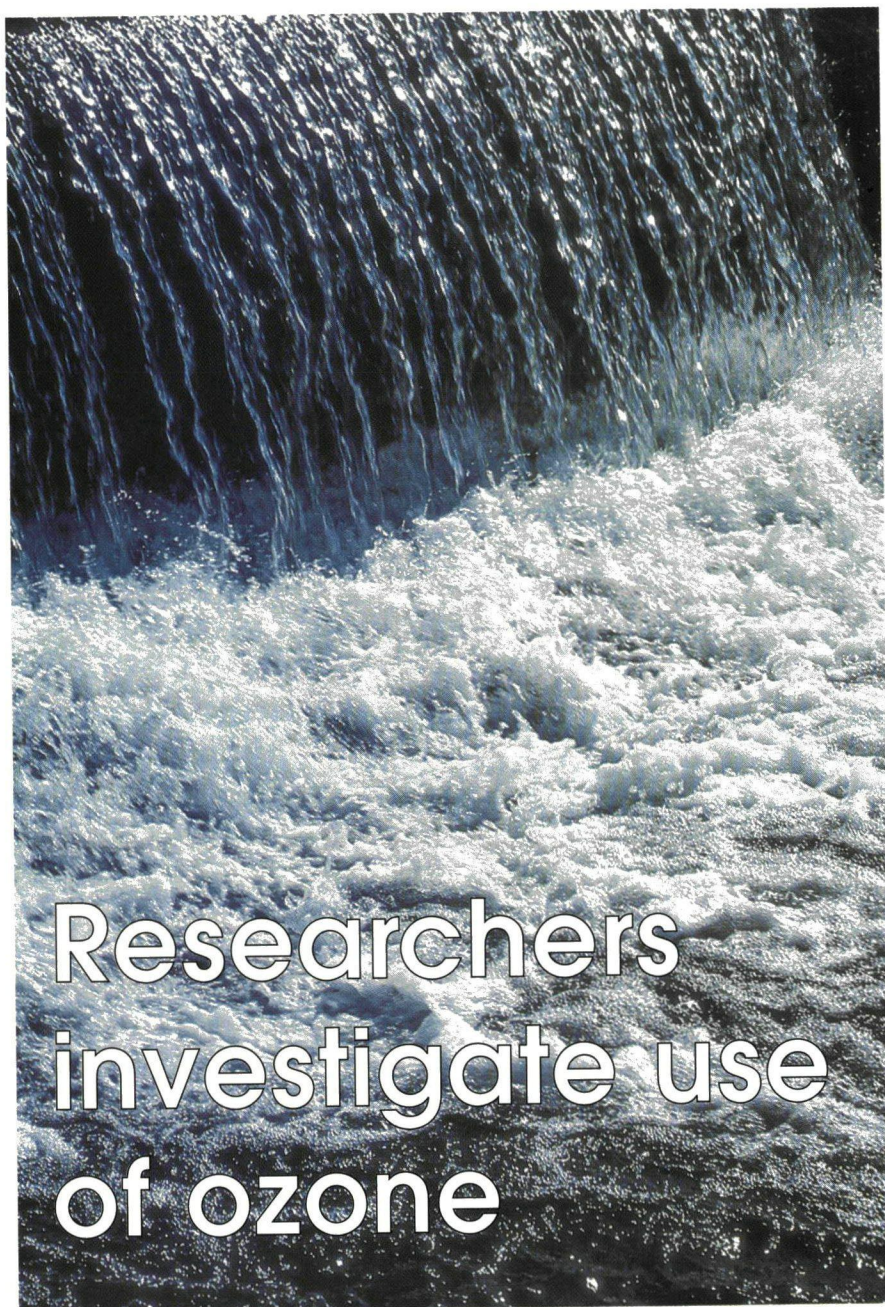
narios. The researchers say the scenarios were based on the instream flow requirement recommendations for the Marite, Sand and Sabie Rivers and represent the most recent flow modification recommendations, from an ecological perspective, to date.

The researchers say SEDFLO predicts temporal changes in sediment storage (as reflected by bar growth and erosion) for 40 linked channel type cells along the Sabie River. The biota, however, respond to changes at substantially reduced spatial scales, and it has therefore been necessary to develop models that predict change at the morphological unit scale. Chapter 7 describes the application and testing of a geomorphological model first developed for predicting change at the unit morphological scale along the Sabie River.

The researchers say the modelling approach used at this smaller scale is fundamentally different from that used in SEDFLO for predicting gross change in sediment storage along the whole river. At the smaller scale the volumes of sediment are less important than the forms of the deposits and the problem is therefore one of qualitative description rather than detailed quantification. A novel approach has therefore been used, which applies logical rules (rather than computation) to describe changes in the relative proportions of morphological units (eg. different types of bars and bedrock features) constituting the different channel types.

The two models are designed to be applied in sequence at "nested" scales. SEDFLO can describe the change in sediment storage at a channel-type scale resulting from changes in catchment sediment yield and hydrology. The rule-based model can then use the SEDFLO output to predict the morphological unit response to the change in sediment storage in different channel-type cells.

Copies of the report **Geomorphological change models for the Sabie River in the Kruger National Park** (WRC report 782/1/00) are available free of charge in South Africa from the Water Research Commission, PO Box 824, Pretoria 0001. Please note, the overseas price is US\$ 30 (via surface mail).



Researchers investigate use of ozone

Proper understanding of the chemical and physical mechanisms that take place during water treatment forms the basis for successful design and operation of modern water purification plants. This is said by researchers JC Geldenhuys, E Giard, M Harmse, K Neveling and M Potgieter of Rand Water Board in a report to the Water Research Commission. The researchers investigated the use of ozonation in combination with lime and activated sodium silicate in water treatment.

Domestic and industrial pollution of surface water supplies, as well as public awareness of drinking water quality and scientific investigations, require that treatment methods to produce drinking water should be examined continuously.

The effectiveness of the conventional water treatment process, designed primarily to remove suspended matter and disinfect water with chlorine, also need to be evaluated to see if drinking water of the desired quality can be produced at all times even if the raw water source is contaminated.

According to the report the consumer wants water that is clear, tasteless and odourless, and the assurance that the water is safe to drink without any harmful effect on his health. It is the water supplier's responsibility to provide water which is safe and does not present a potential health treat to the end-user. Therefore, the water must be free of any pathogenic organisms or deleterious organic or inorganic chemical compounds.

The treatment required to produce drinking water is a function of the source water quality and the desired quality to be distributed. Although chlorination is still the most common method of disinfection, the usefulness and power of ozone in water treatment is quite apparent. Ozonation can be used in three ways: as a biocide, as a oxidant and as a pretreatment to improve the performance of subsequent processes

OZONE

The use of ozone is well demonstrated and is used worldwide in some 1 000 treatment plants with capacities varying from as little as 10 m³/h to as large as 30 000 m³/h.

The usefulness and power of ozone in water treatment is quite clear and is applied for specific purposes, such as:

- ☐ Oxidation/ Pre-ozonation
 - oxidation of soluble iron and manganese
 - removal of taste, odour and colour
 - enhancement of particulate removal (or miscellation-demicellisation)
 - oxidation of specific micropollutants such as some pesticides and phenolic compounds

- control of algae and algal blooms
- ☐ Biological stabilisation
 - ozonation before granular activated carbon to reduce the concentration of assimilable organic compounds by Biological Activated Carbon (BAC)
- ☐ Reduction of disinfection by-products during disinfection
 - in contrast to chlorination, trihalomethane (THM) compounds are not formed by ozonation
- ☐ Disinfection
 - Bacterial, viral and protozoa inactivation

However, from a practical point of view the main disadvantages of the use of ozone in water treatment are the following:

- ☐ no disinfection residual can be maintained
- ☐ oxidation of organic material produces more biological assimilable compounds that could lead to microbacterial aftergrowth
- ☐ ozone is generated on site and cannot be stored
- ☐ some ozone by-products may form which are mostly a function of the water quality being treated (eg. Bromoform (CHBr_3) could form if bromine present in the water forms hypobromous acid (HOBR) on ozonation which reacts with natural organics to form bromoform).

SOUTH AFRICA

In South Africa ozone is applied at only two large purification plants, namely at Western Transvaal Regional Water Company for the removal of manganese by oxidation and at Umgeni Water's Wiggins treatment plant to treat eutrophied water.

Ozonation of water abstracted from the Upper Vaal River has never been performed (and questions on the effect of ozone on the removal of suspended matter and algae still need to be answered). According to the report the use of hydrated lime and activated sodium silica treatment as practised by Rand Water for the destabilisation and flocculation of suspended matter in Vaal Dam water is unique.

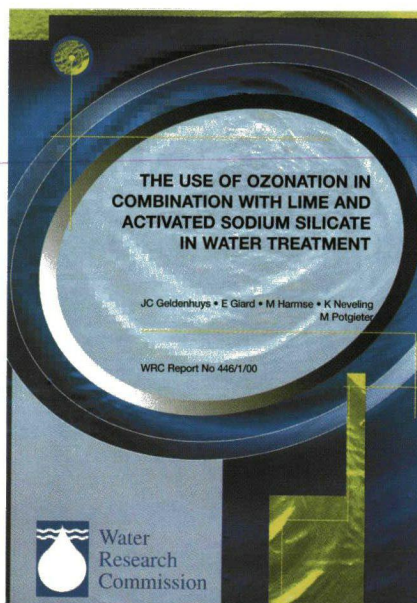
The effect of ozonation on the removal of suspended organic and inorganic

material in combination with hydrated lime and activated sodium silicate has never before been studied.

AIMS

The purpose of this study was to evaluate the use of ozone in combination with activated sodium silicate and hydrated lime to deter the effect on:

- ☐ the coagulation, flocculation and the removal of suspended matter
- ☐ the removal or destruction of algae and other mechanisms
- ☐ the fate of organic compounds in Klip River and Vaal Dam water during the treatment process.



RESULTS

- ☐ Ozone affects the coagulation and flocculation of water when treated with activated sodium silicate and hydrated lime. Vaal Dam water was affected negatively and fewer fast settling macro particles were formed after pre-ozonation.
- ☐ However, Klip River water was affected positively and more fast settling macro particles were formed after pre-ozonation. Spontaneous flocculation took place with the ozonation of Klip River water.
- ☐ The zeta potential of natural occurring suspensions in Klip River and Vaal Dam water is changed by ozonation, making it less negative

and therefore reduces the normal coagulant demand.

- ☐ Organic carbon compounds seem to play an important role in the improvement of coagulation and flocculation following ozonation.
- ☐ Ozonation improved the organic quality of water; the dissolved organic carbon (DOC) content as well as the ultraviolet light extinction at 254 nm of both Vaal Dam and Klip River water were reduced. The percentage reduction in Vaal Dam water for these two determinants is greater than in the Klip River water which suggests that the nature of organic compounds plays a role.
- ☐ Ozone by itself, and in combination with hydrogen peroxide, attacks algal cells and causes internal and external damage which kills the algae. Pre-oxidation improves the physical removal of algal cells by sedimentation and filtration.
- ☐ Ozone by itself, and in combination with hydrogen peroxide, reduces the number of micro-organisms by oxidation, but not to the extent that it improves the overall removal efficiency of the treatment process.
- ☐ The test of aggregation can be used effectively to study subtle changes in water quality, and the effects of different water treatment processes.

The report concludes that before the application of ozone for water treatment is considered, the following aspects need to be carefully taken into consideration, namely:

- ☐ the effect of ozone on coagulation and flocculation
- ☐ the effect of ozone on the organic matter present, and
- ☐ the effect of ozonation on the concentration of assimilable organic compounds.

The report entitled **The use of ozonation in combination with lime and activated sodium silicate in water treatment** (WRC report 446/1/00) is available, free of charge in South Africa, from the Water Research Commission, PO Box 824, Pretoria 0001. E-mail: library@wrc.org.za (Foreign orders please note: US \$10 per copy, via surface mail.)

SAPWAT - a powerful South African tool for planning and managing irrigation



The need to rehabilitate existing small-scale farmer irrigation schemes, as well as the implementation of catchment management agencies and water user associations has emphasised the importance of managing irrigation water effectively.

According to a report released by the Water Research Commission, the estimation of crop water requirements is an essential starting point when both farm-scale and major irrigation projects are planned or upgraded. The report, dealing with a new computer program (called SAPWAT) for establishing irrigation requirements in South Africa, says the past two decades have seen significant progress in irrigation technology. Moving systems, largely centre pivots, have been installed in their thousands for irrigating field crops while micro and drip systems, many computer controlled, now dominate in horticulture. Similarly, there is now a greater appreciation for the effectiveness of flood irrigation systems utilised by small-scale farmers. On-farm management of irrigation has advanced with the introduction, for example, of automatic weather stations

and the measurement of soil water status by neutron probe. Unfortunately, the methodology for estimating crop irrigation requirements has not kept pace with these developments.

According to the report, written by CT Crosby and CP Crosby, the first publication on estimating crop irrigation requirements in South Africa was the *Green Book* (1973). This was expanded, updated and published with the title "Estimated irrigation requirements of crops in South Africa", known as the *Green Book* (1985). The *Green book* was for many years the accepted South African standard for estimating crop irrigation requirements for planning and design purposes. However, the models used in developing the tables in the *Green Book*, while adequate for conventional flood and sprinkler irrigation, do not have the flexibility to cater for the new short-cycle irrigation methods, which contributed to outputs lacking in credibility in practice.

In a pilot study funded by the Water Research Commission in 1996 the aim was, *inter alia*, to establish a decision

making procedure for the estimation of crop water requirements as well as the provision of comprehensive "built-in" databases that obviate the need to seek climate or crop data elsewhere. This study has led to the development of the pilot computer program SAPWAT 1.0 (now replaced by SAPWAT).

SAPWAT

SAPWAT is not a crop growth model. It is a planning and management tool relying heavily on an extensive South African climate and crop database. It is general in applicability, in the sense that the same procedure is utilised for vegetable and field crops, annual and perennial crops, as well as pasture and tree crops. It is possible to simulate wide-bed planting, inter-cropping and different irrigation methods. In addition, the effect of soil water management options such as deficit irrigation can be evaluated. It extends the facilities provided by the irrigation program CROPWAT and is a tool that can facilitate "designing for management". It also facilitates consultation and interaction with farmers and advisors.

SAPWAT is not difficult to apply from the operational point of view and demands minimum computer expertise. A user with some knowledge of irrigation should be able to come up unaided with crop irrigation requirement estimates that would be more valid than those achieved in the past. SAPWAT should, however, be regarded as an aid to judgement and the user should be comfortable with its application and feel free to contribute local knowledge and experience.

APPLICATIONS

Possible applications, listed in the document, are the following:

□ Macro planning

Irrigation accounts for the major share of water requirements in South Africa so much that the irrigation component is important in catchment planning. SAPWAT principles have been recognised by the Department of Water Affairs and Forestry and incorporated in the irrigation inputs into the national water balance model.

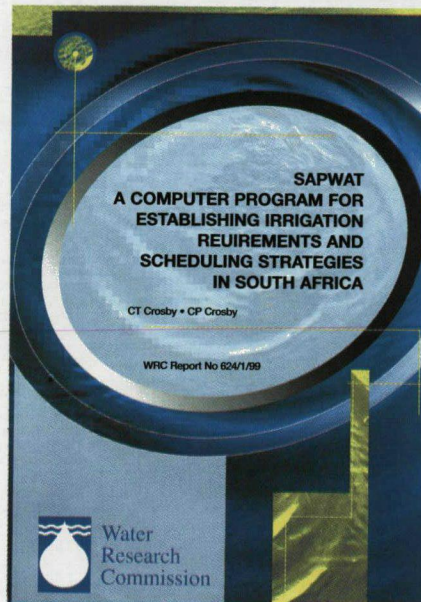
□ Water pricing strategy

In terms of the National Water Act users are required to register the use of irrigation water for pricing purposes and the Department have indicated that the method for determining the annual irrigation requirement is the SAPWAT computer program. SAPWAT, in the absence of general metering, enables all water use for irrigation to be quantified equally

thereby ensuring a cost recovery in a "fair and systematic" manner.

□ Water demand management strategy

In the future water user associations (WUAs) will be required to develop water management plans on a regular basis. The impact of irrigation practices and strategies on water budgets requires the assessment of impact on crop irrigation requirements. This is one of the functions for which SAPWAT was developed.



□ Small-scale farmer irrigation schemes and community gardens

One of the primary objectives of the SAPWAT development programme was

"provision for the specific circumstances and requirements of emerging irrigation farmers and community gardens". Particular attention was paid to this aspect and presently consultants engaged in the land care initiatives of the National Department of Agriculture are basing designs for sustainable rehabilitation of irrigation schemes on SAPWAT predictions.

□ Irrigation planning and management

Planning how much irrigation water is required and when is a prerequisite for individual farmers, designers, water user associations, irrigation schemes and reservoir management. The strength of SAPWAT lies in an extensive database that saves the user the chore of "looking for figures" and inbuilt routines for undertaking sensitivity analyses of alternative strategies.

□ Support for irrigation scheduling

SAPWAT is not a real-time scheduling model but can be a valuable complement to instrumented soil water content methods. It is being realised that for farmers, advisors and consultants scheduling can be a labour intensive and expensive operation. An atmospheric demand-based program can provide pre-season irrigation programmes based on historic weather data that can go a long way towards alleviating much of the urgency of short-term real time scheduling. SAPWAT is designed to accommodate updated historic weather data to the present, should this be required.

Copies of the report entitled **SAPWAT - a computer program for establishing irrigation requirements and scheduling strategies in South Africa** are available free of charge from the Water Research Commission, PO Box 824, Pretoria 0001. (Overseas price - US\$ 10, via surface mail). Please note: The SAPWAT software is available free of charge in South Africa only from CT Crosby, an associate of MBB Consulting Engineers in Pretoria, at tel (012) 803-2870.

SASS4

Ongoing courses of 7-9 days in the SA Scoring System 4 (SASS 4) Biomonitoring technique, are presented in the Natal Midlands. Course consists of identification of invertebrates using dissecting microscopes and the practical application of the technique on site, including habitat assessment and interpretation of results.

Cost: R3 000 per person

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Jan Baxter
Suite H33
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Water & Sanitation Source Book

AVAILABLE ON THE WRC WEBSITE - Free access
Go to <http://www.wrc.org.za/wrcdatabases.default.htm>

It is well known that water is a major constraint on South Africa's economic development. To find new sources of water (groundwater), to best utilise what is available (supply and demand), and to safeguard the quality of the country's water supplies, is of paramount importance. Hence, it follows that water resources might not be properly utilised and protected in the future, if the recording and collation of water and sanitation information is deficient.

To try and address this information need, the WRC contracted a researcher, PG Alcock, at the University of Natal, to compile a bibliographic database and source book in terms of water and sanitation systems, with special reference to KwaZulu-Natal. (KwaZulu-Natal, as a specific region, received major emphasis in the project, although relevant material from across South Africa and in some cases, Southern Africa, was included.)

An important aim of the project was to present information in a multi-disciplinary format, in an attempt to provide an holistic perspective for the reader with regard to a broad range of sub-disciplines. The material covered in the project varies, for example, from bioclimatic regions (groups) to sanitation. With the increasing complexity of the modern world, no single discipline can hope to encompass all, or even most aspects of water and sanitation. Users, therefore, will find valuable information on allied disciplines - information which was often difficult to acquire and to verify. In summary, the main purpose of the project was to provide the user with a conceptual framework within which to obtain further information. This applies particularly to the environmental manager who must integrate material - written by the individual researcher following his chosen research path - in an holistic manner in practical day to day situations.

INFORMATION AWARENESS

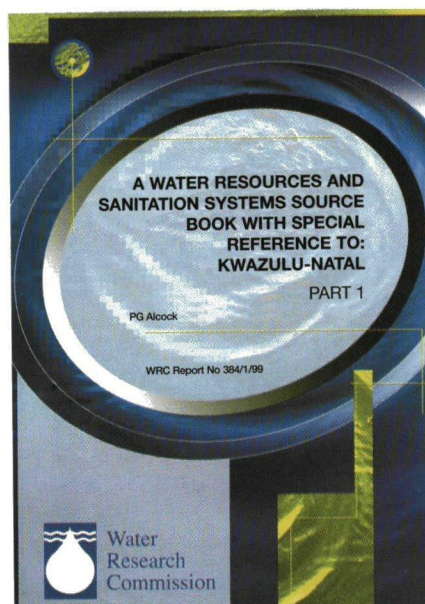
The project tries to sharpen perceptions of the importance of water and sanitation information in a broad spectrum of water-related disciplines in a largely semi-arid land, and to assist in the best possible use of water resources through knowledge of pertinent information. The researcher says he believes that full use is not being made of extant information resulting in, at worst, the omission of significant facts necessary for the overall success of specific projects.

"There is evidence to suggest that certain civil engineering (consulting) firms are particularly at risk in this regard."

The project accordingly, attempted to bridge this gap by providing both scientific and planning data.

aim of the project was to retrieve and to alert users to the increasing proportion of material now appearing in the form of "grey literature". Grey literature consists of unpublished or internal reports (such as civil engineering reports) which are a valuable source of practical data. These reports are seldom examined by a wider audience. The explosion in grey literature in South Africa - as in other countries - implies that determined efforts are necessary to locate the material in the first instance. In the field of water resources planning much of the information may only be available as grey literature. According to the author, the sole discovery method, frequently necessary, involves the physical searching of the libraries and information storage areas of numerous consulting engineering firms and similar sources. The retrieval of grey literature, accordingly, is a major challenge facing the planning (and scientific) community.

Finally, the researcher gathered information on older technologies and procedures, which together with modern scientific concepts, might profitably be re-examined for possible future use, especially in rural areas. Reference is made here for example to hydraulic rams (rampumps) and sand storage dams.



GREY LITERATURE

The author says a particularly important

Printed copies of the report (consisting of 6 separate volumes) entitled **A water resources and sanitation systems source book with special reference to KwaZulu-Natal** are obtainable from the Water Research Commission, PO Box 824, Pretoria 0001.

To gain access to the information, please visit the Water Research Commission's website at <http://www.wrc.org.za/wrcdatabases/default.htm> or <http://www.wrc.org.za/wrsbibs1.htm>



TENTH SOUTH AFRICAN NATIONAL HYDROLOGY SYMPOSIUM

www.ccwr.ac.za/sanciahs2001/

"Southern African Hydrology: Past, Present and Future"

26 - 28 September 2001, University of Natal, Pietermaritzburg

Organised for SANCIAHS by
*School of Bioresources Engineering & Environmental Hydrology, University of Natal Computing
Centre for Water Research and CSIR, Environmentek*

OBJECTIVE AND THEMES

To celebrate the 10th South African National Hydrology Symposium the aim is to highlight the role of hydrologists, water resources engineers, aquatic scientists and catchment managers in the past, present and future development, management and study of the southern African region's water resources, through the following sub-themes:

- * Hydrology and Integrated Water Resources Management
- * Incorporating social and environmental concerns in decision-making and Modelling
- * Hydrology, land-use and ecosystems
- * Prediction and coping with change: Hydrological Data
- * Education in Hydrology

CALL FOR PAPERS

Papers are invited which address one of the above topics. Participants intending to present a paper or poster are requested to send an extended abstract, a maximum of two pages in length, to the conference secretariat. Authors should identify whether the paper is for oral or poster presentation and under which topic the paper is submitted. Papers will be selected following a review of submitted abstracts. Books, software and equipment will be exhibited. Organisations wishing to exhibit or to advertise, should contact the organisers without delay.

DEADLINES

30 April 2001.....Receipt of abstracts by Conference Secretariat
30 May 2001.....Authors notified of accepted abstracts
30 July 2001.....Submission of papers to Editors

SYMPOSIUM FORMAT

The Symposium will extend over 3 days and consist of oral presentations during plenary sessions and parallel sessions as well as a field trip on the afternoon of the 2nd day. The Symposium will be preceded by a "meet, greet, eat and register" opportunity on the evening of 26 September 2001. The traditional SANCIAHS Dinner will take place on the evening of 27 September 2001.

STUDENT PRIZES

A prize will be awarded to the best paper and best poster presented by a full time student.

FEES AND ACCOMMODATION

The registration fee will be of the order of R500.00. This fee will include the cost of teas/coffees, lunches, the "meet & greet", the field trip, the Dinner and the Proceedings, but excludes accommodation. Full-time students will be offered a reduced rate. Delegates must make their own accommodation arrangements. (A list of local hotels and B&Bs will be available on the conference website).

REGISTRATION AND SUBMISSION OF PAPERS

Please submit papers and registration enquiries to:

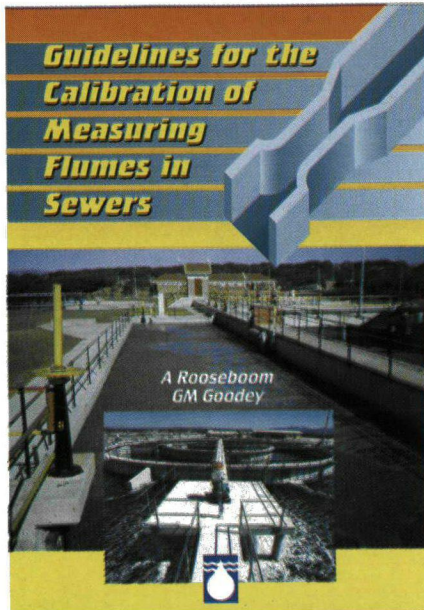
Ms N Mabasa, Computing Centre for Water Research, University of Natal, Pietermaritzburg, Scottsville, 3209

Tel: (033) 260-5178 • Fax: (033) 260-6288 • E-mail: mabasa@aquac.cwr.ac.za

General enquiries: Dr Graham Jewitt • Fax: (033) 260-5818 • Tel: (033) 260-5490 • E-mail: jewittg@nu.ac.za

New reports published by the Water Research Commission

The following reports are available (free of charge in South Africa) from the Water Research Commission in Pretoria. To order a copy, please contact the librarian, WRC, PO Box 824, Pretoria 0001. Tel: (012) 330-0340. Fax: (012) 331-2565. E-mail: orders@wrc.org.za



Report TT 111/99 - Guidelines for the calibration of measuring flumes in sewers. Report to the Water Research Commission by Sigma Beta Consulting Engineers

Authors: A Rooseboom and GM Goodey
Overseas price: US\$ 25 (via surface mail)

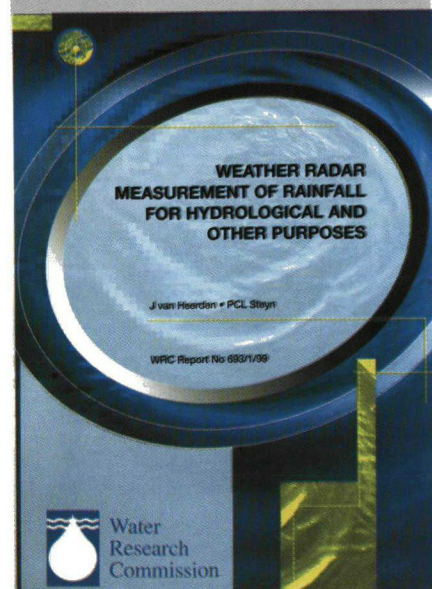
Measuring flumes are most commonly used in sewage works to measure flow. Standard equations for calibration curves are available to calculate flow through these measuring flumes but these equations are subject to measuring flume compliance with certain specifications.

At the East Rand Water Care Company (ERWAT) countless flow-measuring flumes which have been designed and constructed by different organisations do not comply with specifications or have other defects. Thus the accuracy of flow metering at these measuring flumes is questionable. Of particular concern is the impact of deviating dimensions, such as inlet shape, roughness in the flume itself,

as well as submergence of the flume, on the accuracy of flow metering.

Extensive tests were conducted in the Hydraulics Laboratory of the University of Stellenbosch to try and establish calibration coefficients, enabling ERWAT and other organisations to accurately calibrate all their measuring flumes. This research work has led to the compilation of the Guidelines. Information has been included on the measurement of discharges in pipes which flow partially full under uniform flow conditions. This information may be used to measure discharges by means of velocity recorders in cases where it is not practicable to install (more accurate) flumes.

A standard measuring flume has been calibrated accurately. This flume may be used in up- or down-scaled versions for accurate flow measurement under a wide range of conditions. All laboratory tests and findings are described and briefly explained in this publication.



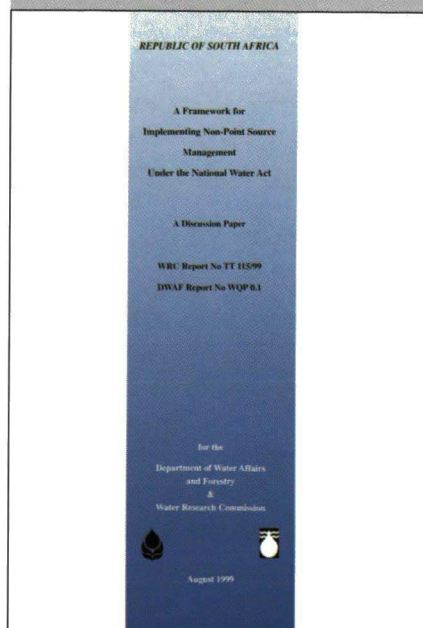
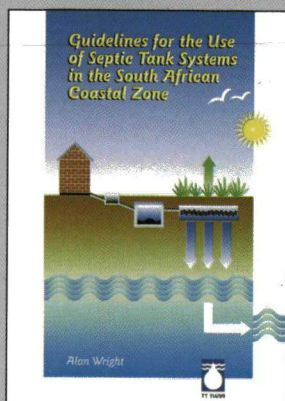
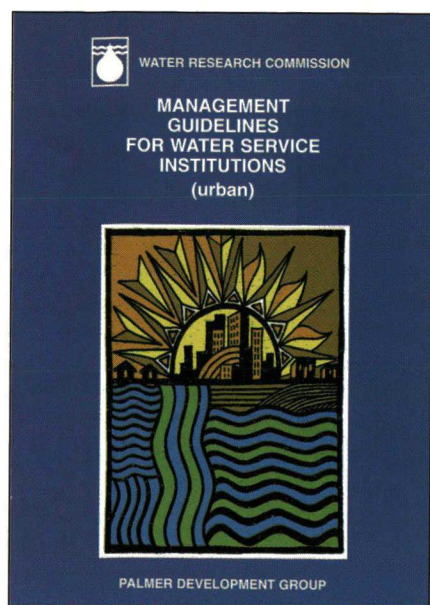
Report 693/1/99 - Weather radar measurement of rainfall for hydrological purposes. Report to the Water Research Commission by the Department of Earth Sciences, University of Pretoria.

Authors: J van Heerden and PCL Steyn
Overseas price: US\$ 20 (via surface mail)

The difficulty and cost in maintaining a rainfall gauge network country wide, as well as the increasing unwillingness of lay-observers to report daily rainfall, demand the investigation of alternative methods of recording rainfall. Radar-based rainfall estimates are a viable alternative.

This report summarises the results of a

WRC sponsored study into the weather radar measurement of rainfall as well as hydrological applications of weather radar. The objectives were to develop a greater understanding of the space-time characteristics of convective precipitation over the highveld regions of South Africa using the MRL-5 10/3 cm and other radar data; to develop and apply measuring techniques based on 10 and 3 cm radar data to measure storm rainfall accurately - from cloud scale to catchment scale; to refine the inter-calibration links between S-, X- and C-band radars for quantitative rainfall measurement and to develop the means of communicating experimental radar/satellite based rainfall data to potential users, satisfying hydrological requirements.



Report TT 98/98 - Management guidelines for water service institutions (urban). Report to the Water Research Commission by the Palmer Development Group.

Authors: Ian Palmer, Richard Tainton, Bee Thompson and Craig Bekker

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

This publication aims to assist those involved in providing retail services in the water and sanitation sector to manage these services effectively and efficiently by making available relevant and practical information.

The publication consists of the following modules:

- Module 1 - An introduction to organisational arrangements for water service providers
- Module 2 - Preparation of a water services development plan
- Module 3 - Customer profile and demand for services
- Module 4 - Setting water tariffs
- Module 5 - Setting sanitation tariffs
- Module 6 - Reporting procedures for water services
- Module 7 - Reporting procedures for sanitation services

Complementing the guidelines are two software models - WSSM and SSM. The publication incorporates many of the principles in the new Water Services Act and will assist practitioners in meeting some of the requirements of the Act.

Report TT 114/99 - Guidelines for the use of septic tank systems in the South African coastal zone. Report to the Water Research Commission by Environmentek, CSIR.

Author: Alan Wright

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

The author says there exists a wealth of technical information on septic tank systems, yet little appears to have reached the local user along the South African coast line. This report aims to rectify

this problem.

Much of the information contained in the report has previously been published by other authors, who are listed in the bibliography. The report draws heavily on earlier CSIR research, but also includes research findings from the USA, United Kingdom and Australia.

The author says it is well to remember that septic tanks don't fail - it is rather a case of people who fail to design, locate, install and use them correctly.

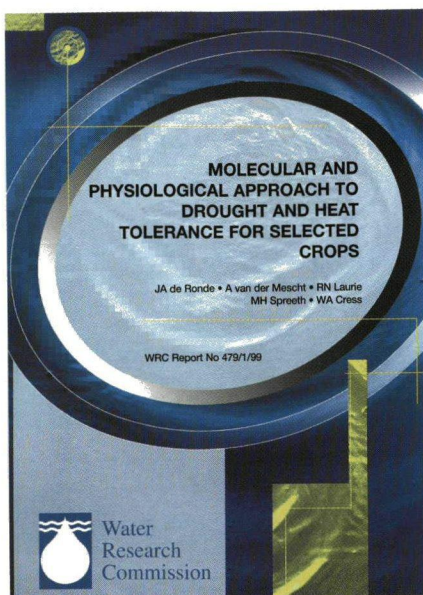
Report TT 115/99 - A framework for implementing non-point source management under the National Water Act - a discussion paper. Report to the Water Research Commission by Guy Pegram, Andre Görgens and Gavin Quibell.

Overseas Price: US\$ 10 (via surface mail)

During 1997 the government published a White Paper on a National Water Policy for South Africa, which was followed in 1998 by the National Water Act (Act no 36 of 1998). Together with the Water Services Act (Act no 108 of 1997) this represented the culmination of a substantial reform of South Africa's previous water legislation. These events have necessitated the establishment inside the Department of Water Affairs of a strategic

process to ensure policy implementation.

As part of these new developments, the Directorate: Water Quality Management is generating appropriate tools in the form of guidelines and procedures to facilitate the implementation of source directed controls for the management of both point source and non-point (diffuse) source pollution. However, the Directorate has realised that there has been a need to examine a number of considerations related to the National Water Act implementation process in terms of non-point source management. This discussion paper, based on interviews with selected stakeholders in the water quality management sector, explores these considerations and suggests a framework for the non-point source aspects of the policy implementation process.



Report 479/1/99 - Molecular and physiological approach to drought and heat tolerance for selected crops. Report to the Water Research Commission by the Abiotic Stress Unit at the Agricultural Research Council, Vegetable and Ornamental Plant Institute, Roodeplaat, Pretoria.

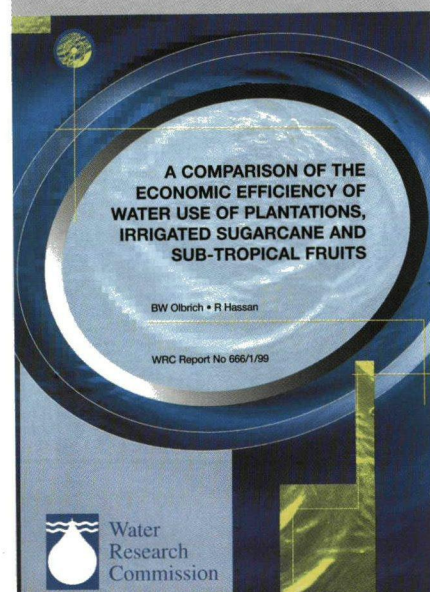
Authors: JA de Ronde, A van der Mescht, RN Laurie, MH Spreeth and WA Cress

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

In South Africa, where drought is a severe problem, the value of drought tolerance in economically important crops cannot be underestimated. Since most agronomically important plants can only survive limited drought, an understanding of how water stress affects their growth, metabo-

lism, development and yield is of practical value. The general aim of this research project was to identify and characterise the genes which are involved in drought tolerance in plants and to transfer such genes to drought sensitive plants. Different approaches were followed with different crops and these are outlined in the publication. Crops involved were tobacco, potatoes, cotton and maize.

The researchers concluded that "there are no genes for drought tolerance as such". Only genes for traits involved in drought tolerance offered the opportunity to develop a screening method. From these results it can be defined that the mechanisms of drought and heat tolerance involved a series of anatomical and physiological traits, but that the importance of these traits differs between species and stresses.



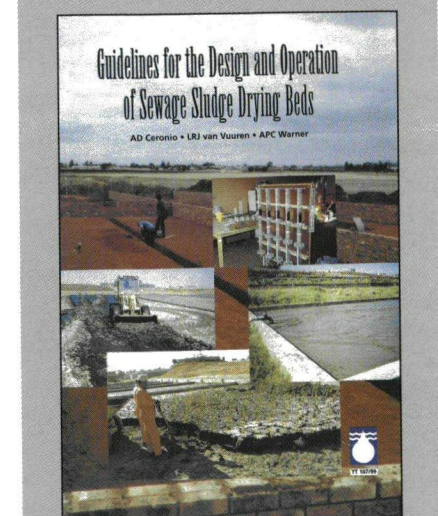
Report 666/1/99 - A comparison of the economic efficiency of water use of plantations, irrigated sugarcane and sub-tropical fruits. Report to the Water Research Commission by Environmentek, CSIR and the University of Pretoria

Authors: BW Olbrich and R Hassan

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

The apportionment of water resources in the Crocodile River catchment has become a critical issue. A variety of sectors, such as industry, agriculture, forestry and domestic users are demanding their fair

share of the catchment's limited water. This particular investigation focuses specifically on the irrigated agricultural and forestry sectors in the Crocodile River catchment of Mpumalanga Province. These two sectors have traditionally viewed each other as competing over the water resource. The objective of this project was to compare the direct economic returns at farm gate realised from the use of water in these two sectors. This information will contribute to a basis for rational and equitable allocation of water in those parts of the country where there is a conflict between forestry and downstream agriculture.



Report TT 107/99 - Guidelines for the design and operation of sewage sludge drying beds. Report to the Water Research Commission by GFJ (Pty) Ltd.

Authors: AD Ceronio, LRJ van Vuuren and APC Warner

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

Roughly one fifth of the capital cost of a new sewage treatment plant can be attributed to sludge drying beds. Despite this, very little local research is accessible to designers, limited design guidelines are

available and even less is available to guide the operator.

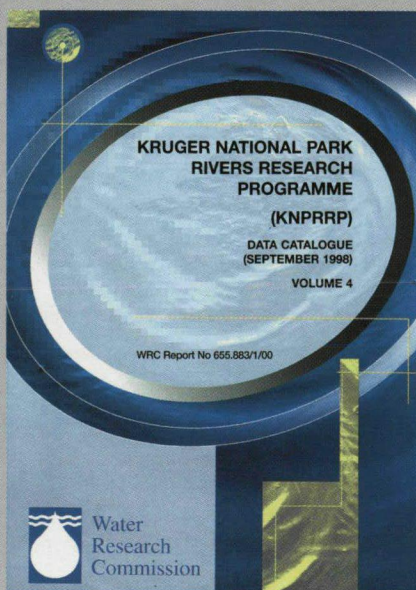
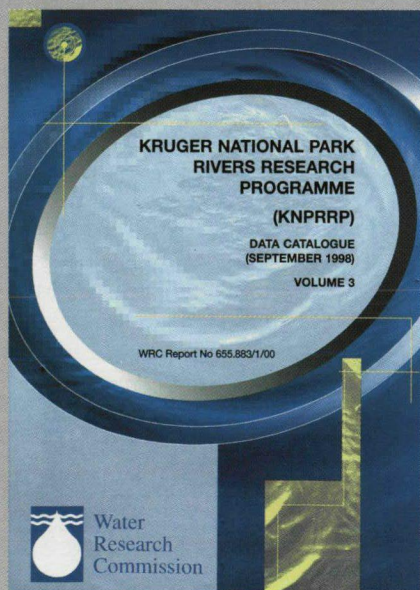
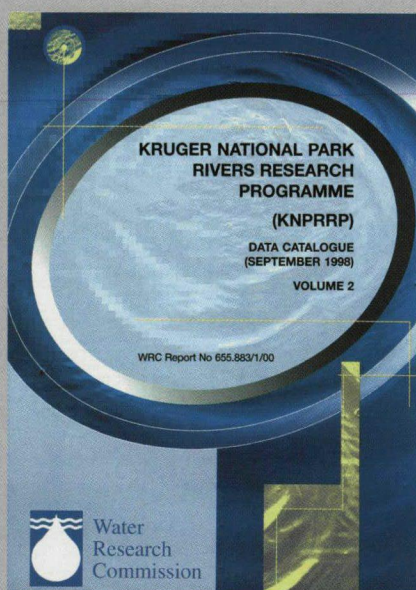
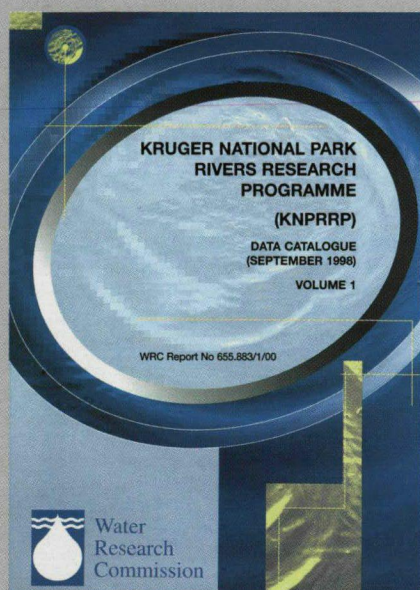
It is the purpose of this guide to attempt to address this situation. The guide contains an evaluation of fundamental research work that has been done on the topic. It also defines and discusses some fundamental principles that would assist in the design and operational stages. Models proposed for the design of sludge beds are investigated and practical suggestions are made towards the physical design and detailing of the beds as well as the optimisation of bed operation.



Researcher honoured

The South African Society of Animal Science has awarded Dr JA (James) Meyer with a bronze medal in acknowledgement of his exceptional research project, funded by the Water Research Commission, titled "Modelling for the prediction of water quality guidelines in South Africa". Dr Meyer is a lecturer in the Department of Animal and Wildlife Science at the University of Pretoria (UP).

The picture shows Professor Norman Casey (right) from the UP presenting the prize to Dr Meyer at the Society's 38th Congress earlier this year.



Report 655.883/1/00 - Kruger National Park Rivers Research Programme (KNPRRP): Data catalogue (September 1998) - Five volumes. Report to the Water Research Commission by the Information Systems Development and Management Subprogramme of the KNPRRP.

Authors: H Biggs, S Freitag, M Uys, M van der Merwe, Y Coetzee and W Lefotlha

Overseas prices (including postage via surface mail):

Volume 1 - Hydrology and catchment studies - US\$ 20

Volume 2 - Geomorphology and hydraulics, GIS, water quality and instream flow - US\$ 15

Volume 3 - Biota - US\$ 15

Volume 4 - Conservation status and importance, legal/decision support systems - US\$ 10

Volume 5 - Appendices - US\$ 15

After the Kruger National Park Rivers Research Programme had been running for several years it became evident that researchers and managers were having difficulty in obtaining an overview of available data, particularly in relevant fields other than their own. To address this problem it was decided to set up metadata files (data files describing data sets) and to properly catalogue and index these in as user-friendly but functional scheme as possible. These five reports constitute the metadata catalogue. It gives an excellent representation of research done within the Kruger Park Programme.

SA WATERKALENDER

The Water Research Commission is placing this calendar in order to assist with the co-ordinating of water events in South Africa.

You are invited to send information about conferences, symposia or workshops to the SA Waterbulletin.

Address:
The Editor,
SA Waterbulletin,
P.O. Box 824,
0001 Pretoria
Tel (012) 330-0340
Fax (012) 331-2565

Legend:

- An SA Water Event arranged for these dates.
- 2nd SA Water Event scheduled for these dates.
- × 3rd SA Water Event scheduled for these dates.

See conferences and symposia pages for events.

2001

JANUARY

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Die Watnavorsingskommissie plaas hierdie kalender om te help met die koördinering van watergebeurtenisse in Suid-Afrika.

Alle belanghebbendes word uitgenooi om inligting aan SA Waterbulletin te stuur.

Adres:
Die Redakteur
Posbus 824
0001 Pretoria
Tel: (012) 330-0340
Fax: (012) 331-2565

Gids:

- Een SA Watergeleentheid vir hierdie dae.
- 'n Tweede SA Watergeleentheid vir dié datums.
- × 'n Derde SA Watergeleentheid vir dié datums.

Sien Konferensies- en Simposiumbladsy vir aangeduide geleenthede.

2002

JANUARY

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SOUTHERN
AFRICA

2001

SEAWEED

JANUARY 28 - FEBRUARY 2

The 17th international seaweed symposium will be held in Cape Town.

Enquiries: ISS 2001, University of Cape Town, PO Box 34098, Rhodes Gift 7707 Cape Town. E-mail: ISS2001@botzoo.uct.ac.za. Web: <http://www.uct.ac.za/conferences/iss>

WORLD WETLANDS DAY
FEBRUARY 2

The 30th anniversary of the Ramsar Convention on wetlands will be celebrated. The Ramsar Bureau will be happy to provide Ramsar handbooks as well as copies of the World Wetlands Day set of stickers and a 30th anniversary poster.

Enquiries: Bureau of the Ramsar Convention on Wetlands, Rue Mauvernay 28, CH-1196 Gland, Switzerland. Tel: +41 22 999 01 70. Fax: +41 22 999 01 69. E-mail: ramsar@ramsar.org Web: <http://www.ramsar.org>

WATER WORKSHOP
FEBRUARY 6 - 8

Symmetry Software will present a LabWare Laboratory Information Management System (LIMS) water workshop in Vereeniging aimed at better water management. The workshop includes a visit to Rand Water laboratories. Enquiries: Marie Ferreira, Symmetry Software Services, Devon House, Hampton Park, 20 Georgian Crescent, Bryanston. PO Box 98725, Sloane Park, 2152 Sandton. Tel: (011) 463-5700. Fax: (011) 463-5728. E-mail: marief@symmetry.co.za

AQUATIC RESOURCES
FEBRUARY 12 - 16

A national short-course on the role and use of biological monitoring in aquatic resource assessment will be held at the Settler's Inn Motel in Grahamstown.

Enquiries: Dr Patsy Scherman or Dr Nikite Muller, Institute for Water Research, Rhodes University, Grahamstown. Tel: (046) 622 2428 or (046) 603 8532. Fax: (046) 622 9427. E-mail: patsy@iwr.ru.ac.za or

nikite@iwr.ru.ac.za
ENVIRONMENTAL AUDIT
MARCH 5 - 9

An environmental auditor training course will be held at the Eskom Conference Centre in Midrand, Gauteng. The course is accredited by EARA UK and presented by Aspects International UK.

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

MEMBRANES

MARCH 25 - 28

The 4th WISA-MTD symposium and workshop with the theme "Membranes-Science & Engineering" will be held in Stellenbosch.

Enquiries: Dr EP Jacobs, Institute for Polymer Science, University of Stellenbosch. Tel: (021) 808-3178.

PROCESS WATER

APRIL 3 - 5

The ESKOM international conference on power plant chemistry and process water treatment will take place at the Eskom Conference Centre in Midrand, Gauteng.

Enquiries: D Dalgetty, Senior Consultant Power Plant Chemistry. Tel: (011) 629-5056.

GROUNDWATER

APRIL 23 - 25

A short course in "The principles of the investigation of contaminated sites", including investigation strategies, risk assessment, quality assurance, safety and health protection, will be held at the Institute for Groundwater Studies, the University of the Free State.

Enquiries: Kornelius Riemann, Institute for Groundwater Studies, University of the Free State, PO Box 339, Bloemfontein 9300. E-mail address: kornelius@igs-nt.uovs.ac.za

AQUIFERS

APRIL 26

A short course on "Tracer tests in fractured aquifers" consisting of single well tests - point dilution test, injection withdrawal test, and multiple well tests - radial convergent test, natural flow test, will be presented at the Institute for Groundwater Studies, University of the Free State.

Enquiries: Kornelius Riemann, Institute for Groundwater Studies, University of the Free State, PO Box 339, Bloemfontein 9300. E-mail address: Kornelius

@igs-nt.uovs.ac.za
ENVIRONMENTAL
MANAGEMENT

MAY 8 - 10

A short course on environmental management will be held at the Post-Graduate Centre of the University of Pretoria.

Enquiries: Ms Tanya de Bruin. Tel: (012) 362-5118/9. Fax: (012) 362-5285. E-mail: tanya.ce@up.ac.za

SASAQS 2001

JULY 1 - 6

The 36th conference of the Southern African Society of Aquatic Scientists will be held at Aventura Eco Eiland in the Northern Province. The theme will be "Aquatic ecology and resource management in Southern Africa".

Enquiries: Mr P Fouche. Tel: (01596) 28383. E-mail address: psocaddy@univen.ac.za

AFRIWATER EXHIBITION

AUGUST 15 - 17 2001

The international African water, waste & environmental exhibition will be held at Gallagher Estate, Midrand.

Enquiries: Craig Newman, TML Reed Exhibitions. Tel: (011) 886-3734. Fax: (011) 789-6497. E-mail: craign@tmlreed.co.za

AFRIWATER SEMINARS

AUGUST 15 - 17 2001

The Water Institute of Southern Africa will organise a series of half-day seminars on pertinent topics at the Gallagher Estate in Midrand.

Enquiries: Roelien Bakker, WISA. Tel: (011) 805 6368. Fax: (011) 315 1258. E-mail address: conference@wisa.co.za

SANITATION

AUGUST 20 - 24

The 27th WEDC conference with the theme "People and systems for water, sanitation and health" will be held in Lusaka, Zambia.

Enquiries: Professor John Pickford, WEDC, Loughborough University LE11 3TU, England. Fax: (44) 01509 211027. E-mail: j.a.pickford@lboro.ac.uk

ENVIRONMENTAL
MANAGEMENT

SEPTEMBER 18 - 20

A short course on environmental management will be held at the Post-Graduate Centre of the University of Pretoria.

Enquiries: Ms Tanya de Bruin.

Tel: (012) 362-5118/9. Fax: (012) 362-5285. E-mail: tanya.ce@up.ac.za

2002

RIVER SYSTEMS

MARCH 3 - 8 2002

The 4th international ecohydraulics symposium with the theme "Environmental flows for river systems" will be held in Cape Town.

Enquiries: Conference Secretariat, Southern Waters Ecological Research and Consulting (Pty) Ltd. PO Box 13280. Mowbray 7705. Fax: (021) 6503887. E-mail address: conference2002@southernwaters.co.za. Web: <http://www.southernwaters.co.za>

HYDROLOGY

MARCH 18 - 22

UNESCO's 4th international conference on Flow Regimes from International Experimental and Network Data (FRIEND) with the theme "Bridging the gap between research and practice" will be held in Cape Town.

Enquiries: Juanita McLean, Institute for Water Research, Rhodes University, PO Box 94, Grahamstown 6140. Tel: (046) 622-4014. Fax: (046) 622-9427. E-mail: Juanita@iwr.ru.ac.za

DESERTIFICATION

APRIL 8 - 10

An international symposium on alternative ways to combat desertification - Connecting community action with science and common sense - will be held in Cape Town.

Enquiries: Mary Seely, Desert Research Foundation of Namibia, PO Box 20232, Windhoek, Namibia. Tel: +264 61 229855. Fax: +264 61 230172. E-mail: mseely@drfn.org.na

OVERSEAS

2001

RECYCLED WATER

FEBRUARY 1 - 2

An international water reuse workshop on recycled water - a proven alternative resource - will be held in Los Angeles, California, USA.

Enquiries: Valentina Lazarova, Lyonnaise des Eaux CIRSEE, 38

rue du president Wilson, 78230 Le Pecq, France. Tel: (+33) 1 3480 2251. Fax: (+33) 1 3053 6207. E-mail address: valentina.lazarova@lyonnaise-des-eaux.fr

LIMNOLOGY

FEBRUARY 4 - 10

The 28th congress of the International Association of theoretical and applied limnology will take place at Monash University in Melbourne, Australia.

Enquiries: Irene Thavarajah at oce@adm.monash.edu.au. Web: <http://www.monash.edu.au/oce/sil2001>

SEWERS

FEBRUARY 5 - 8

The 2nd international conference on interactions between sewers, treatment plants and receiving waters in urban areas (INTERURBA II) will be held in Lisbon, Portugal.

Enquiries: Conference Secretariat. E-mail: gaby@civil.ist.utl.pt Tel: +351 1841 8365. Fax: +351 1849 7650.

CORROSION

MARCH 11 - 16

The 56th conference and exhibition on corrosion, organised by the national association of corrosion engineers, will be held in Houston, Texas.

Enquiries: NACE International, 1440 South Creek Dr., Houston, TX 77084. Tel: 281-228- 6223. Fax: 281-228-6329. E-mail: msd@mail.nace.org

SLUDGE

MARCH 25 - 28

A symposium on sludge management entering the 3rd millennium - industrial, combined and water works residues will be held in Taipei, Taiwan.

Enquiries: Dr DJ Lee, Department of Chemical Engineering, National Taiwan University, Taipei 106, Taiwan. E-mail: djlee@ccms.ntu.edu.tw Tel: +886 22362 5632. Fax: +886 22362 3040.

ODOURS

MARCH 25 - 29

The 2nd IAWQ symposium on odours with the theme "Measurement, regulation and control techniques" will be held in Sydney, Australia.

Enquiries: Dr John Kaiyun Jiang, Centre for Water and Waste Technology, School of Civil Engineering, University of South Wales, Sydney 2052, Australia. E-mail: johnj@unsw.edu.au Tel: +61 2385 5452. Fax: +61 2313 8624.

WATER EXHIBITION

APRIL 3 - 5

The central Asia water exhibition will be held in Almaty, Kazakhstan. Enquiries: Worldexpo Ltd, 8 ul. Sniadekich, PL-85-011 Bydgoszcz, Poland. Tel: 011-48-52-3253031. Fax: 011-48-52-3253030 or 3212713. E-mail: officemtplk.byd@targi-fair.com.pl

ENVITEC

MAY 14 - 17

Messe Düsseldorf will host Envitec, a trade fair on environmental protection, occupational health and safety, in Düsseldorf, Germany.

Enquiries: Messe Düsseldorf GmbH, Postfach 101006, D-40001 Düsseldorf, Germany. Tel: +49 (0) 211/4560-01. Fax: +49 (0) 211/4560-668. E-mail: info@messe-duesseldorf.de Web: www.messe-duesseldorf.de

WETLANDS

MAY 27 - JUNE 1

The 22nd annual meeting of the society of wetland scientists will be held in Chicago, IL, USA.

Enquiries: Web: <http://www.sws.org/chicago/>

DESALINATION

MAY 28 - 31

A European conference on desalination and the environment water shortage will be held in Lemesos (Limassol), Cyprus.

Enquiries: Miriam Balaban, Science and Technology Park of Abruzzo, Via Antica Arischia, 1 67100 L'Aquila, Italy. Tel: +39 0862 3475 308. Fax: +39 0862 3475 213. E-mail address: miriam.balaban@aquila.infn.it

WATERSHED MANAGEMENT

JUNE 10 - 15

A symposium on diffuse/nonpoint pollution and watershed management will be held in Milwaukee, USA.

Enquiries: Professor Vladimir Novotny, Institute for urban environmental risk management, Marquette University, Milwaukee, WI 53201-1881, USA. E-mail: novotny@execpc.com Tel: +414 288 3524. Fax: +414 2887521.

ACTIVATED SLUDGE

JUNE 13 - 15

A conference on microorganisms in activated sludge and biofilm processes will be held in Rome, Italy.

Enquiries: Prof C Tandoi, CNR Water Research Institute, via

Reno 1, 00198 Rome, Italy. E-mail: tandoi@irsa1.irsa.rm.cnr.it Tel: +61 73365 4645. Fax: +61 7 3365 4620.

COASTAL ZONE

JUNE 18 - 20

The 4th international symposium on computer mapping and GIS for coastal zone management will be held in Halifax, Nova Scotia (Canada).

Enquiries: Coastgis2001@agc.bio.ns.ca. Web: <http://www.agc.bio.ns.ca/coastgis2001/>

TOXICOLOGY

JULY 8 - 13

The 9th international congress on toxicology will be held in Brisbane, Australia.

Enquiries: Congress secretariat. E-mail: ictx2001@im.com.au Fax: +61 73369 1512.

FOG COLLECTION

JULY 15 - 20

The second international conference on fog and fog collection will be held in St John's, Newfoundland, Canada. The conference will focus on the physics, chemistry, meteorology, forecasting and remote sensing of fog; fog deposition and the interaction of fog with vegetation; dew research, fog collection projects in developing countries and the negative effects of fog on commercial offshore activities.

Enquiries: Dr Robert Schemenauer (Conference Chair), PO Box 81541, 1057 Steeles Avenue West, Toronto, Ontario M2R 2X1, Canada. Fax (1 416) 739 4211. E-mail address: robert.schemenauer@ec.gc.ca

WEDC

The 27th Water, Engineering and Development Centre (WEDC) conference with the theme "People and systems for water, sanitation and health" will be held in Lusaka, Zambia.

Enquiries: WEDC, Institute of Development Engineering, Loughborough University, Leicestershire LE11 3TU UK. Tel: +44 (0) 1509 222885. Fax: +44 (0) 1509 211079. E-mail: WEDC@lboro.ac.uk Web: <http://www.lboro.ac.uk/wedc>

AQUACULTURE

AUGUST 5 - 7

The European Aquaculture Society (EAS) will hold a symposium with the theme "aquaculture in Europe" in Trondheim, Norway.

Enquiries: [http://www.easeon-](http://www.easeon-line.org)

line.org

ANAEROBIC DIGESTION

SEPTEMBER 3 - 5

A conference on anaerobic digestion titled AD2001 will be held in Antwerp, Belgium.

Enquiries: Lood FM van Velsen, NVA, PO Box 70, 2280 AB Rijswijk, the Netherlands. Tel: +31 24 3284282. Fax: +31 24 3604737. E-mail: sf@haskoning.nl

ICHTHYOLOGY

SEPTEMBER 3 - 7

The 10th European conference on ichthyology will be held in Prague, Czech Republic.

Enquiries: Web: <http://www.eci-x.iapg.cas.cz>

ACTIVATED SLUDGE

SEPTEMBER 10 - 12

The 5th Kollekolle seminar on activated sludge modelling with the theme "Modelling and the microbiology of activated sludge processes" will be held in Kollekolle, Denmark.

Enquiries: Ms Mia Clausen, Miacon c/o Department of Environmental Science and Engineering, Building 115, Technical University of Denmark, DK-2800, Lyngby, Denmark. E-mail address: mc@imt.dtu.dk Tel: +45 4525 1613. Fax: +45 4593 2850.

WATER RESOURCES

SEPTEMBER 24 - 26

The first international conference on water resources management will be held in Halkidiki, Greece.

Enquiries: Web address: <http://www.wessex.ac.uk/conferences/2001/wrm01/>

WASTE MANAGEMENT

OCTOBER 1 - 5

The 8th international waste management and landfill symposium will be held in S. Margherita di Pula, Cagliari, Italy.

Enquiries: EuroWaste srl, via Altinate, 96 - 35121 Padova. Tel: +39 049 663860. Fax: +39 049 663960. E-mail: eurowaste@tin.it Web address: www.unipd.it/sardiniasymposium

WEFTEC 2001

OCTOBER 13 - 17

The 74th annual conference and exhibition of the American Water Environment Federation will be held in Atlanta, USA.

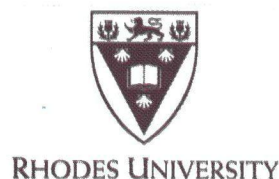
Enquiries: E-mail: confinfo@wef.org Fax: +1 703 684 2475. Web: <http://www.wef.org/docs/conference.html>

Announcement of the next National Short Course on

THE ROLE AND USE OF BIOLOGICAL MONITORING IN AQUATIC RESOURCE ASSESSMENT



Currently coordinated by:
**Institute for Water Research
Rhodes University
Grahamstown**



AIM OF THE COURSE

Aquatic biomonitoring, or response monitoring, is increasingly used as a monitoring and assessment tool in water resource management. This course will provide a basic understanding of the concepts, advantages, uses and limitations associated with different biomonitoring techniques, including field bio-assessment and toxicity bioassays. The course is designed to address the relevant concepts and the interplay between biomonitoring and resource management, rather than the technical details of how to conduct monitoring. There will be a balance between theoretical lectures (presented by experts from various organisations), hands-on exposure in the laboratory and field, group discussions and problem solving. Presentations and course material will be in English.

WHO SHOULD ATTEND?

Mid-level managers, planners and other officials from government or private institutions who need and want to improve their knowledge and use of biomonitoring in general.

WHERE AND WHEN?

In Grahamstown, 12 - 16 February 2001.

COST

The course fee is R3 500 per person (excluding accommodation) and includes lecture material and use of field and laboratory equipment.

ENQUIRIES

Dr Patsy Scherman
IWR
Tel: (046) 622-2428 or 603-8532
Fax: (046) 622-9427
e-mail: patsy@iwr.ru.ac.za

or

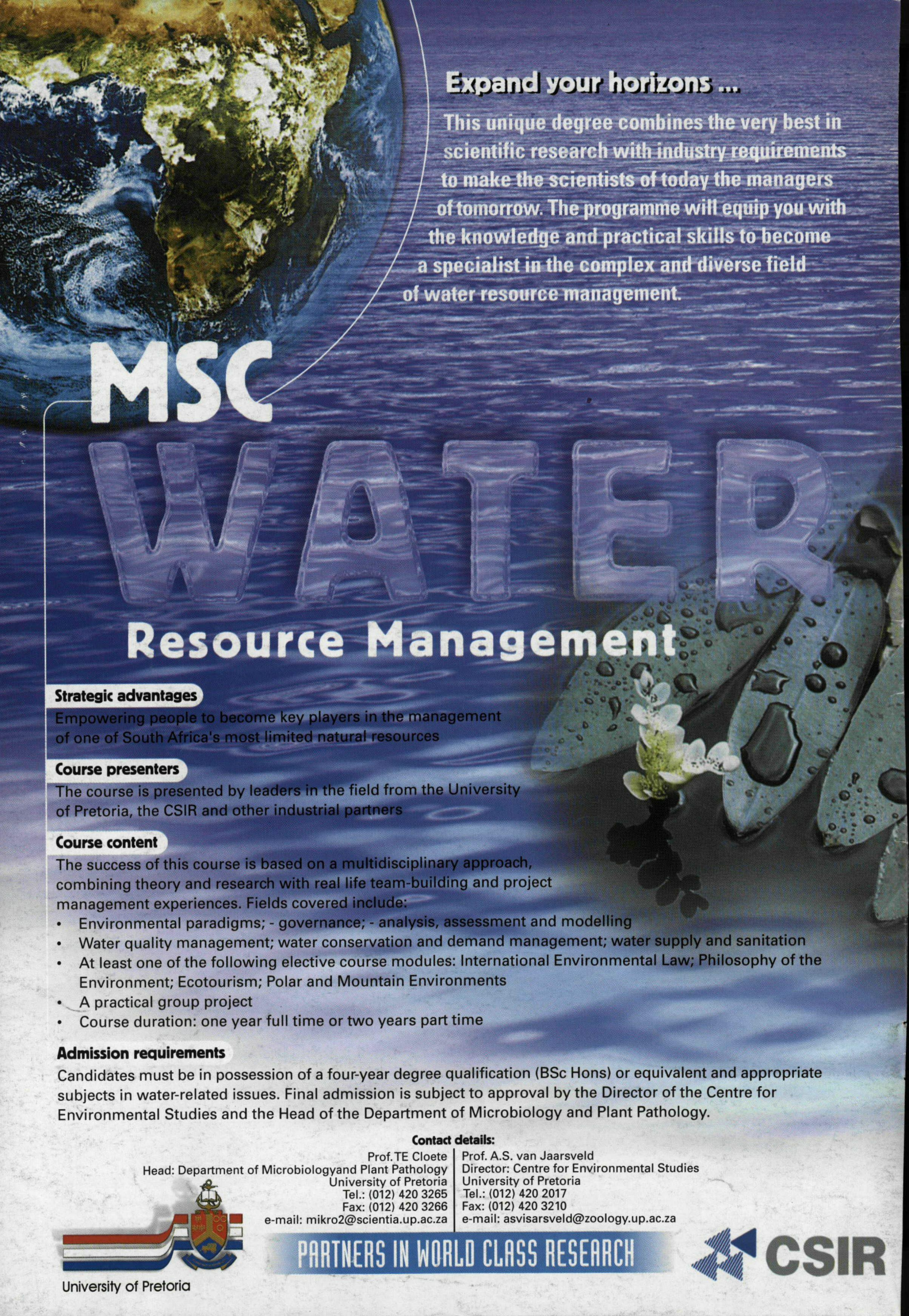
Dr Nikite Muller
IWR
Tel: (046) 622-2428 or 603-8532
Fax: (046) 622-9427
e-mail: nikite@iwr.ru.ac.za



The national short course was initiated by:
The Institute for Water Quality Studies
(IWQS) of the Department of Water Affairs and Forestry
&

CSIR's Division of Water, Environment and Forestry (Environmentek)





Expand your horizons ...

This unique degree combines the very best in scientific research with industry requirements to make the scientists of today the managers of tomorrow. The programme will equip you with the knowledge and practical skills to become a specialist in the complex and diverse field of water resource management.

MSC

WATER

Resource Management

Strategic advantages

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

Course presenters

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

Course content

The success of this course is based on a multidisciplinary approach, combining theory and research with real life team-building and project management experiences. Fields covered include:

- Environmental paradigms; - governance; - analysis, assessment and modelling
- Water quality management; water conservation and demand management; water supply and sanitation
- At least one of the following elective course modules: International Environmental Law; Philosophy of the Environment; Ecotourism; Polar and Mountain Environments
- A practical group project
- Course duration: one year full time or two years part time

Admission requirements

Candidates must be in possession of a four-year degree qualification (BSc Hons) or equivalent and appropriate subjects in water-related issues. Final admission is subject to approval by the Director of the Centre for Environmental Studies and the Head of the Department of Microbiology and Plant Pathology.

Contact details:

Head: Department of Microbiology and Plant Pathology
University of Pretoria
Tel.: (012) 420 3265
Fax: (012) 420 3266
e-mail: mikro2@scientia.up.ac.za

Prof. A.S. van Jaarsveld
Director: Centre for Environmental Studies
University of Pretoria
Tel.: (012) 420 2017
Fax: (012) 420 3210
e-mail: asvisarsveld@zoology.up.ac.za



University of Pretoria

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