



Report No: TT 490/11

Introduction to integrated water meter management: Edition 1 (JE van Zyl)

Currently there is a lack in the proper management of water meters and meter data, resulting in increased levels of water losses and reduced income for municipalities. In addition, initiatives of water demand management and conservation are hampered by a lack of good information. This book covers all aspects of water meters and water metering in municipalities. It covers the theoretical principles of meters, legal and metrological requirements, meter types, best practice guidelines as well as practical aspects of water meter management (among others).

Report No: 1934/1/11

Management of the microbial water quality in catchments (SN Venter; A Lötter; LM Burke; WJ le Roux & M du Preez)

Management of the microbiological quality of water requires a good understanding of the behaviour of microorganisms at an ecosystem level. The behaviour, which is linked to the microbial population structure and diversity, consequently influences the effectiveness of catchment level mitigation strategies that contribute to sustainable management of our surface water resources. Managing microbial loads at catchment levels could provide both financial and health benefits for downstream users. Among others, this study investigated the applicability of novel molecular approaches for the

determination of true microbial diversity in surface waters.

Report No: 1842/1/11; 1842/2/11 & 1842/3/11

Towards water resources regulations in South Africa Volume 1: Survey of approaches to water resources regulations; Volume 2: Institutional criteria, functions and arrangements & Volume 3: The use of regulatory impact assessment in developing approaches and tools for pro-poor water resources regulation (B Schreiner; S Chimuti; A Cupido & V Mbanda)

Water resources management provides a broad suite of activities, of which water resources regulation is one important set of activities. It is clear from the current status of water resources and water resource use in South Africa, that regulation is failing. Among others, climate change threatens the reliability of water availability in already stressed catchments, while raw and drinking water challenges are costing the country significantly in terms of foregone exports of crops, waterborne disease, death and lost productivity. This project was aimed at assisting in understanding these issues, including a consideration of institutional arrangements, tools and approaches. The focus of this project is on technical regulation in the water resources sector, rather than economic or governance regulation, although the institutional relationships are a critical part of sound technical regulation.

Report No: KV 271/11

Technology transfer of SAPWAT3, verifying correctness of program output and evaluation of its adoption potential (PS van Heerden and CT Crosby)

SAPWAT3 is the product of 20 years of research related to irrigation, agricultural engineering, soil, crops, agricultural meteorology and agricultural economics funded by the WRC. Development time and the cost involved accentuate the need to disseminate knowledge of SAPWAT3

to as wide a scope of potential users as possible, as well as to provide the necessary back-up, otherwise the danger exists that SAPWAT3 will not be used to its fullest potential and development time and funding would have been wasted. The next program version will include the expansion of functionality and correction of errors that have been identified, some of which is included in this report.

Report No: 1759/1/11

Guidelines on freeboard for dams Volume 1 (Literature review and case studies) (E Bosman & G Basson)

This WRC study on freeboard for dams started in 2007 and was carried out over a period of three years. A literature review was carried out to determine the state-of-the-art knowledge on the quantification of the secondary components to be taken into account in the determination of dam freeboard. Research carried out in the coastal engineering field of aspects which are relevant and applicable to dams was incorporated.

Report No: 1759/2/11

South African National Committee on Large Dams Volume II: Guidelines on freeboard for dams (DE Bosman; J Basson; T Tente & GR Basson)

The revision of the original SANCOLD Interim Guidelines on Freeboard for Dams coincides aptly with the draft revision of the Dam Safety Regulations in terms of the National Water Act. Only one major change has been advocated which is in respect of wave heights to be used in the calculations of freeboard. The revised guidelines also have updated wind, earthquake, and landslide information for South Africa.

Report No: KV 272/11

Remote sensing evapotranspiration (SEBS) evaluation using water balance (L Gibson, Z Münch, M Carstens & J Conrad)

This report follows on from a previous

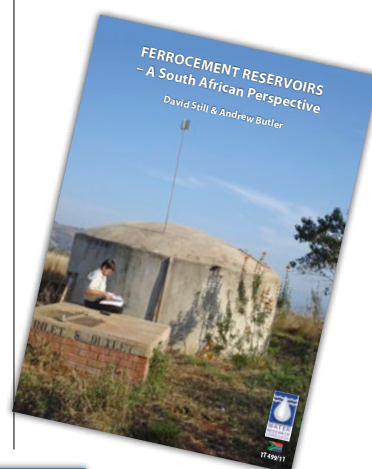
WRC-funded study which investigated remote sensing as a tool for resource assessment. This study showed that due to many uncertainties and limitations with both the input data and methodology it was not possible to determine the actual water consumption of individual farms or compliance to legislation. In this project, the aim was to address the uncertainties and limitations and thereby determine the efficacy or efficiency of the method to highlight water-stressed catchments.

Report No: TT 499/11

Ferrocement reservoir – A South African perspective (D Still & A Butler)

Ferrocement is the name given to a composite material from a high strength mortar cement mix reinforced with steel mesh and wire. Since the 1990s several hundred ferrocement reservoirs have been built in South Africa. The largest such reservoir to date were two tanks built at Osindisweni, some 20 km west of Verulam.

One of the objectives of this study was to carry out field evaluations of ferrocement reservoirs in practice to see how they had weathered in the field. A total of 41 reservoirs were visited and they were checked for signs of spalling, cracking or leakage. It was found that the reservoirs were in general performing well and that they had not undergone any discernible deterioration.



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Awareness and labelling can benefit inland fisheries



Sustainable seafood initiatives, including certification and ecolabelling and awareness schemes, could be extended to more effectively cover inland, freshwater fisheries, according to researchers writing in the November issue of *BioScience*.

The world's growing dependence on fish protein and the imperilled state of many freshwater fisheries argues for such efforts, the authors conclude, although because freshwater fisheries tend to be smaller and are more concentrated in developing countries than marine and coastal fisheries, the efforts would have to be modified substantially to target the different consumers.

Authors, Steve Cooke of Carleton University and colleagues, initially set out to assess the scientific literature on ecolabelling and awareness schemes as they related to freshwater species, but

soon determined there were very few such studies. Although freshwater species and those that live in freshwater during part of their lifecycle are included in lists intended to guide consumers on sustainable diet choices, they constitute a small minority, according to a survey of ten certification and labelling schemes.

This imbalance could lead to a public misconception that freshwater species are generally less at risk than marine species, Cooke and his colleagues argue. Grassroots schemes, rather than multimedia marketing-oriented certification schemes, are the most promising approach to increasing awareness of the threats to freshwater species and what choices consumers can make to reduce these, the authors say, because many freshwater fisheries are artisanal.

New snail species discovered in Greece

A new minute freshwater snail species belonging to the genus *Daphniola* was found by researchers of the University of Athens in a snow-covered spring on Mount Parnassos, in central Greece. The new species, *Daphniola eptalophos*, has a transparent conical-flat coiled shell, and a grey-black pigmented soft body. *Daphniola* is endemic to Greece, inhabiting most of the mainland. Two of

the three currently known species are categorised as endangered and critically endangered. It is notable that the new species was been found in only one spring to date, and its population abundance seems to be low.

The new species is threatened by habitat destruction as a result of urbanisation, water pollution, waste accumulation, tourism and agricultural practices.

UN report outlines investment strategies to reduce water scarcity

An annual investment of US\$198-billion, or 0.16% of global gross domestic product (GDP) in the water sector could reduce water scarcity and halve the number of people without sustainable access to safe drinking water and basic sanitation in less than four years.

This is according to the water chapter in the United Nations Environment Programme (UNEP) latest Green Economy Report. According to UNEP, investing in sanitation and drinking water, strengthening local water supply systems, conserving ecosystems critical for water supply, and developing more effective policies can help avert the high social and economic costs resulting from inadequate water supplies.

Cambodia, Indonesia, the Philippines and Vietnam, for example, lose an estimated US\$9-billion a year, or 2% of their combined GDP, due to problems caused by poor sanitation, according to the report, which was released during the World Water Week in Stockholm earlier this year.

"Improving access to cleaner drinking water and sanitation services

is a cornerstone of a more sustainable, resource-efficiency society," noted UNEP Executive Director, Achim Steiner. "The Green Economy Report shows how accelerated investment in water-dependent ecosystems, water infrastructure and water management, coupled with effective policies, can boost water and food security, improve human health and promote economic growth."

With the recommendations outlined in the report, global water use could be kept within sustainable limits and the Millennium Development Goals of reducing by half the proportion of the population without sustainable access to safe drinking water and basic sanitation could be met by 2015. Improving the efficiency and sustainability of water use is also vital if the world's increasing energy demands are to be met, said UNEP.

To access the Green Economy Report, Visit: <http://www.unep.org/greeneconomy/GreenEconomyReport/tabid/29846/Default.aspx>

Australia to share farming lessons with Africa

The Australian government will establish an international food security centre to offer research and technical expertise to will-ing governments and institutions in Africa.

The Australia International Centre for Food Security will be established in the second quarter of this year. Australian Prime Minister Julia Gillard announced the establishment of the centre late last year. It will be set up at a cost of around US\$37-million and be hosted by the Australian Centre for International Agriculture Research.

Under the scheme African scientists will be linked to top Australian research bodies and tertiary education institutions to access solutions to the challenges of farming in tropical and sub-tropical environments. Australian researchers will also train African scientists in the technology the country uses to cope with many of the environmental challenges it shares with Africa, such as

extreme climate, soil infertility and climate change.

Gabrielle Persley, adjunct professor at the Global Change Institute at the University of Queensland in Australia, said the centre will help African scientists develop drought-resilient crop varieties, an area where Australia has made great strides. "Developing the capacity of African scientists and other experts in areas such as developing market access for smallholder farmers and deploying Australian advanced technology in helping farmers cope with impacts of climate change will be major facets of this initiative."

The building of the centre will be preceded by an international conference on African food security, in the first of this year. The conference will bring together Australian and African researchers to identify opportunities for cooperation.

Climate change downsizing fauna, flora



Climate change is reducing the size of many animal and plant species, including some which supply vital nutrition, *ABC Science* reports.

From microorganisms to top predators, nearly 45% of species for which data was reviewed in a recent study grew smaller over multiple generations due to climate change. The impact of rapidly climbing temperatures and shifts in rainfall patterns on body size could have unpredictable and possible severe consequences, according to the research which appeared in the 17 October issue of the journal, *Nature Climate Change*. The

research was conducted by scientists from the University of Singapore.

According to the researchers, for cold-blooded animals, including insects, reptiles and amphibians, the impact of climate change is direct: experiments suggest that an upward tick of 1°C translates into roughly a 10% increase in metabolism. That, in turn, results in downsizing.

In turn, overfishing has been blamed for decreased body size in both wild and commercially-harvested aquatic species, threatening the key source of protein of a billion people around the world. But experiments and observational studies have shown that warming waters play a role as well, especially in rivers and lakes.

Some of the most worrying changes are at the bottom of the food chain, especially in the ocean, where tiny phytoplankton and calcium-building creates are dwindling in size due to acidification and the reduced capacity of warmer water to hold oxygen and nutrients.

Source: ABC Science

US scientists find evidence of Roman-period megadrought

A new study at the University of Arizona's Laboratory of Tree-Ring Research has revealed a previously unknown multi-decade drought period in the second century AD.

Almost 900 years ago, in the mid-12th century, the southwestern US was in the middle of a multi-decadal megadrought. It was the most recent extended period of severe drought known for this region. But it was not the first.

The second century AD saw an extended dry period of more than 100 years characterised by a multidecade drought lasting nearly 50 years, says a new study from scientists at the University of Arizona.

Geoscientists Cody Routson, Connie Woodhouse and Jonathan Overpeck conducted a study of the southern San Juan Mountains in south-central Colorado. The region serves as a primary drainage site for the Rio Grande and San Juan rivers.

"These mountains are very important for both the San Juan River and the

Rio Grande River," explained Routson, primary author of the study, which appeared in the journal, *Geophysical Research Letters*.

Dendrochronology is a precise science of using annual growth rings of trees to understand climate in the past. Because trees add a normally clearly defined growth ring around their trunk each year, counting the rings backwards from a tree's bark allows scientists to determine not only the age of the tree, but which years were good for growth and which years were more difficult.

"If it is a wet year, they grow a wide ring, and if it is a dry year, they grow a narrow ring," explained Routson. "If you average that pattern across trees in a region you can develop a chronology that shows what years were drier or wetter for that particular region."

To develop their chronology, the researchers looked for indications of climate in the past in the growth rings of the oldest trees in the southern San Juan region. In particular, the region is known for its bristlecone pine trees, the oldest of which are more than 4 000 years old.

Core samples were taken from these trees. The chronology thus created by the researchers extended back 2 200 years.

The study revealed another period of increased aridity earlier than the two major droughts already known – one in the middle of the 12th century, and the other at the end of the 13th century. "This new record shows that there is also evidence for an earlier megadrought during the second century AD," noted Routson.

"We are showing that there are multiple extreme drought events that happened during our past in this region. And the climatic events behind these previous dry periods are really similar to what we are experiencing today."

Although natural climate variation has led to extended dry periods in the southwestern US in the past, there is reason to believe that human-driven climate change will increase the frequency of extreme droughts in the future.

Rising air pollution worsens drought, flooding – Study

Increases in air pollution and other particulate matter in the atmosphere can strongly affect cloud development in ways that reduce precipitation in dry regions or seasons, while increasing rain, snowfall and the intensity of severe storms in wet regions or seasons. This is according to a new study by US researchers at the University of Maryland. The research provides the first clear evidence of how aerosols – soot, dust and other small particles in the atmosphere – can affect weather and climate. The findings have important implications for the available, management and use of water resources in regions around the world, according to the researchers.

"Using a ten-year dataset of extensive atmosphere measurements from the US Southern Plains research facility in Oklahoma, we have uncovered, for the first time, the long-term, net impact of

aerosols on cloud height and thickness, and the resultant changes in precipitation frequency and intensity," reported lead author Zhanqing Li, a professor of atmospheric and oceanic science at Maryland.

The study found that under very dirty conditions, the mean cloud height of deep convective clouds is more than twice the mean height under crystal clean air conditions. "The probability of heavy rain is virtually doubled from clean to dirty conditions, while the chance of light rain is reduced by 50%," said Prof Li.

The scientists obtained additional support for these findings with matching results obtained using a cloud-resolving computer model. The study is published in the November 13 issue of the journal, *Nature Geoscience*.

"These findings of long-term impacts, which we made using regional ground measurements, are also consistent with

the findings we obtained from an analysis of NASA's global satellite products in a separate study. Together, they attest to the needs of tackling both climate and environmental changes that matter so much to our daily life," concluded Li.

