

## Special day spotlights plight of migratory birds



On 10 May the world celebrated World Migratory Bird Day focused on conserving one of the world's true natural wonders – the spectacular movements of migratory birds along their flyways.

This year's theme focused on migratory birds and tourism.

Thanks to an innovative new project led by the World Tourism Organisation (UNWTO) some of the world's estimated 50 billion migratory birds should soon be able to benefit from sustainable tourism and development. *Destination Flyways*, currently in its preliminary phase, aims to develop sustainable tourism at destinations along the world's migratory bird routes.

Focusing on a selection of eight key sites for migratory birds in Africa, Asia and Europe, the project aims to be a vehicle for both environmental and

socio-economic sustainability, benefiting wildlife, local communities and tourists alike. By providing an adequate framework for sustainable tourism management, diversifying tourism and channelling its revenue back into conservation of the project sites and the communities around them, the initiative will work to safeguard the birds' habitats, while creating job opportunities for local communities along the flyways.

With over one billion international tourists travelling the world every year, generating a global trade income of US\$1.4 trillion, and 9% of global GDP, tourism clearly has an immense

potential to contribute to sustainable development.

"Tourism is an undisputed generator of national wealth, corporate income and local employment. Managed sustainably, it can benefit people and the planet alike," reported UN Secretary-General Ban Ki-moon in a message to the 20<sup>th</sup> Session of the UNWTO General Assembly.

One of the eight project sites selected for the Destination Flyways project is Lake Natron, in the remote north of Tanzania. Home to 75% of the world's population of Lesser Flamingo, Lake Natron is the only breeding ground for this species in East Africa.

## Nanoparticles from dietary supplement drinks could reach environment, say scientists

Nanoparticles are becoming ubiquitous in food packaging, personal care products and are even being added to food directly.

However, the health and environmental effects of these tiny additives have remained largely unknown. A new study now suggests that nanomaterials in food and drinks could interfere with digestive cells and lead to the release of potentially harmful substances to the environment. The report on dietary supplement drinks containing nanoparticles was published in the journal *ACS Sustainable Chemistry & Engineering*.

Robert Reed and colleagues note that food and drink manufacturers use nanoparticles in and on their products for many reasons. In packaging, they can provide strength, control how much air gets in and out, and keep unwanted microbes at bay. As additives to food and drinks, they can prevent caking, deliver nutrients and prevent bacterial growth. But as nanoparticles increase in use, so do concerns over their health and environmental effects. Consumers might absorb some of these materials

through their skin, and inhale and ingest them. What doesn't get digested is passed in urine and faeces to the sewage system. A handful of initial studies on nanomaterials suggest that they could be harmful, but Reed's team wanted to take a closer look.

They tested the effects of eight commercial drinks containing nano-size metal or metal-like particles on human intestinal cells in the lab. The drinks changed the normal organisation and decreased the number of microvilli, finger-like projections on the cells that help digest food. In humans, if such an effect occurs as the drinks pass through the gastrointestinal tract, these materials could lead to poor digestion or diarrhoea, they say. The researchers' analysis of sewage waste containing these particles suggests that much of the nanomaterials from these products are likely making their way back into surface water, where they could potentially cause health problems for aquatic life.

**Source: American Chemical Society**

## Fish also on spiders' menu

Although viewed by ecologists as the classical predators of insects, researchers have become increasingly aware that spiders are not exclusively insectivorous.

Certain larger-sized species supplement their diet by occasionally catching small fish, a new study shows. The research was undertaken by zoologist and spider expert, Martin Nyffeler from the University of Basel, Switzerland, and Bradley Pusey from the University of Western Australia. The researchers gathered and documented numerous incidents of spiders predating fish from all around the world.

According to their systematic review, spiders from as many as five families have been observed predating on small fish in the wild and three more families contain species that catch fish under laboratory conditions. These so-called semi-aquatic spiders typically dwell at the fringes of shallow freshwater streams, ponds or swamps. These spiders, some of which are capable of swimming, diving and walking on the water surface, have powerful neurotoxins and enzymes that enable them to kill and digest fish that often exceed them in size and weight.

"The finding of such a large diversity of spiders engaging in fish predation is



novel. Our evidence suggests that fish might be an occasional prey item of substantial nutritional importance", says Nyffeler.

Based on this study, naturally occurring fish predation by spiders has been reported from all continents, with the exception of Antarctica. Most incidents have been documented in North America, especially in the wetlands of Florida, where semi-aquatic spiders have often been witnessed catching and eating small freshwater fish such as mosquito fish. In order to catch its prey, the spider will typically anchor its hind legs to a stone or a plant, with its front legs resting on the surface of the water, ready to ambush. The fish will then be dragged to a dry place before the feeding process can begin, which usually lasts several hours.

**Source: University of Basel**

## New from the WRC

### Report No. TT 570/13

*The use of isotope hydrology to characterise and assess water resources in south(ern) Africa (Tamiru Abiye – Editor)*

Environmental isotopes are routinely employed worldwide in the study of groundwater and surface water, as they provide unique information on transport and interconnectivity of water resources and reservoirs. The overall contribution of this project was to raise awareness of environmental isotope hydrology as a useful tool in the assessment of water resources at different spatial scale both at local and international level.

### Report No. TT 583/13

*Community engagement in drinking water-supply management: A review (U Rivett; D Taylor; C Chair; B Forlee; M*

*Mrwebi; JP van Belle & W Chigona)*

This review emanates from a previous WRC-funded project that investigated the possibility of incentivising community engagement in

order to improve drinking water supplies in South Africa. The research is based on the notion that an increase in community engagement, particularly in rural areas, would result in an increased understanding of the current shortcomings of drinking water supplies, an increased understanding of the communication challenges between communities, water service authorities and water service providers, as well as an improved experience of greater transparency and accountability for all stakeholders.

### Report No. TT 575/13

*DRIFT: DSS software development for integrated flow assessments (CA Brown; AR Joubert; J Beuster; A Greyling & KM King)*

DRIFT or Downstream Response to Imposed Flow Transformations is an environmental flow assessment process that was developed in South Africa. In a previous study, the feasibility of developing a

decision support system (DSS) for integrated flow assessments based on DRIFT was investigated. The aims of this projects were to further develop a DSS for supporting sustainable use of water resources through equal consideration of the ecological, social and economic implications of management options; and to code the DSS for use in any size catchment, from local to international.

### Report No. TT 572/13 to TT 574/13

*The Shared Rivers Initiative Phase II parts 1-3 (S Pollard; H Biggs; A Rydannykh; D du Toit; A Laporte-Biquit; R Pejan; A Robertson; J Cogger; D Sefatsa; M Emmerson; J Burt & M von Balkom)*

The Shared Rivers Initiative is a trans-boundary project that aims to understand and effect change in the implementation of policies and legislations relevant to the wise use of the Lowveld river systems. The final report of Phase 1 of the initiative was published in 2010 (**Report No. TT 477/10**). Phase 2 addressed three different aspects of integrated water resource management raised in Phase 1. They are collective action for improved water resources management, building regulatory competence for addressing unlawful water use, and benefit sharing – understanding the intention of the Reserve and the benefits than an ecosystems goods and services approach provides. The results are discussed in three separate publications (Part 1, Part 2 and Part 3). It is believed that the work presented has the potential to contribute to our knowledge of the policy-science-management-practice interfaces by adopting an integrated approach that seeks to track a policy intent such as environmental water requirements through to outcomes. It seeks to deepen the discourse on environmental water requirements, built on the recognition

that ensuring water for future generations is the basis for a healthy and thriving society. Ensuring both provisioning and regulating services through Reserve compliance provides for benefits that impact on health and at the same time the economy.

### Report No. TT 323/13

*Scoping study: Energy generation using low head hydro technologies (SJ van Vuuren, M van Dijk & b Barta)*

Low head hydropower generation refers to electricity generated from a relatively low pressure head normally found in rivers or irrigation canals, and is applicable to sites with less than 5 m of head. This study illustrated that there is an untapped source of hydropower which should be harnessed. It also reflected that the hidden or unused potential in run-of-river generation; impoundments and irrigation schemes should be seen as priorities. The potential sites where low head hydropower can be installed in South Africa are dams and barrages, rivers, irrigation systems (canals and conduits) and urban areas (such as industrial and urban discharge and stormwater systems).

### Report No. TT 577/13

*Optimal utilisation of thermal springs in South Africa (J Olivier & N Jonker)*

Thermal (hot) springs have been used for religious and/or medicinal purposes for hundreds, if not thousands, of years. Many of these developed into flourishing centres of culture, health and tourism. Although some remained popular over time, many have fallen into disuse. In South Africa, about half of the documented 74+ thermal springs have been developed as family leisure and recreational resorts alone, while the rest remain undeveloped.

Decisions regarding the viability of alternative and optimal uses of a thermal spring resource are largely based on their physical and chemical characteristics but, apart from research carried out on thermal springs during the early and mid-20<sup>th</sup> century, little is known about them. The principal aim of this project was to determine the optimal uses of thermal springs in South Africa.

### Report No. TT 584/13

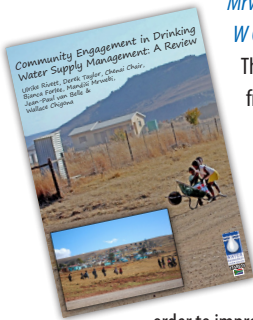
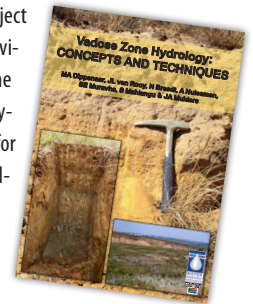
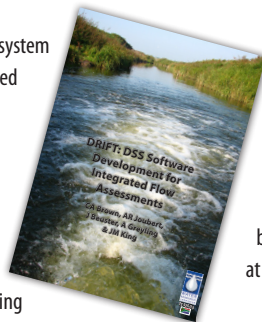
*Vadose zone hydrology: Concepts and techniques (MA Dippenaar; JL van Rooy; N Breed; A Huisamen; SE Muravha; S Mahlangu & JA Mulders)*

This WRC-funded project followed on from previous work outlining the importance of classifying the vadose zone for improved understanding. The study aimed to address the most important vadose zone investigative techniques used by different disciplines, emphasising the intermediate vadose zone and subsurface processes rather than soil moisture measurements, and to incorporate these for the use of other disciplines. The study concludes to say that although vadose zone hydrology is in itself a specialised interdisciplinary field, the applications rely on the requirements of the individual specialists involved in its study. Better dialogue between specialists is the solution rather than a single uniform discipline, and the contributions of all interested disciplines improve the quality of investigations.

### Report No. 2091/1/13

*Behavioural nudges as a water savings strategy (G Smith & M Visser)*

Historically, municipalities have relied largely on tariffs, technical interventions (such as leakage control) and customer education campaigns to manage the demand for water. In recent years, however, municipalities, mainly in the developed world, have begun experimenting



## Water diary

### Unconventional gas mining

August 18-19

The Groundwater Division of the Geological Society of South Africa and the Mine Water Division of the Water Institute of Southern Africa are hosting a two-day symposium on Unconventional Gas: Just the Facts. *Enquiries: Jacon Seaman, Tel: (011) 805-3537; Fax: (011) 315-1258; Email: [events@wisa.org.za](mailto:events@wisa.org.za); Visit: [www.wisa.org.za](http://www.wisa.org.za)*

September 1-3

### Hydrology

The 17<sup>th</sup> SANCIAHS National Hydrology Symposium, hosted by the University of Cape Town Institute for Water Studies, will be held in Cape Town. The symposium theme is 'Hydrology in the Anthropocene: Navigating our future research by building on more than 30 years of SANCIAHS achievements'. *Enquiries: Emma Vaughan, Tel: (021) 406 6407; Email: [emma.vaughan@uct.ac.za](mailto:emma.vaughan@uct.ac.za); Visit: [www.sanciahs2014.co.za](http://www.sanciahs2014.co.za)*

### Groundwater and mining

September 1-3

The Africa Groundwater Academy will be hosting a course on the 'Application of Modelling in Mines' at the University of the Western Cape. The course will focus on teaching participants how to build flow and transport models, input field data, use zone budget to assess water balance, accumulate mine pollutants transformation, and more. *Visit: [www.gwd.org.za](http://www.gwd.org.za) for more information.*

### Groundwater

September 15-19

The 41<sup>st</sup> International Congress of the International Association of Hydrogeologists (IAH) will be held in Marrakech, Morocco, with the theme 'Groundwater: Challenges and Strategies'. *Email: [contact@iah2014.org](mailto:contact@iah2014.org) or Visit: [www.iah2014.org](http://www.iah2014.org) for more information.*

### World water

September 21-26

The International Water Association (IWA) is holding its World Water Congress & Exhibition in Lisbon, Portugal. *Visit: [www.iwa2014lisbon.org](http://www.iwa2014lisbon.org) for more information.*

### Civil engineering

October 28-31

The 9<sup>th</sup> World Congress on Engineering Asset Management will be held in Pretoria. Engineering asset management encompasses all types of engineered assets, including built environment, infrastructure, plant, equipment, hardware systems and components. *Visit: <http://2014.wceam.com/> for more information.*

### Municipal engineering

October 29-31

The 2014 Conference of the Institute of Municipal Engineering in South Africa (IMESA) will be held at the Durban International Convention Centre, in Durban. *Visit: [www.imesa.org.za](http://www.imesa.org.za)*

## Popular water treatment tool now upgraded

The chemical quality of water can have a major impact on the system storing and conveying the water, and on the use of the water. Waters from underground sources in dolomitic areas, when brought to the surface, in contact with air, may become oversaturated with respect to calcium carbonate, and cause excessive precipitation in storage dams, canals and pipes.

All these waters need to be treated to remove or minimise the various adverse effects. The difficulties with any water are to assess its characteristics and to devise an appropriate treatment to give a non-scaling, non-aggressive, non-corrosive water.

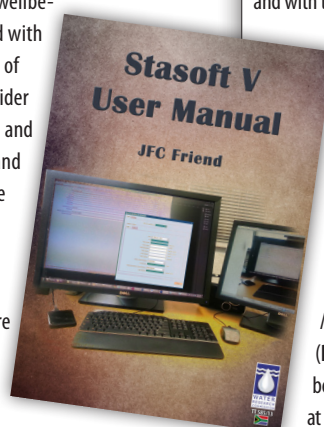
The popular Stasoft software tool was first developed through WRC funding in the 1980s. It provides rapid numerical solutions to characterisations of water and the dosing requirements to obtain the desired chemical water quality for a prescribed input.

The program has been upgraded and enhanced several times over the years. The latest version of the program, Stasoft V, is now available. It was developed to be functional on new operating platforms (Windows 7 and higher).

The program addresses water conditioning problems in aqueous media with a total dissolved solids concentration of up to 15 000 mg/l, and with the carbonate system as the

only weak acid system in solutions. The software addresses a range of chemical conditioning problems likely to arise in the treatment of municipal waters, cooling waters and mining wastewaters.

The *Stasoft V User Manual* and software package (**Report No. TT 585/13**) can be obtained from Publications at no cost.



with strategies that are informed by the field of behavioural economics in order to manage the demand upon their utilities. These strategies have yielded some encouraging results. The attraction of these methods is that they are generally very cheap to deploy, require limited infrastructure and offer few, if any, opportunities for corruption. This study assessed whether there was scope to use feedback, informed by several principles derived from the behavioural economics literature, delivered in the past with the water bill to reduce household water consumption within the City of Cape Town.

### Report No. KV 324/13

*An adaptable, multi-disciplinary water resource management framework for the Umngeni River basin (S Mitchell; D Hay & C Breen)*

We all need water to survive, but for many a water resource provides other benefits. For some it may be recreation and for others a necessary input for production or manufacturing. Our choices affect others. Therefore, a society is required that is informed, is sensitive to, and appreciative of how the state of the water resources and social and economic well-being are interlinked. This project is a first step toward developing an

approach for preparing a 'state of the river basin report' in which river health and societal well-being are linked with the intention of promoting wider appreciation, and why, where and how each one of us should act so that we progress toward a more equitable and sustainable future.

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