



Fluid Thoughts



WRC CEO, Dhesigen Naidoo

Reflections on World Water Week 2016

At first glance the setting for World Water Week 2016 (WWW2016), the annual gathering in Stockholm, Sweden, of thought leaders, policy makers, advocacy groups and academics to deliberate on the global water scarcity and poor quality challenges, is paradoxical.

Stockholm comprises 14 islands set in pristine Lake Malaren just before it meets the Baltic with some of the best water services in the world. But the half-life of the paradox rapidly diminishes as Mayor, Karin Wanngard, reminds us, that while you can now virtually drink the water directly from the lake outside the City Hall, 19th century Stockholm was an unhealthy place – a city that was not sewered and had no piped water. This resembles many cities around the world in the throes of the 21st century challenges of rapid inadequately planned for urbanisation, with poor infrastructure and inadequate services.

Cities like Stockholm and Singapore demonstrate what is possible with a converged vision, political will, smart planning, prudent investment and innovative implementation with an ethos of continuous improvement. These are two examples of places in the world that have demonstrated that a combination of knowledge based decision-making, sound infrastructure, pools of skilled talent with active pipelines and water wise behaviors by all citizens – individual and corporate can and did achieve water security, perhaps even water prosperity.

But we do not have the century that it took for Stockholm or the 50 years it took for Singapore to reach their states of water prosperity. This is why WWW2016 was an incredibly important bus stop and consolidation point to tie together the strings of the various global dialogues and initiatives with a view to creating a stronger rope to pull in the resources, and other commitments to set us on a sounder course to sustainable development.

The keystone of the global water and sanitation narrative is the 2015 Heads of State adopted United Nations Sustainable Development Goals (SDG) suite, and in particular SDG 6 which seeks to have access to safe water and improved sanitation for all people everywhere in the world by 2030.

While the Millennium Development Goal (MDG) scorecard is a mixed one, there have been sufficient achievements globally to usher the SDGs into the realm of possibility. Such an ambitious agenda has the potential to fundamentally improve the quality of life for all the world's population to a never before achieved level of global development. What is therefore needed is a series of catalytic actions to propel the SDGs from the outer rim of

possibility to the mainstream of probability.

One of the important accelerators that was further crystallised in WWW2016 was the United Nations Secretary General's High Level Panel on Water (HLPW). The group of 10 Heads of State, which includes South Africa have been tasked to develop solutions for an enabling environment to achieve the SDG 6 by 2030.

My own reflections of the week-long gathering that enjoyed the participation of more than 3 000 delegates from around the world rests on three points.

The first is one of great encouragement. The 2016 Stockholm Water Prize Laureate was Prof Joan Rose, the world renowned authority on water quality from the USA and the winners of the Stockholm Junior Water Prize was a team of three schoolgirls from Thailand who presented an amazingly rich biomimicry project.

The picture of the four Laureates together spelled hope for the future. Not only was it an acknowledgement of the power of women in science, it also provided an assurance of leadership into the future with a stalwart from the developed world symbolically handing over the baton of tomorrow's water science leadership to three remarkable girls from the developing world.

The second was an anxiety. The water community, while preaching integration and the removal of silos, continues to be quite insular in its approach. WWW2016 demonstrated an important recognition of the imminent competition for skills and resources between the different SDG teams in pursuit of the 17 individual goals. While water is both a connector and an enabler to achieve and empower the complete SDG suite, the water and sanitation community of practice has to reach out to the other sectors in a more deliberate and meaningful way, while becoming prominent players in facilitating the pursuit of the related SDGs.

Africa was prominent in its participation in WWW2016, and South Africa quite pivotal with the WRC being a strategic partner and Minister of Water and Sanitation, Nomvula Mokonyane, being a prominent voice of the Global South in many of the key debates.

"The water and sanitation community of practice has to reach out to the other sectors in a more deliberate and meaningful way."

The water and sanitation revolution we want to realise will only come about on the back of innovative new disruptive solutions. We need to abandon the notion of incremental improvements if our targets are to be met in a mere 15 years.

The third point of reflection is, in fact, an offer. The world needs a greenfields site to experiment at scale with these new water and sanitation solutions and technologies. Africa can and should be

that global laboratory to finetune and demonstrate the suite of revolutionary water and sanitation services and practices for the 21st century.

In that spirit, we must invite the world to partner us in this great African laboratory to define the new parameters for Global Water Prosperity in the 21st Century.



Stockholm Water Prize winner, Prof Joan Rose, and the three Junior Water Prize winners from Thailand.



Water Diary

Water Law

Various dates

The South African Institution of Civil Engineering is hosting a series of workshops by water law expert, Hubert Thompson. The workshops will be held in Durban on 20-21 September, in Cape Town on 27-28 September and in Midrand on 20-21 October. *Contact Tel: (011) 805-5947; Email: dawn@saice.org.za.*

Hydrological sciences

September 14-16

The 18th biennial symposium of SANCIAHS will be held at the University of KwaZulu-Natal, in Durban. The theme for this year's symposium is 'Characterising hydrological uncertainty in a changing world: Transferring theory to practice.' *Contact: Scott Sinclair, Tel: (031) 260-1151 or Visit: <http://cwrr.ukzn.ac.za/sanciahs/sanciahs-2016>*

Young science professionals

October 6-7

The Young Scientists' Conference will be held at Birchwood Hotel with the theme 'Human Rights'. Enquiries: Edith Shikumo; *Tel: (012) 349-6614; Email: edith@assaf.org.za*

World water

October 9-13, 2016

The IWA World Water Congress will take place in Brisbane, Australia with the theme 'Shaping our water future'. *Visit: <http://www.iwa-network.org/event/world-water-congress-exhibition-2016/>*

Municipal engineering

October 26-28

The annual conference of the Institute of Municipal Engineering of Southern Africa (IMESA) will be held at the East London Convention Centre. The theme is

'Siyaphambili – Engineering for the future.'

Enquiries: Debbie Anderson,

Tel: (031) 266-3263;

Email: conference@imesa.org.za;

www.imesa.org.za

Mine-water management

November 9-10

The Water Institute of Southern Africa's Mine Water Division is holding its annual symposium with the theme 'Management options for mine-water'.

Email: chair@wisa-mwd.org or

Visit: www.wisa-mwd.org

Water history

June 15-17, 2017

The conference of the International Water History Association will be held in Grand Rapids, Michigan, USA. The conference is co-hosted by the Western Michigan University. *Visit: www.iwha.net*



WE HAVE MOVED

Water Research Commission New Offices

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WRC moves to new location

After nearly 28 years at the same premises the Water Research Commission (WRC) has found a new home. On 1 September the WRC took up its new residence at Lynnwood Bridge office park at 4 Daventry Road, Lynnwood Manor.

The WRC has moved into floors two and three of the A-grade Bloukrans office building, part of the Lynnwood Bridge mixed-use commercial precinct. It is located next to the Kaaimans building, in close proximity to the City Lodge Hotel Lynnwood.

Combined, the Kaaimans and Bloukrans buildings offer a combined 12 000 m³, with a shared podium, parking basement, visitor parking and security site. Each building comprises six storeys, served by five basement levels and a central atrium. The WRC shares its building with other major tenants such as radio station Groot FM, Stratus Computers, and Atterbury Property. Consulting engineering firm, Aurecon, is located in the Kaaimans building.

The five-star Green Star building offers the WRC closer proximity to other science entities, such as the CSIR, Department of Science and Technology and the University of Pretoria. The precinct's strong

appeal also benefits from its access just off the N1 highway at Lynnwood Road. The offices are well served by public transport, including the Gautrain bus service.

The building has been thoughtfully constructed with lots of smart, green tactics incorporated. They include rainwater harvesting which collect, store, treat and use large quantities of rain from the building's roof and surrounding paving, to be used for tasks such as toilet flushing. The building's façade controls heat from the sun entering the building through full-height glazing, yet let in plenty of light. Instead of water-cooled chiller, it uses air-cooled ones. The buildings are also designed for lots of fresh air and efficient lighting, occupancy sensors, and have a fine-tuned building management system.

There is plenty of place for nature at these building that feature roof gardens, timber decking, cobbles and landscaped shrubs chosen to keep watering to a minimum. And, the tower also offer benefits for people striving to keep their own environmental footprint light, with 35 prime designated parking bays for hybrid vehicles and motorcycles and secure storage for 40 bicycles, with added benefit of changing facilities and lockers.



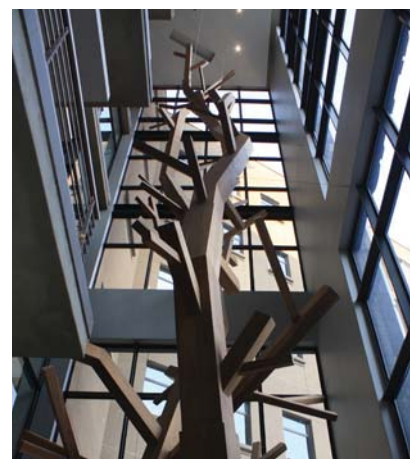
The freshly stocked resource centre.



WRC Receptionist, Shirley Maheso, greets visitors at the new entrance.



The new offices offer various spaces for interaction.



The building features several nature-inspired design features.

WRC awarded international prize from Monaco

On 30 June 2016, the Water Research Commission (WRC) was awarded the 2016 Water Award by the Foundation of the HSH Prince Albert II of Monaco.

The Commission received the award for its contribution towards a better understanding of the environment as well as its work in South Africa in the field of water resource management, water supply and sanitation.

The Foundation was established by Prince Albert in 2006 and is dedicated to environmental protection, sustainable development, with a particular focus on climate change, biodiversity and water.

WRC CEO, Dhesigen Naidoo, who received the award on behalf of the WRC said: "I knew about the Foundation from afar but

this award was a complete surprise. The Foundation is a very interesting space, and one of the powerful things about the Monaco Foundation, it is one of the few in this domain around the world that isn't recognised as having a corporatised agenda, so it's a genuinely neutral voice pushing the climate change and the green agenda in the world that is really well respected. This recognition helps our organisation to be able to get our own messages out around the importance of research and innovation to make a fundamental change to the lives of people and the planet."

Addressing his figures of how 663 million people do not have access to safe water and one-ninth of the world goes hungry every day, Naidoo added, "The way societies are structured, there's such a

distance between those who don't have and those who do have that there's a convenience, you can turn the other way.

"Poor folk have the smallest voice everywhere and don't have to be listened to. Interestingly, the green agenda turns that on its head. The green agenda says that your climate change future depends on how you organise these interventions around the poorest folk of the world. Because if you're not providing an energy solution to poor folk, than they have to destroy the forests to survive, they have to increase carbon emissions by burning off wood for power. The interventions of the poor actually organise itself around a much broader equation for all of this and maybe this will turn the tide.

Global science community calls for harvesting of local knowledge to aid development



Integrating local knowledge into research could expedite solutions to global challenges such as disease, poverty and climate change.

This is according to experts attending the EuroScience Open Forum 2016 (ESOF 2016), held in Manchester, in the United Kingdom, in July.

The biennial event served up an array of

topics which attracted robust discussion. Department of Science and Technology (DST) Deputy Director-General, Imraan Patel (who is also a member of the Water Research Commission Board) participated in a panel discussion contemplating the question: Can science, technology and innovation help eradicate poverty and secure development? Other panel members included Sir Peter Gluckman (Chief Science Advisor to the Prime

Minister of New Zealand), and Robert-Jan Smits, Director-General for Research and Innovation at the European Commission.

Gluckman pointed out that the decisive defeat of global challenges required the concerted integration of local and scientific knowledge, adding that it was time for the world to recognise that there were different kinds of science and scientific expertise, and that all of them should be used together towards development and problem-solving.

South Africa is increasingly offering support mechanisms, investing in indigenous knowledge systems (such as programmes covering African traditional medicines, cosmeceuticals and nutraceuticals). Patel was adamant that science, technology and innovation could and should play a central role in development globally. However, he highlighted the importance of international partnerships, saying that these were crucial if the sustainable development goals were to be achieved.

Source: DST

67 boreholes to bring relief

Operation Hydrate and Awqaf South Africa, supported by the Department of Water and Sanitation and the Mandela Foundation have pledged to drill at least 67 boreholes in drought-stricken areas over the coming months.

The initiative was announced as part of Mandela Month celebrations in July. The organisation and its partners were aiming to drill as many as 95 boreholes.

An amount of R7-million has been set

aside for the drilling of 67 boreholes. A further 28 boreholes are expected to be drilled later this year at a cost of R3-million.

The four organisations said they are all committed to continue assisting communities in need of water. "The drought is far from over, and these boreholes will go a long way towards providing much needed water to the communities," the organisations said in a joint statement.

Water and Sanitation Minister, Nomvula Mokonyane, said the department will continue to do its part, as well as support humanitarian initiatives that espouse and reflect the values that Madiba stood for. "This is a long-term and sustainable initiative to show what can be achieved when the private and public sectors work together to make a difference in the lives of others."

Source: SAnews.gov.za

Freshwater science doyenne wins WWF Living Planet Award

International river flow expert, Dr Jackie King, was awarded WWF South Africa's prestigious Living Planet Award at its annual conference earlier this year. The award is given to exceptional individuals in South Africa who inspire people to live in harmony with nature. As a leading aquatic ecologist in South Africa, Dr King was praised for "inspiring several generations of scientists, planners

and legislators in South Africa and around the world."

Over the past four decades, she has been part of and led scientific teams working on the river flow management of many of the world's major river systems, among them the Nile, Mekong, Indus and Okavango.

Dr King was recognised for her leading role in ensuring that aquatic ecological research led to the sustainable development and management of river systems and, in particular, her innovative and practical approaches that gave effect to improved water management in the real world.

Water and science consultancy wins top science award

Twenty-five years of pioneering scientific work, coupled with successfully growing a start-up business into a highly respected consultancy, have been acknowledged with a prestigious award for Cape Town earth sciences company Umvoto Africa.

At the 18th annual National Science and Technology Forum awards (NSTF-South32), held on 30 June in Gauteng, Umvoto won the category 'Research leading to innovation through an SMME'. NSTF is a multi-stakeholder non-profit forum in South Africa that promotes science and technology through collaboration.

These national awards recognise, celebrate and reward excellence in science, engineering, technology and innovation in South Africa. The awards were presented by Minister of Science and Technology, Naledi Pandor, who is also the event patron.

Umvoto researches and develops

sustainable geoscientific and technological solutions to address resource, environmental, social and economic concerns. It consults in integrated water resource management, contamination and remediation studies, education and training, process facilitation and ecological risk management studies. In the research and development arena, Umvoto's processes rely on inventive application of aerial and satellite remote-

sensing, geographic information systems and space-geodesy for hydrogeological exploration and mapping.

In the photograph Umvoto founder and MD, Rowena Hay (centre), is receiving the award from Minister of Science and Technology, Naledi Pandor (left) and Agnes Peter, Group Executive, Agency and National Advertising, Independent Newspapers.





Global

New drought management handbook now available



The Integrated Drought Management Programme (IDMP), which is co-sponsored by the World Meteorological Organisation (WMO), the Global Water Partnership (GWP) and some 30 other partners, has officially released the *Handbook of drought indicators and indices*.

"The handbook addresses the needs of practitioners and policymakers," notes Robert Stefanski, Chief: Agricultural Meteorology Division at WMO. "It is based on available literature and draws findings from relevant works wherever possible. The purpose of the handbook is to present some of the most commonly used drought indicators and indices that are being applied across drought-prone regions."

The goal is to advance monitoring, early-warning and information-delivery systems in support of risk-based drought management policies and preparedness plans. These concepts and indicators and indices are outlined in the handbook, which is considered a living document that will evolve and integrate new indicators and indices as they come to light and are applied in the future.

The handbook is aimed at those who want to generate indicators and indices themselves, as well as for those who simply want to obtain and use products that are generated elsewhere. It is

intended for use by general drought practitioners such as meteorological/hydrological services and ministries, resource managers and other decision-makers.

"The handbook aims to serve as a starting point, showing which indicators and indices are available and being put into practice around the world", said Frederik Pischke, GWP's Senior Programme Officer for International Climate and Hydrology. "In addition, the handbook has been designed with drought risk management processes in mind. However, this publication does not aim to recommend a 'best' set of indicators and indices. The choice of indicators and indices is based on the specific characteristics of droughts most closely associated with the impacts of concern to the stakeholders."

To download the handbook, Visit: http://www.droughtmanagement.info/literature/GWP_Handbook_of_Drought_Indicators_and_Indices_2016.pdf

Dirty to drinkable – novel hybrid nanomaterials transforms water

Graphene oxide has been hailed as a veritable wonder material; when incorporated into nanocellulose foam, the lab-created substance is light, strong and flexible, conducting heat and electricity quickly and efficiently.

Now, a team of engineers at Washington University in St. Louis, USA, has found a way to use graphene oxide sheets to transform dirty water into drinking water, and it could be a global game-changer.

"We hope that for countries where there

is ample sunlight, such as India, you'll be able to take some dirty water, evaporate it using our material, and collect fresh water," said Srikanth Singamaneni, associate professor of mechanical engineering and materials science at the School of Engineering & Applied Science.

The new approach combines bacteria-produced cellulose and graphene oxide to form a bi-layered biofoam. A paper detailing the research is available online in *Advanced Materials*.

"The process is extremely simple," Singamaneni said. "The beauty is that the nanoscale cellulose fiber network produced by bacteria has the ability to move the water from the bulk to the evaporative surface while minimising the heat coming down, and the entire thing is produced in one shot.

The new biofoam is extremely light and inexpensive to make, making it a viable tool for water purification and desalination. "Cellulose can be produced on a massive scale," Singamaneni said,

“and graphene oxide is extremely cheap -- people can produce tons, truly tons, of it. Both materials going into this are highly scalable. So one can imagine making huge sheets of the biofoam.”

“The properties of this foam material that we synthesised has characteristics that enhances solar energy harvesting.

Thus, it is more effective in cleaning up water,” noted Pratim Biswas, the Lucy and Stanley Lopata Professor and chair of the Department of Energy, Environmental and Chemical Engineering.

“The synthesis process also allows addition of other nanostructured materials to the foam that will increase

the rate of destruction of the bacteria and other contaminants, and make it safe to drink. We will also explore other applications for these novel structures.”

To access the original article, Visit: [http://onlinelibrary.wiley.com/journal/10.1002/\(ISSN\)1521-4095](http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1521-4095)

US launches comprehensive system for forecasting water resources



The National Oceanic and Atmospheric Administration (NOAA) has reported launching a comprehensive system for forecasting water resources.

WRF-Hydro, a powerful NCAR-based computer model, is the first US wide operational system to provide continuous predictions of water levels and potential flooding in rivers and streams from coast to coast. NOAA's new Office of Water Prediction selected it last year as the core of the agency's new National Water Model.

“WRF-Hydro gives us a continuous picture of all of the waterways in the contiguous United States,” said NCAR scientist David Gochis, who helped lead its development. “By generating detailed forecast guidance that is hours to weeks ahead, it will help

officials make more informed decisions about reservoir levels and river navigation, as well as alerting them to dangerous events like flash floods.”

WRF-Hydro (WRF stands for Weather Research and Forecasting) is part of a major Office of Water Prediction initiative to bolster US capabilities in predicting and managing water resources.

By teaming with NCAR and the research community, NOAA's National Water Centre is developing a new national water intelligence capability, enabling better impacts-based forecasts for management and decision-making.

Unlike past streamflow models, which provided forecasts every few hours and only for specific points along major river

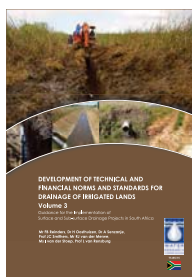
systems, WRF-Hydro provides continuous forecasts of millions of points along rivers, streams, and their tributaries across the contiguous US.

To accomplish this, it simulates the entire hydrologic system — including snowpack, soil moisture, local ponded water, and evapotranspiration — and rapidly generates output on some of the nation's most powerful supercomputers.

WRF-Hydro was developed in collaboration with NOAA and university and agency scientists through the Consortium of Universities for the Advancement of Hydrologic Science, the US Geological Survey, Israel Hydrologic Service, and Baron Advanced Meteorological Services.



New WRC reports



Report No. 2026/1/15 (Volume 1), 2026/2/16 (Volume 2) and TT 655/15 (Volume 3)

Development of technical and financial norms and standards for drainage of irrigated lands

There are numerous benefits, both economic and environmental, of well designed and constructed surface and sub-surface drainage systems in irrigated agricultural lands. The need arose in South Africa to research the technical and financial aspects of drainage systems to ensure that current practices were technically sound as well as being financially feasible. Thus this project was initiated. As a result of thorough research three comprehensive volumes were produced. The manual provides a comprehensive text on the subject of both the technical and financial aspects of surface and sub-surface drainage and will benefit engineering technicians in the country's provincial agricultural departments; financial and technical advisors at co-operatives and agri-businesses who offer financial and technical advice to farmers; banks who offer financial assistance to farmers; technical personnel at engineering consultancies; and students in the field of agricultural or bio-resources engineering. In addition, examples are presented in the text which illustrate application of the underlying scientific and economic principles which are unique to the field of drainage.

Report No. 2269/1/16 (Technical report) and 2269/2/16 (Implementation manual)

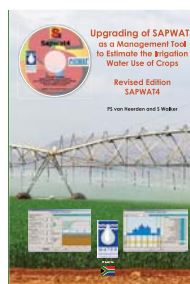
The design of a National Wetland Monitoring Programme

Wetlands are complex and dynamic ecosystems that provide indispensable services to the people and the environment of South Africa. In order to protect and manage the remaining wetlands of the country, assessment, monitoring and reporting on the state of wetlands is crucial. The South African Department of Water and Sanitation conceptualised a National Aquatic Ecosystem Health Monitoring Programme (NAEHMP) in the early 1990s. Although a number of monitoring programmes have been implemented under the NAEMP, a wetlands monitoring programme has yet to be established. With this need in mind the WRC issued a directed call for a project entitled the design of a National Wetland Monitoring Programme (NWMP) following a phased approach. The phases were: Firstly, conducting a situation analysis regarding the complexities of monitoring wetland health or integrity and developing a framework that can serve as the basis for phases 2 and 3; Secondly, designing a monitoring programme and developing an implementation plan; and thirdly, pilot testing.

Report No. 2138/1/16

An investigation into the presence of free living amoebae and amoeba resistant bacteria in drinking water distribution systems of healthcare institutions in Johannesburg, South Africa

Free living amoebae (FLA) are ubiquitous in natural and man-made water systems. Certain FLA are known human pathogens and carriers of amoeba resistant bacteria (ARB) known to cause serious, potentially fatal infectious diseases. Members of the genera *Legionella*, *Mycobacterium*, *Vibrio*, *Staphylococcus*, *Pseudomonas* and others are known ARB often implicated in nosocomial infections. The importance of drinking water quality supplied to and distributed through public healthcare facilities, with special reference to FLA and certain ARB, had not been studied prior to this project. The study attempted to provide a general overview of the presence of these organisms within water distribution systems of three public healthcare institutions in Johannesburg and also briefly highlight the potential human health risk implications.



Report No. TT 662/16

Tool to estimate the irrigation water use of crops: Revised edition – SAPWAT 4

SAPWAT 4 is an improved version of SAPWAT 3, the program that is extensively applied in South Africa and internationally and was developed to establish a decision-making procedure for the estimation of crop irrigation requirements by irrigation engineers, planners, agriculturalists, administrators, teachers and students. The development of the current SAPWAT 4 program, as in the case of SAPWAT3, is based on the FAO published Irrigation and Drainage Report No. 56, *Crop evapotranspiration: Guidelines for computing crop water requirements*. This intuitive and comprehensive document is highly acclaimed and has become accepted internationally.

Report No. KV 354/15

A revised Adopt-a-River programme: Stakeholder input on the institutional and financial frameworks with a focus on an implementation strategy

This document builds on the Adopt-a-River (AaR) review and redesign document prepared by the project team and summarises the outcomes of a two-day stakeholder workshop held at the WRC offices in Pretoria in November 2015 to discuss the revision of the AaR programme. The primary aim of the workshop was to understand and re-vision the AaR Programme, to redefine the key objectives and strategy (including re-vision of the institutional/governance framework as well as developing a funding framework and potential business case) towards developing a revised and sustainable AaR Programme.

Report No. 2382/1/16**Strategic assessment and mapping of opportunities for water desalination and water use optimisation of concentrated solar power generation in South Africa**

Renewable energy projects, including concentrated solar power (CSP), are being increasingly developed in South Africa while the country attempts to minimise its reliance on fossil fuel-based

power production. CSP plants use a thermal power generation process which requires a steam cycle; the steam is required to be condensed, and this requires cooling. Sites need to be chosen that have a suitable combination of cost of energy and cost of water to maximise the energy cost efficiency of CSP plants while still minimising water consumption.

**New range of tools to reduce mining impact on wetlands**

By virtue of their positions in the landscape and relationship to drainage networks, wetlands are frequently impacted by coal-mining activities, especially opencast methods. The impacts are on-going, since coal is a strategic resource and will continue to be mined to support the country's development. However, regulatory authorities and the public now have an improved understanding of the range of economic, social, ecological and hydrological costs of wetland loss and degradation. The rules of the game have changed, with regulators increasingly insisting that mines avoid, minimise and mitigate their impacts on wetlands, and internalise the true costs of wetland loss into their balance sheets. Many mining proposals entailing large-scale wetland loss have encountered delays in licence approvals, unrealistic rehabilitation commitments and unwelcome public and media attention. As a result, the coal mining sector has realised that it needs to proactively and systematically address the business risk posed by its impact on wetlands. One of the key project aims was to improve the knowledge and use of appropriate spatial information to guide mining companies and regulators in their planning and decision-making. This is a set of publications to guide both mining companies and regulators with regard to high risk wetlands and associated landscapes. It identifies key wetland landscapes in the grassland biome of Mpumalanga that are particularly important or irreplaceable in terms of biodiversity, water resource management and ecosystem services. There is a users' guide to the Atlas and a DVD that contains this High Risk Wetlands Atlas itself, the required software to use it, and the underlying spatial data for those who use their own GIS systems.

The full set of publications comprises: *Wetland rehabilitation in mining landscapes: An introductory guide* (Report No. TT 658/16); *High risk wetlands atlas: Reference guide to the Mpumalanga Mining Decision Support Tool* (Report No. TT 659/16); *Mpumalanga Mining Decision Support Tool* (available as a DVD inside TT 659/16); *Wetland offsets: A best practice guide for South Africa* (Report No. TT 660/16); *A review of depressional wetlands (pans) in South Africa* (Report No. 2230/1/16) and *Assessment of the ecological integrity of the Zaalklapspruit wetland in Mpumalanga (South Africa) before and after rehabilitation: The Grootspuit case study* (Report No. 2230/2/16).

**The Water Research Commission has relocated!**

From 1 September 2016 the WRC will be based at its new offices at Bloukrans Building, Lynnwood Bridge Office Park, 4 Daventry Street, Lynnwood Manor. You can still contact our Publications team at Tel: (012) 330-0340; Email: orders@wrc.org.za or Visit: www.wrc.org.za. Please note that since the bulk of the WRC's reports are now stored off site pre-ordering is essential.