

# FLUID THOUGHTS



WRC CEO, Dhesigen Naidoo

## Day Zero on the back of drought in southern Africa – lessons for the future

Cape Town has become the latest poster child of drought in the southern African region. The dramatic declaration of Day Zero — the date on which the taps are turned off — has caught the attention of the world. Indeed, in light of this looming deadline, now set for July 7 of this year, the city is facing the implementation of unprecedented water restrictions, such as a daily limit of 50 ℓ of water per person; severe, mandatory decreases in water usage by agricultural users and commercial properties; and complete bans of unnecessary water usage, such as pools and washing cars.

But the Cape Town experience is not an isolated one: This development follows stark drought episodes in the broader southern African region on the back of the 2014 El Niño, which has been recognised as the most severe in 20 years. Even before El Niño, East Africa was ravaged by the severe 2011–2012 drought, which jeopardised food security there: Most acutely felt in Somalia, Djibouti, Ethiopia, Kenya, and Uganda, where collectively 10 million people were threatened with famine.

This food shortage and threat to agricultural security has continued to the present as a result of the erratic weather patterns. During the El Niño, severe droughts in South Africa's summer rainfall areas plunged five of its nine provinces into the realm of stagnating economic growth. A traditional grain exporter, South Africa has been forced to import staples. After-effects of drought are not just limited to food insecurity. For example, in 2017, Zimbabwe has been ravaged by post-drought flooding, resulting in both loss of lives and livelihoods.

### Three factors that brought Cape Town to Day Zero

One of the primary difficulties in addressing water scarcity in Africa, and indeed the decreasing water security worldwide, is the continued conservatism of the current global establishment. We insist on trying to solve twenty-first century problems with twentieth century technology and solutions, using nineteenth century operating rules, standards and guidelines.

The water crisis in Cape Town illustrates this trend. Planners at city, provincial, and national levels, relied on the 2005 planning exercise that, at the time, indicated the city was water secure until 2022. This was when the next major water augmentation or major new water supply infrastructure would be required. These plans did not accommodate other scenarios, in spite of continuing major drought events in South Africa and its neighbours, which clearly indicated a shift in weather patterns.

A second factor is the city's over-reliance on traditional surface water sources, with limited investment in a sustainable groundwater strategy or other augmentation options such as desalination. The water demand management strategy was far short of what was required in the early 2000s to maintain water security up to 2022.

Third, there is limited enthusiasm from South African institutions and their international partners to embrace the array of new solutions and technologies. Cape Town and other South African cities are renowned, quite justifiably, as having some of the better water utilities in the world. This is a key factor in how South Africa has been able to ensure water security in one of the driest countries on Earth. It is also fair to say that we came out less than favourably when stress tested by this five-year intermittent, but extreme, drought episode.

### A “new normal”—and its consequences

Core to every analysis of these drought episodes, and extreme weather events in general, is the phenomenon of a change in regional climate in southern Africa on the back of global climate change. There is a growing political acceptance of the concept of a “new normal”—a term that has found resonance in platforms like the African Union (AU) African Ministers Council on Water.

This “new normal” has precipitated changes that have had a profound impact **economically**, with direct and dramatic losses in earnings at many levels experienced by individuals, as well as countries' GDPs and growth rates.

The second impact of the new normal is **social**. Climate change events are directly reducing livelihood opportunities, with

Ashraf Hendricks/Grundup



In Cape Town the search for alternative water supplies continues, such as the drilling of additional boreholes.

citizens eking out a living from a rapidly degrading environment in the short term. In addition, indirect repercussions, such as challenges of social upheaval in the medium to long term are also becoming evident. Indeed, two features of this emerging trend are social delivery protests in countries like South Africa and Ethiopia as well as the new phenomenon of what can best be described as 'climate change migration'.

This is an important outcome of the third impact which is **environmental**. Degradation of the environment and biodiversity loss is a graphic feature of a new drier and hotter regional climate. The new category of refugees is seeking asylum from economic, social, and environmentally depressed traditional locations on the back of droughts and floods precipitated by the changes in the Sub-Saharan climate in recent years.

This triumvirate of drivers will inevitably have a profound impact on the political stability and the security status of the region, inviting the somewhat inappropriate metaphor of a dark cloud hanging over this part of the world.

### **So, is there a silver lining?**

At the same time as these dangers, we are also sitting on an unprecedented opportunity: Some of the highest levels of innovation in water in human history are being developed. We have an ability to revolutionise both water and sanitation in a manner that facilitates the targets of universal access to safe water and dignified sanitation, as expressed in the United Nations' Sustainable Development Goals. In addition, if we fully utilise the boons of recent scientific discovery and innovation, we can do this in a manner that vastly increases local and global water security. Thus, water can be available for economic growth, with increased opportunities for livelihood creation and entrepreneurship, food security, and concomitant health

security. In the African context this will remove one of the core constraints in the realisation of the AU's Vision 2063 ambition for a more industrialised and prosperous Africa.

What makes this opportunity even more exciting is that the new science points to water-energy nexus solutions that, if engineered imaginatively, will provide combined water and energy solutions in a sustainable development paradigm. That will not only relieve the burden on existing water and energy grids, but because of their ingenuity, organise to engage and achieve this goals with lower carbon dioxide emissions—thus paving the way to a lower carbon future. These new solutions include new sanitation mechanisms epitomised by the Gates Foundation-led Reinvent the Toilet Challenge, and exciting new solutions to turn polluted waters like acid-mine water into potable water. New technologies can enable water-sensitive cities to not only have the ability to see to a significant percentage of the city's nutritional needs through urban agriculture, but to also develop inner-city artificial and enhanced natural wetland systems that radically decrease the city's ecological footprint and impact on surrounding rural areas.

The brightest part of this silver lining is that Africa, precisely because of its lower levels of development, is not as locked into the existing infrastructure as her neighbours in Europe and the Americas. Therefore, the continent has the best opportunity to leap frog with these new solutions, transforming into a water-secure continent, and pioneering the possibility of a water-secure world.

This article was published first by Brookings, <https://www.brookings.edu/>

## WATER DIARY

### **Water business**

**April 15-17**

Business meetings are at the heart of the Global Water Summit, happening in Paris, France. Every year, over 600 top executives come together to determine water's key role in sustainable economic growth and to meet with potential partners, suppliers and clients.

**Visit: [www.watermeetsmoney.com](http://www.watermeetsmoney.com)**

### **Water loss**

**May 7-9**

The IWA Water Loss Specialist Group, together with the City of Cape Town, will host the biennial Water Loss Conference and Exhibit at the Century City Conference Centre in Cape Town. The conference will be one of the world's largest water loss conferences and is expected to attract over 500 participants

from more than 50 countries.

**Visit: <https://www.eiseverywhere.com/ehome/251759&internal=1>**

### **Aquatic science**

**June 24-28**

The Southern African Society of Aquatic Scientists will be holding its 2018 congress in Cape St Francis Bay resort, in the Eastern Cape. The theme for the congress is 'Aquatic ecology in the Anthropocene'. Enquiries: Petrie Vogel (conference organiser); Tel: (012) 346-0687; Email: [admin@savetcon.co.za](mailto:admin@savetcon.co.za);

**Visit: [www.savetcon.co.za](http://www.savetcon.co.za)**

### **Water resource management**

**June 24-27 2018**

The Water Institute of Southern Africa (WISA) is hosting its biennial conference at the Cape Town International Convention

Centre.

**Visit: [www.wisa2018.org.za](http://www.wisa2018.org.za)**

### **World water week**

**August 26-31**

World Water Week is the annual focal point for the globe's water issues. It is organised by the Stockholm International Water Institute. The theme is 'Water, ecosystems and human development'.

**Visit: <http://www.worldwaterweek.org/>**

### **Municipal engineering**

**October 31-November 2**

The annual conference of the Institute of Municipal Engineering of Southern Africa will be held in Port Elizabeth with the theme, 'Innovative Infrastructure Solutions'.

**Visit: [www.imesa.org.za](http://www.imesa.org.za)**

# NEWS

## South Africa's largest water conference coming to Cape Town

The Water Institute of Southern Africa (WISA) will host its Biennial Conference and Exhibition in Cape Town from 24-27 June 2018.

This is traditionally the biggest event on the South African water calendar.

The central theme of the conference – Breaking barriers, connecting ideas – seeks to address past, existing and future water resource challenges by promoting collaboration, cooperation and integration within the water sector, explains Jason Mingo, WISA 2018 Technical Committee chair and project manager in the Western Cape Department of Environmental Affairs and Development Planning. Amid growing concerns around the impact of climate change, and the threat of more extreme weather events, the southern

African region faces increased uncertainty and vulnerability regarding water supply, he notes.

This makes the 2018 event all the more timeous, not least because the host city is facing its own drought and water security troubles. “The conference, while hosted every two years, is especially relevant given the attention and focus placed on water in terms of its scarcity across the southern African region,” says Mingo. “The development of new technologies, processes and advancements in research during this time means that there has never been a more exciting time to be involved in the water sector.”

The conference is targeting both water professionals and those persons interested and involved in some way

with the sector. The conference features a diversity of forums, presentations and workshops to engage on new ideas, to enable the connection of such ideas to become a reality and drive positive change within the field.

“The event aspires to be the turning point in how the water profession within the region considers its role within the broader society and to address the need of better integrating and collaborating across sectors and disciplines,” notes Mingo. “By promoting and supporting concepts linked with the theme, it is hoped that WISA 2018 will be the beginning of a new approach to the management of water.”

Visit: [www.wisa.org.za](http://www.wisa.org.za)

## Nation called on to conserve water amid drought



With a national state of disaster having been declared in three provinces, newly elected President Cyril Ramaphosa has appealed to the nation to continue to intensify efforts to use water wisely.

Ramaphosa made the appeal during his inaugural State of the Nation Address (SONA) as President of the Republic in Parliament in February.

“The country remains gripped by one of the most devastating droughts in a century, which has severely impacted our economy, social services and agricultural production. The drought situation in the Western Cape, Eastern Cape and Northern Cape has been elevated to a national state of disaster. This gives national government the authority to manage and coordinate our response nationally with support from all provinces.

“This will ensure that we also heighten integrated measures to support the

provinces that are hardest hit. We are looking at activating the necessary extraordinary measures permitted under the legislation,” said Ramaphosa.

With SONA being held in Cape Town due to the location of Parliament, the new President used the platform to commend the people of Cape Town and the rest of the Western Cape for diligently observing water saving measures. Level 6b water restrictions have been in effect from 1 February, which require all residents to drop their daily use to 50 litres per person per day or less.

[SAnews.gov.za](http://SAnews.gov.za)

## Groundwater brings relief to thirsty Kimberley school



Ongoing drought in the western parts of the Karoo have hit every water user hard, but when Middelpoos Primary School was landed with a R18 000 water bill last year, a more sustainable plan had to be made.

Located in the small town of Middelpoos, between Calvinia and Sutherland in the Northern Cape, the school and its hostel were subject to the water restrictions in the Hantam Local Municipality – but

clearly could not afford the water it needed. Through a provincial Department of Education programme to alleviate the water crisis in schools, RE Construction was awarded the tender to provide a solution.

The company approached SRK Consulting to site a water-supply borehole within the school property to alleviate the water problem. "There is an existing borehole at the hostel, but due to numerous sewage pits in the vicinity, the water quality is unsuitable for human consumption," said Bernie de Jongh of RE Construction. "However, the school is upstream of the town and the likelihood of finding potable groundwater in this area is considered to be fairly good."

According to SRK principal hydrogeologist, Chris Esterhuysen, no prominent geological features linked to the occurrence of groundwater on the school property could be identified from satellite imagery. "However, detailed surface geological mapping of the area revealed a narrow joint system that

intersects the property – and we selected a drill site there."

Borehole drilling was completed in the school yard on a single day. "We were pleased when fresh groundwater was intersected at 34 m below ground level with a measured drill stem blowout yield of 2.8 l/s.

The borehole was completed to a final depth of 50 m below ground level and a water sample submitted to UIS Analytical Services in Kimberley for quality analysis. A second borehole was completed to a final depth of 66 m below ground level, and also achieved a positive result.

The results from this investigation suggest that groundwater can be a quick, viable solution to improve water supply, especially in drought-stricken areas. Finding suitable drill sites was crucial, so the appointment of a hydrogeologist with the necessary expertise to conduct the investigations and select the borehole sites was invaluable," noted De Jongh.

## Government intention to introduce a single CMA gathers momentum

The Department of Water and Sanitation (DWS) is powering ahead with efforts to collapse the current nine catchment management areas (CMAs) and establish a single catchment management agency (CMA).

The department has set itself a deadline of 2018/19 financial year to establish the single CMA. According to the DWS, the envisaged CMA will help manage water resources at a local level, facilitate inclusive water resources management and minimise costs. A number of internal and external consultations have been taking place in different regions in this regard.

Speaking at the consultative meeting at the Gauteng Provincial office, DWS Project

Coordinator, Thivhloni Masindi, said the decision to establish a single CMA was motivated by concerns of costs associated with running multiple institutions. The department felt a need to rationalise and align existing institutions as a mechanism to unburden the state of burgeoning service costs.

According to Masindi, the creation of a single CMA would not impact the water resource management at catchment level. "The only change will be the governance structure of the CMA. Instead of having nine governing boards there will be only one governing board."

Added Masindi: "The single CMA will allow the nine water management area offices on the decision-making process at the

local level and community participation will remain as central as stipulated in the National Water Act."

The nine water management areas will still be responsible for the development of their catchment management strategy. Visit, <http://bit.ly/2n8YcGx>, to read the business case for a single CMA.



## Planning cities to better manage rising temperatures



The CSIR has developed a modelling capability that can help municipalities adapt to climate change and associated rises in temperature.

This is done by combining information from temperature projections and detailed information of urban surfaces, such as roads and buildings, using the city spatial development plan in that region.

In addition to the challenge of rising temperatures, climate change risks facing cities in South Africa include more frequent heat events, heavy rain and droughts. This will put pressure on municipalities to provide infrastructure and services designed, developed and implemented to anticipate and respond proactively to these factors.

The modelling capability developed, though initially focused on the urban heat island, enables the interpretation and translation of key technical information into usable narratives that can be used by decision-makers to help them toward optimal decision-making in responding to climate change and developmental goals.

Researchers have found that South Africa's urban areas are at risk of the urban heat island effect, where temperatures in cities are warmer than the surrounding rural areas. This is caused primarily by the heat absorbed by building and built-up surfaces. More than half of South Africa's population lives in urban areas.

CSIR researchers found that warmer cities mean increased energy demand for cooling needs. In turn, this increases

greenhouse gas emissions. Higher temperatures also put a strain on infrastructure such as roads, pavements and railways and ultimately have negative effects on human health and comfort.

The CSIR-developed model can be used to adapt any city by recommending key interventions that can mitigate the effects of the urban heat island effect, such as the use of reflective materials for roofs and pavements; and expanding green spaces in cities through green roofs and urban parks.

The science council is working with the eThekweni Municipality to apply the model for Durban.

## Water engineering fraternity loses a giant



The South African water engineering fraternity has lost another giant. Dam safety expert Dr Chris Oosthuizen, formerly of the Department of Water and Sanitation (DWS), passed away on 11 November at the age of 70 after a long battle with cancer.

Chris spent his career working in dam engineering, starting at the then Department of Water Affairs in 1974 at the construction of Vanderkloof Dam.

Chris was the Approved Professional Person for dam safety evaluations and/or remedial works of more than 300 DWS dams since the inception of South Africa's dam safety legislation in 1986, and he spent much of his career looking after the safety of the department's dams. He also served as the dam safety expert for two dams in Switzerland, and was involved in mentoring the dam safety and surveillance teams of dams in the Lesotho Highlands Water Project (Phase 1) as well as Cahora Bassa Dam.

Chris served on the advisory committees of the University of Cape Town (UCT) and UNISA and was an ex-Professor Extraordinaire at the Tshwane University of Technology. He also lectured post-graduate students at UCT and Stellenbosch University. Furthermore, he chaired the International Commission on Large Dams (ICOLD) Technical Committee on Dam Surveillance from 2012.

Chris was a very active member of the South African National Committee on Large Dams (SANCOLD), presenting papers and lectures, serving on the management committee for several years, as well as acting in the role of SANCOLD Secretary for a number of years.

Chris was awarded the SANCOLD Award in 2013 in honour of his exceptional contributions to SANCOLD and in the field of dam engineering in South Africa. In the accompanying photograph he can be seen receiving the award from SANCOLD Chair, Danie Badenhorst (left).

Chris was universally respected by all his peers and his contribution to dam engineering in South Africa was immeasurable. The South African water engineering fraternity has lost a great man.

## Water ambassadors pledge to #SaveWater

The Department of Water and Sanitation with various stakeholders have launched the #SaveWater Ambassador Programme to foster responsibility towards saving water resources in the City of Cape Town and the rest of the country.

Launched at the Cullinan Hotel in Cape Town in February, the multi-stakeholder programme is an initiative that will serve as a platform to heighten communications among and between a variety of stakeholders, and especially communities to increase efforts to

conserve water. The initiative saw different groups pledging to partner with the department to ameliorate the effects of the drought in the mother city.

Among the groups included Miss Earth South Africa, Operation SA, Tsogo Sun, South African Rugby Union, and the Muslim Judicial Council. During the launch, all partners echoed one another's sentiments, saying that there was a need to make sure that Day-Zero did not happen through their partnership and working together.

They said it was time the citizens led the way in finding solutions to the water challenge that is facing the country.

"The work of the initiative will not only be confined to the City of Cape Town as the most drought-stricken area, but will make its presence felt throughout the country in the face of the calamity that is quickly spreading to other provinces," the department said.

Source: SAnews

## GLOBAL

## Increasing number of natural World Heritage sites affected by climate change



The number of natural World Heritage sites threatened by climate change has grown from 35 to 62 in just three years, with climate change being the fastest growing threat they face. This is according to a report released in January by the International Union for Conservation of Nature (IUCN).

The *IUCN World Heritage Outlook 2* – an update of the 2014 report – assesses, for the first time, changes in the conservation prospects of all 241 natural World Heritage sites. It examines the threats, protection and management of the sites, and the state of their World Heritage values – the unique features which have earned them their prestigious World Heritage status.

According to the assessments, climate change impacts, such as coral bleaching and glacier loss, affect a quarter of all sites – compared to one in seven in 2014 – and place coral reefs and glaciers among the most threatened ecosystems. Other ecosystems, such as wetlands,

low-lying deltas, permafrost and fire sensitive ecosystems are also affected. The report warns that the number of natural World Heritage sites affected by climate change is likely to grow further, as climate change remains the biggest potential threat to natural world heritage.

“Protection of World Heritage sites is an international responsibility of the same governments that have signed up to the Paris agreement,” says Inger Andersen, IUCN Director-General. “This IUCN report sends a clear message... climate change acts fast and is not sparing the finest treasures of our planet. The scale and the pace at which it is damaging our natural heritage underline the need for urgent and ambitious national commitments and actions to implement the Paris Agreement.”

Retreating glaciers, resulting from rising temperatures, threaten sites such as Kilimanjaro National Park – which boasts Africa’s highest peak.

“Natural World Heritage sites play a crucial role supporting local economies and livelihoods,” says Tim Badman, Director of IUCN’s World Heritage Programme. “Their destruction can thus have devastating consequences that go beyond their exceptional beauty and natural value. This adds to the urgency of our challenge to protect these places.”

The broader findings of the report show further challenges to the World Heritage Sites. Other threats, such as invasive species, unsustainable tourism or infrastructure development, are also increasing. They affect ecological processes and threaten the survival of species within the sites. Invasive alien species are the most widespread of all the threats.

Visit, [www.worldheritageoutlook.iucn.org](http://www.worldheritageoutlook.iucn.org) to download the report.

## Scientists suggest way to predict the behaviour of invasive weeds



Is it possible to predict which non-native plant species will become invasive weeds and when? According to research featured in the journal, *Invasive Plant Science and Management*, the answer is 'hopefully yes'. And those predictions can lead to more effective and cost-efficient weed management.

Researchers say invasive species generally follow a three-phase development curve – from lag to expansion to plateau. The

length and rapidity of expansion phase varies across species and determines how aggressively a plant spreads.

“Understanding the source of this variation can help us predict which non-native species become invasive,” notes Pedro Antunes, who co-authored the paper with Dr Brandon Schamp, both of Algoma University in Ontario, Canada.

“The key is to take a best practices-based approach to gathering and comparing data about past invaders, their traits and preferred habitats.”

Examples of the best practices the research recommends include using herbarium records as a data source for invasion curves; verifying the accuracy of the records and confirming the origin and taxonomic status of each specimen; and

comparing invasion curves to determine which traits are linked to more aggressive growth and expansion.

“As our knowledge increases, we can make better-informed predictions about the likelihood of particular species becoming invasive and the timeline they will travel as they do,” Antunes says. “We can take advantage of the lag time before the plant population expands to intervene with appropriate management controls.

Visit, <http://bit.ly/2DALxqZ>, to read the journal article.

## More trees would mean cleaner water, air for megacities – study



Planting 20% more trees in our megacities would double the benefits of urban forests, such as pollution reduction, carbon sequestration and energy reduction. This is according to a study published in *Ecological Modelling*.

The authors of the study, which was carried out at Parthenope University in Italy, say city planners, residents and other stakeholders should start looking within cities for natural resources and conserve the nature in our urban areas by planting more trees. In the study, the team used a

tool called i-Tree Canopy to estimate the current tree coverage in cities and the potential for more urban forest cover, and worked out the benefits that would bring.

Nearly 10% of the world's population live in megacities (cities of at least 10 million people). “By cultivating the trees within the city, residents and visitors get direct benefits,” explained lead author, Prof Theodore Endreny. “They are getting an immediate cleansing of the air that is around them. They are getting that direct cooling from the tree, and even food and other products. There is potential to increase the coverage of urban forests in our megacities, and that would make them more sustainable, better places to live.

To view the original article, Visit: <http://bit.ly/2rzh1rZ>



# NEW WRC REPORTS

## *Development of a high throughput sequential phytoremediation system for sustainable water purification using endemic macrophytes*

Overloading of wastewater treatment systems and the inadequate provision of sewerage in many rural areas can result in very poor quality surface waters containing high concentrations of emerging organic contaminants being released from water treatment facilities. These xenobiotics include pharmaceuticals and frequently also cyanotoxins where polishing ponds precede release. The released water typically also contains high levels of nutrients. The aim of this work was to validate the concept of a consortium of macrophytes in series to remove multiple xenobiotics while protecting those macrophytes that may be harmed by one or more of the xenobiotics.

**Report No. 2367/1/17**

## *Assessing aquatic ecosystem services value chains and markets in South Africa: Some case studies*

We still have a limited understanding of the value chains, markets and the actual economic value of ecosystem services from aquatic ecosystems. Different studies have developed various approaches for determining the economic value of these benefits, and of the associated natural capital. This study focused on identifying key ecosystem services and their forward linkages, understanding how to improve market access to such services, and creating or improving the value chains in the South African context. The research is intended to help identify opportunities for improvements that benefit society more broadly. It is anticipated that the study will be useful to land use planners, designers of infrastructure and town planners.

**Report No. 2341/1/17**



## *Direct reclamation of municipal wastewater for drinking purposes*

Existing water sources are increasingly coming under stress due to growing water demand on a global scale. Water resource managers and planners are forced to look at other, unconventional water sources such as water reuse. Water reuse has become an attractive option for water augmentation due to improvement in efficiency of

treatment processes, reduced costs and the fact that this water source is readily available and in close proximity to the point of application. The overall aim of this study was to investigate and test the major factors that govern people's decisions towards the use of reclaimed water for drinking purposes; and develop

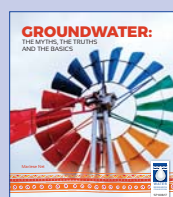
strategies and tools to inform better information sharing and public engagement within the institutional decision-making process for introducing reclaimed water. The intention was to find ways to influence public perceptions through public knowledge acquisition and information flows, and to engage with the public in order to overcome resistance and build trust, so as to assist water institutions effectively to introduce and manage water reclamation schemes. Volumes 2 (Investigation into institutional and social factors influencing public acceptance of reclaimed water for potable uses in South Africa) and Volume 3 (Framework guidelines for public engagement on water reuse) of this study are now available. Volume 1, *Guidance on monitoring, managing and communication of water quality* (Report No. TT 641/15) was published in 2015.

**Report No. TT 734/17 (Volume 2) and TT 735 (Volume 3)**

## *Response of urban and peri-urban aquatic ecosystems to riparian zones land uses and human settlements: A study of the rivers Jukskei, Kuils and Pienaars*

The negative impacts of land use on aquatic ecosystems have generated conditions that are conducive to the devastation of goods and services emanating from water resources. The use of sensitive riparian areas in urban and peri-urban areas has been due to high rates of urbanisation, which is driven by the community's need for socio-economic improvement, while municipal service provision is not increasing at the same pace. This study aimed to investigate the impacts of land use and human settlements in urban and peri-urban areas on aquatic ecosystems.

**Report No. 2339/1/17**



## *Groundwater: The myths, the truths and the basics*

Groundwater forms an important part of the water cycle, and of the water resources landscape in South Africa, providing crucial water supplies to millions of people, especially in rural areas. This special publication from the Water Research Commission explores some basic concepts about groundwater in South Africa. This includes how groundwater moves, how groundwater can be polluted, and how to find and manage groundwater. The country also explores some interesting facts about groundwater in South Africa, particularly around the towns and cities that are dependent on groundwater for their survival. **Report No. SP 108/17**

To order any of these reports contact Publications at Tel: (012) 761-9300, Email: [orders@wrc.org.za](mailto:orders@wrc.org.za) or Visit: [www.wrc.org.za](http://www.wrc.org.za) to download an electronic copy.