Mental models for water pricing

South Africans have been in a fierce debate around infrastructure investment shortfalls in public services, such as electricity, roads, housing and water. At the same time, there has been an ever more vigorous dialogue on how these services and infrastructure should be paid for, for example, the Gauteng highway e-toll saga and the ongoing electricity tariff processes, both focusing strongly on the divergence in thinking on the correct models to use.

A new bulk water pricing strategy will soon be gazetted for public comment by the Minister of Water and Environmental Affairs. The finalisation of the raw water tariff model will stimulate a ripple of pricing strategies throughout the system, especially with the move to full implementation of charges for all water users and uses. There is a large body of opinion that supports a higher tariff system in order to sharpen the focus on the scarcity and value of water in South Africa and so entrench a culture of water conservation and demand management. The general outcry in the other direction is that higher tariff structures in the wake of the electricity price hikes, combined with the extremely high food inflation in an environment of slow economic growth and poor employment figures, will simply make water less accessible – this time economically.

The argument is further reinforced by the fact that there are gross inefficiencies in the system. This is clearly illustrated in the latest WRC non-revenue water study (**WRC Report No. TT 522/12**), which puts South Africa's non-revenue water figure at 36,8% of which only around 25% constitutes physical water loss. At nominal rates the non-revenue water is a R7,2-billion/year of lost revenue. This also means that even in areas where we have efficient reticulation we are losing R2,3-billion/year in revenue through poor water financial management – a combination of metering, billing and collection deficiencies. One argument is that we should not be talking about increases until these inefficiencies are dealt with. The opposing view is that it requires increased investment to fix the problem, and therefore increased tariffs.

The debate on the margins, like with electricity and e-tolls, will be difficult to resolve amicably. The water pricing debate should be allowed to revisit some of the fundamental principles (see Figure 1).

The first consideration is that of relationship between price and cost. The correlation does not have to be absolute, but it has to be reasonable. The cost calculation has to take a lifecycle perspective of source to use and return to source. There also needs to be an information-rich, sector-by-sector and activity-by-activity differentiation in determining block tariffs that:

1. Subsidises basic needs use,
2. Rewards efficiency practices, and
3. Organises for inefficient and wasteful users to pay high enough tariffs to subsidise the first two categories.

Research can contribute enormously to enable this tariff framework. There is a need for industry sector and activity benchmarks that define the efficiency envelopes from both a water quantity and quality perspective. This would have to be complimented by a sophisticated metering and monitoring infrastructure.

Innovative models using a combination of self-monitoring with official verification would be the methodology of choice in the short term. This suite of interventions would have the net results of higher water use efficiencies, more water availability in the system, a lower pollution burden; all in the environment of the increased water revenues.

The second consideration is that of the long-term view. The National Water Resource

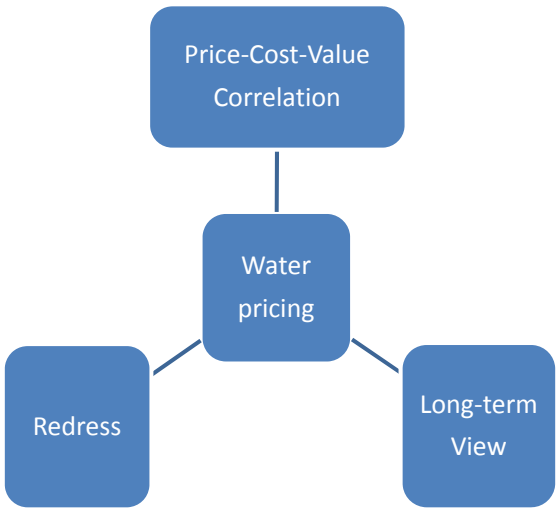


Figure 1
Key considerations in the water pricing debate

Lani van Vuuren

Higher future water tariffs might lead to a higher incidence of municipal service delivery protests.

Strategy 2 and its successors must ensure that South Africa's water capture and storage capacities remain ahead of the curve to ensure that the supply-demand ratio is always greater than one. New infrastructure build must be accompanied by both maintenance and rehabilitation of existing infrastructure in both the water supply and wastewater treatment domains. The added challenge is to be able to do all of this on lower energy budgets, particular in wastewater treatment.

The third consideration is that of redress. South Africa is in the unflattering position of having a very high water Gini coefficient. When we compare the relatively cheap rates for water for most urban domestic and industrial users, with those for folk who do not have formalised services in the peri-urban and rural areas, the differential is stark. The poor of our country that have to walk great distances to rivers, ponds and streams to obtain water, pay the highest costs in our system, if one factors in the opportunity costs associated with these activities.

If one adds the added factors of water quality related risks and the impact of water unavailability on human dignity then the true extent of the large water Gini coefficient becomes apparent. When one extends this analysis to the domain of lost opportunities associated with economic activity that could not take place due to either the lack of availability or accessibility to water, particularly for the poor and for the marginalised, the need for redress and redistribution as core principles in pricing discourse must be clear and unarguable.

Pricing of water is set to be a core component of South Africa's future water management strategy. It is going to be a central element to the quests to ensure that assurance of supply and the availability of good quality water for growth and sustainable development. If we manage to develop and implement innovative and information rich pricing measures, a water prosperous South Africa is possible and achievable.

Water diary

Young water professionals
July 16-18

The Third Young Water Professionals Conference 2013 will take place in Stellenbosch, Western Cape. The conference is expecting 500 delegates from across Africa and beyond. The conference aims to provide a forum for young researchers and practitioners across the water sector to present and discuss their work and ideas. *Enquiries: Glaudin Kruger (Conference Secretariat); Tel: (028) 316-2905; Email: Kruger@kruger-associates.com or Visit: http://saywp2013conference.weebly.com/*

Membranes
August 26-29

The 7th International Water Association Specialised Membrane Technology Conference and Exhibition for Water and Wastewater Treatment Reuse will take place in Toronto, Canada. The conference covers the entire range of water-related membrane technology, while providing a platform to present results of the latest research and industrial experience and facilitating close professional linkages among membrane communities and water professionals. *Visit: www.mtc2013.org*

World water
September 1-6

World Water Week will be held in Stockholm, Sweden, with the theme 'Water Cooperation – Building Partnerships'. *Visit: www.worldwaterweek.org*

Geology
September 9-11

The Geological Society of South Africa is hosting the GeoHeritage 2013 conference in Oudtshoorn. The Klein Karoo is a domain with a dramatic geological history, preserved as mountain ranges, deeply incised valleys, ancient land surfaces and caves. The conference includes various excursions to explore this history. *Email: cal@global.co.za or Visit: www.geoheritage.co.za*

Aquaculture
September 9-13

The 11th Aquaculture conference of the Aquaculture Association of Southern Africa (AASA) will be held in Stellenbosch in collaboration with the Department of Agriculture, Forestry & Fisheries. The theme for this year's conference is 'Fish Farm to Plate'. *Enquiries: Email: deidre@iafrica.com or Visit: www.conferencesetal.co.za*

Water & health
September 15-20

The 17th International Symposium on Health-related Water Microbiology will be held in Florianópolis, Brazil. This is a biennial event organised by the International Water Association Specialist Group on Health-related Water Microbiology. Topics to be covered include water pollution and diseases, microbial source tracking, catchment protection, water reuse and health, microbial biofilms, water and sanitation in developing countries, and microbial risk assessment, among others. *Visit: www.hrwm2013.org*

Groundwater
September 17-19

The 13th Biennial Groundwater Division Conference & Exhibition will take place in Durban, with the theme 'Groundwater: A New Paradigm'. *Enquiries: Conference Secretariat at Tel: (012) 348-9598; Email: info@gwd.org.za or Visit: www.gwd.org.za.*

Critically endangered frogs find a safe haven at the National Zoo

The National Zoological Gardens of South Africa, in Pretoria, has recently received ten critically endangered Pickergill's reed frogs as part of the first captive breeding conservation programme of these amphibians in southern Africa.

The wild-caught frogs will form part of a breeding programme under the auspices of the African Association of Zoos and Aquaria (PAAZAB). The critically endangered status of these amphibians necessitated the collection of some wild specimens to start the breeding programme. The aim of the breeding programme is to maintain an assurance population in a bio-secure manner, while maintaining the genetic integrity of the captive populations.

This conservation initiative is a collaborative effort between a number of institutions, including Ezemvelo KZN Wildlife, the National Zoo and the Johannesburg Zoo.

Amphibians are the most threatened class of vertebrates. Of the close to 7 000 species on earth, 3 900 are believed to be threatened in some way and 170 species are believed to be extinct.

Pickersgill's reed frogs have been identified as one of South Africa's most endangered amphibians. These tiny frogs (measuring about 3 cm in length) are listed as Critically Endangered by the IUCN's Red List of Threatened Species. In 1996, it was listed as Vulnerable and by 2004 the decline in its numbers had been so rapid that it was reclassified as Endangered.

This status changed a mere six years later to Critically Endangered as a direct result of, amongst others, habitat destruction of its small distribution range, habitat fragmentation and drainage of its vital water sources. Some breeding sites are also said to be polluted by DDT used for controlling malarial mosquitoes.

These frogs are endemic to the coastline of KwaZulu-Natal, where there were 19 historically known wild populations.

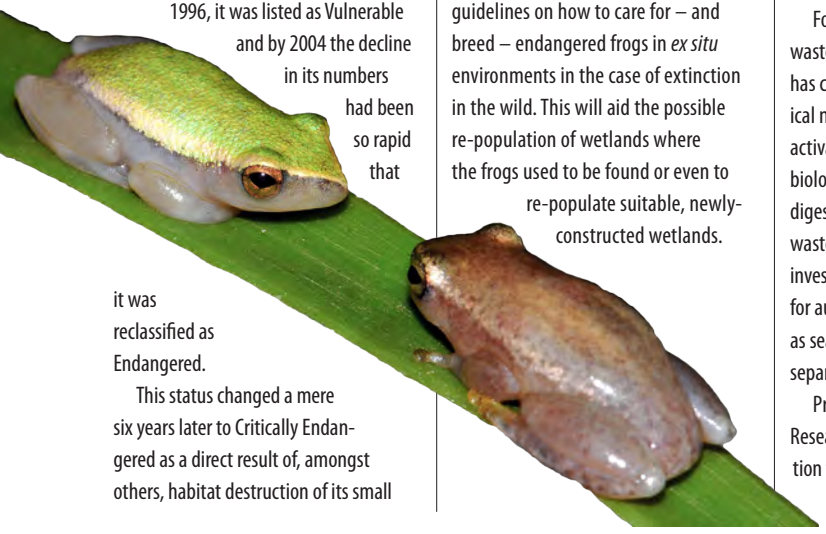
"We are privileged to be playing such an active role in this vitally important conservation project through the receipt of these ten frogs," says Craig Allenby, Marketing Manager of the National Zoo.

A new 'Frog Room' was constructed at the zoo for the sole purpose of housing these rare frogs. The room is bio-secure to prevent the transfer of pathogens to or from the group, in particular the dreaded chytrid fungus and the Rana virus, which have had a devastating influence on frog numbers globally.

As frogs have very porous skin they are extremely vulnerable to changes in water quality, so the Pickergill's reed frogs are given a mix of 'reverse osmosis' water and 'aged water' to maintain optimum conditions for survival and, hopefully, breeding.

Weekly water tests are conducted to ensure water quality. Each enclosure has its own filter system and pumps to keep the water clean, as well as a 'rain chamber' to simulate natural rainfall and maintain the proper humidity levels.

This landmark project will produce guidelines on how to care for – and breed – endangered frogs in *ex situ* environments in the case of extinction in the wild. This will aid the possible re-population of wetlands where the frogs used to be found or even to re-populate suitable, newly-constructed wetlands.



Faecal sludge conference report now available

The conference report for the Second International Faecal Sludge Management Conference, held in Durban in October last year, is now available from the Water Information Network (WIN-SA).

The report is based on information made available at the conference, including individual abstracts and presentations. The conference brought together some 320 policy-makers, scientists and innovators to share ideas and discuss the challenges and opportunities in the business of on-site sanitation.

To order the report, contact WIN-SA at Tel: (012) 330-0340; Email: info@win-sa.org.za or Visit: www.win-sa.org.za

Senior researchers awarded for life-long achievements in water

One of South Africa's most distinguished water researchers, Prof George Ekama, has received the Order of Mapungubwe (Silver) from the South African Presidency for his innovative solutions to enhancing and improving wastewater treatment.

One of the Water Research Commission (WRC) leading researchers since the Seventies, Prof Ekama is a Professor in the Department of Civil Engineering at the University of Cape Town. The Order of Mapungubwe recognises South Africans who have accomplished excellence and exceptional achievement to the benefit of South Africa and beyond.

Focusing on municipal and industrial wastewater treatment, Prof Ekama's work has covered a range of areas, from biological nitrogen and phosphorous removal, activated sludge system modelling, biological sulphate reduction, anaerobic digestion, plant-wide modelling of whole wastewater treatment plans as well as investigating alternatives to desalination for augmenting urban water supply, such as seawater toilet flushing and source separation of urine.

Prof Ekama has held a National Research Foundation A1-rating recognition for more than ten years. He is at the forefront of developments in wastewater treatment, primarily through his strong research group. Widely published, he has authored more than 150 papers on wastewater treatment in top international journals. He has also supervised 43 Masters and 24 PhD students, thus playing an important role in capacity building in the water science sector.

In related news, leading hydrological and water resource modelling researcher, Prof Denis Hughes, has been awarded the Rhodes University Vice Chancellor's Distinguished Senior Research Award at the university's recent graduation ceremonies. Prof Hughes is the Director of the Institute for Water Research at the same university.

With more than 25 years' experience in hydrological and water resource modelling, Prof Hughes has contributed significantly to the South African water sector. He has led and contributed to numerous research projects funded by the WRC and the Department of Water Affairs.

He currently serves as the national representative and chairman of the South African National Committee for the International Association of Hydrological Sciences (IAHS). He is also the Vice President of the IAHS International Commission on Surface Water.

New head at helm of CSIR environment unit

The CSIR has appointed May Hermanus as the Executive Director of its Natural Resources and the Environment (NRE) research unit. Hermanus assumed her new role on 4 June.

Hermanus is the Director and Adjunct-Professor at the Centre for Sustainability in Mining and Industry (CSMI) at the University of the Witwatersrand where she was responsible for developing a centre of excellence for public education in the fields of occupational safety and health, the environment and sustainable development.

Announcing the appointment, CSIR CEO, Dr Sibusiso Sibisi, said it was an honour for the CSIR to have a person of Hermanus's calibre joining the organisation. "She brings with her vast knowledge and expertise from private and public sector which will add value to our business and also contribute to our mandate of using directed and particularly multidisciplinary research and technological innovation to better people's lives," he said.

Hermanus holds a degree in geology from the University of Cape Town and an MSc in physical metallurgy. Commenting on her appointment, Hermanus said she was delighted to be joining the CSIR, a premier organisation for technological and scientific innovation, peopled by many path-breaking thinkers. "I have had the privilege of working in interdisciplinary environments for much of my career and look forward to being part of a team producing multi-dimensional solutions and insights to the complex challenges facing our society. In some respects, this move to the CSIR involves, for me, a wonderful sense of continuity in providing further opportunities to interface with colleagues in various industries and tertiary institutions, and also to grapple with the issues of sustainable development. It ia a pleasure to step into this new role," she said.

Government, organisations collaborate for biodiversity

Non-governmental organisations, private sector and government entities have united under the umbrella of the new National Biodiversity and Business Network (NBBN).

The aim of the network is to assist businesses from various sectors to integrate and mainstream biodiversity issues into their strategies and operations. It is designed to be an open and inclusive association of like-minded organisations that have recognised the need to raise awareness of, and stimulate conversation about, biodiversity issues among the business community. Founding members include the Endangered Wildlife Trust (EWT), Department of Environmental Affairs, Nedbank, Hatch Goba, De Beers, Transnet, Pam Golding Properties and Pick 'n Pay.

"Government and business are realising that the economic and social development of the country is dependent on healthy ecosystems and biodiversity," noted Dr Marie Parramon-Gurney, EWT Head: Conservation and Business. "The South African National Development Plan confirms that national economic growth is dependent on the environmental sustainability of our proposed development path. The Plan refers to the need for transformation to ensure environmental sustainability."

South Africa's national resources, including water, wildlife, soil and flora, are essential for the country's development and businesses are, as a consequence, also inextricably linked to the well-being and sustainable use of these resources, NBBN members point out in a statement. "Therefore, the management of natural capital has to become an essential component of the formal risk management and governance of businesses. For organisations to remain competitive, they have to identify their current and future impacts and dependencies on the environment. By doing so in a pro-active and collaborative approach, industry will also be able to identify opportunities related to the management of natural resources."

Major investment to upskill water and energy skills in South Africa

The Stellenbosch University (SU) Water Institute and the Energy and Water Services Sector Education and Training Authority (EWSETA) have signed a Memorandum of Agreement (MoA)to address the critical need for specific technical and management skills in the water and energy sector.

To be phased in over the next three years, the main objective of the programme will be to increase the number of students in scarce-skill areas, such as the water and energy sector at Further Education and Training (FET) colleges in South Africa. There are currently more than 300 000 students in FET colleges, and the Department of Higher Education and Training aims to increase the number to a million students in the near future.

According to Errol Gradwell (left in the accompanying photograph), CEO of EWSETA, there are many obvious reasons why the project is important: "There is an urgent need to align the skills mismatch between that required by industry and what is supplied by our education systems. We also need to develop curricula and qualifications to serve both the short- and long-term needs of the industry at large." Another important objective of the programme will be to up-skill FET lecturers, increase re-skilling programmes for experienced labour, and up-skill middle to senior managers, he explains.

SU Vice-rector (Research and Innovation) Prof Eugene Cloete (right in the accompanying photograph), said that the Water Institute was honoured to be entrusted with the development of this programme. The programme is also in line with the university's vision for 2030, and supports the broader higher education objectives of the country.

According to the MoA, SU will establish a Water and Energy Programme Office to coordinate the overarching project and manage research and development through to the implementation phase. With funding of R5,7-million for phase one of the project, experts from the Water Institute will be roped in to conduct an educational needs analysis for FET colleges over the next 12 to 15 months, with training of FET lecturers starting in 2014 as part of phase 2.

Sasol, WRC cements culture of working together

The partnership between South Africa's foremost integrated energy and chemical company and national water research and development agency is bound to realise the utmost expertise to drive the water-energy-nexus in South Africa.

This is according to Deputy Minister of Water & Environmental Affairs, Rejoice Mabudafhasi. She was commenting on the strategic partnership signed between Sasol and the Water Research Commission earlier this year. She also assured the parties of the support from the Department of Water Affairs (DWA) towards the partnership.

The agreement coincided with the launch of Sasol's Water Sense campaign, aimed at aligning the group's water stewardship practices as its various operations around the world. According to Sasol Executive Director of Sustainability and Business Transformation, Nolitha Fakude, Sasol Water Sense is the international platform from which water-related actions are coordinated and responded to, whether they are water security regulatory risks associated with being a large industrial water user, or assisting surrounding communities in improving their water management practices.

The group has already started implementing site specific water use efficiency targets for its operations in Sasolburg and Secunda, operations that see it accounting for 4% of the integrated Vaal River system. This represents 80% of Sasol's global water requirements. In this way, the group's total water use decreased from 151 million m^3 in 2011 to 148 million m^3 in 2012. "We recycled nearly 143 million m^3 of water in 2012 compared to 128 million m^3 in 2011," Fakude said.

The partnership between Sasol and the WRC will see both parties collaborate on finding new technologies and opportunities to conserve water in South Africa. Speaking at the event, WRC CEO, Dhesigen Naidoo, said: "Through this agreement we want to fortify our science, technology and innovation partnership to ensure a higher input of knowledge and workable technologies to empower responsible water citizenship at all levels so as to ensure a water successful future for our country."

Under the agreement a joint research commission will be established to oversee and monitor the partnership and seek out new opportunities for collaboration on other water conservation matters. Sasol Technology will offer the use of some of its research and development piloting facilities in Sasolburg and Secunda to researchers and academics funded by the WRC for research in conjunction with Sasol Technology teams.

The agreement will include, among others, collaboration in the following key research areas:

- Climate change;
- Water resource availability and accessibility;
- Catchment management and water quality improvement;
- Water footprinting and best practices for the private and public sectors;
- Water conservation and water demand management;
- Technological development for the treatment and management of water, wastewater and residual byproducts;
- Ecosystem remediation and rehabilitation; and
- Groundwater impacts, vulnerability and remediation.

In related news, Sasol also signed a partnership agreement with the Department of Basic Education in the Free State and DWA. The partnership, known as project Busa Metsi, will seek to minimise water losses at schools and educate learners on the importance of water conservation. A total of 16 schools will

WRC CEO, Dhesigen Naidoo.


WRC CEO, Dhesigen Naidoo with Sasol New Energy MD, Henri Loubser.

Deputy Minister of Water & Environmental Affairs, Rejoice Mabudafhasi.

initially benefit from the project.

"One of the most important pillars to ensure security of water supply in resource-scarce South Africa is that all water decision-making at all levels are informed by very good water science and technology," said Naidoo. "The expression to responsible citizenship by Sasol through this water stewardship is a very important pillar of ensuring South Africa's water security. And Sasol has gone one step further by using its mechanisms, know-how and talent to help communities and individuals to also be good water citizens. As we already start experiencing the further challenges of climate change, this social compact between responsible corporate citizens with communities is the real bastion against water insecurity in South Africa."

WRC CEO, Dhesigen Naidoo and Deputy Minister of Water & Environmental Affairs, Rejoice Mabudafhasi.

Sasol Executive Director, Nolitha Fakude.

Water diary (continued)

Water and social media
September 26-27

International Water Conferences, supported by the IWA, is hosting a gathering in Amsterdam to focus on the use of social media and customer connection in the water sector. During this conference international experts will talk about how water companies can use social media. *Email: wsm@iwconferences.com or Visit: www.iwconferences.com*

Water & development
October 14-17

The next International Water Association Development Congress & Exhibition will take place in Nairobi, Kenya. The conference will focus on practical solutions that work on the ground to achieve universal access to water and sanitation services. *Visit: www.iwa2013nairobi.org*

Wetlands
October 22-25

The 2013 National Wetlands Indaba will be held at the Cape St Francis Resort, in the Eastern Cape. The theme for this year's event is 'Wetlands as Ecological Infrastructure'. *Visit: http://indaba2013.wetlands.zanet*

Green technology
October 20-23

The Membrane Technology Division and Southern African Industrial Water Division of the Water Institute of Southern Africa (WISA) are joining forces to host a Green Technology Conference at the Legend Golf & Safari Lodge, in Limpopo. The theme of the conference is 'Green technology for today's industry'. *Enquiries: Shelley-Ann Abrahams (registration) at Email: shelley@soafrica.com or Carina du Plessis (sponsorship and exhibition) at Email: carina@soafrica.com or Tel: (011) 463-5085 or Visit: www.wisagtc2013.co.za*

Municipal engineering
October 23-25

The 2013 Conference of the Institute of Municipal Engineering in Southern Africa (IMESA) will be held at The Boardwalk Hotel & Conference Centre in Port Elizabeth with the theme 'Municipal Engineering: Meeting Peoples' Needs'. *Enquiries: Debbie Anderson (Conference Secretariat); Tel: (031) 266-3263; Email: conference@imesa.org.za; Visit: www.imesa.org.za*

Large dams
November 5-7

The South African National Committee on Large Dams (SANCOLD) is hosting a conference on 'Advances in Dam Technology for Water and Energy in Southern Africa' at the Black Mountain Hotel in Thaba N'chu, Maria Moroka Nature Reserve. *Enquiries: Merentia Meyer; Tel: (021) 808-4352; Email: merentia@sun.ac.za; Visit: www.sancold.co.za*

Ecosystem health
November 20-21

North West University is hosting its fourth Annual Eco Health Research Forum at Golden Gate Highlands National Park, Clarens. The theme for this year's conference is 'Multidisciplinary Reflections on Environment, Health and Well-being Research in Southern Africa'. *Enquiries: Yolandi Krone (Conference administrator); Email: yolandi.yevents@gmail.com; Cell: 082 553 6463.*

Young water professionals
December 9-11

The Third East African Young Water Professionals Association Conference will take place in Nairobi, Kenya, with the theme 'Securing our water and energy resources in the face of climate change'. *Email: keywpa@gmail.com*

Water loss
March 30 –April 2

The International Water Association Water (IWA) Loss 2014 Conference will be held in Vienna, Austria. This is the sixth event in a series of IWA water loss reduction speciality conferences, following on a successful conference held in the Philippines in 2012. *Enquiries: Conference Secretariat, Email: 2014committee@iwa-waterloss.org; Visit: www.iwa-waterloss.org/2014/cms/*