HUMAN WASTE CAN IDENTIFY COVID-19 HOTSPOTS SEVEN DAYS BEFORE ANYONE GETS SICK

BY DI CAELERS

Human waste has the potential to offer countries across the globe a key advantage in the fight against COVID-19, acting as an early warning system to identify hotspots as long as seven days before the first clinical cases show up in the healthcare system.

The often reviled subject of domestic and municipal wastewater is now emerging as a topic of intense international scientific debate, with many countries keen to mainstream wastewater surveillance as a management tool to support clinical testing for COVID-19 – especially as second, and even third waves of the pandemic threaten.

This was revealed on the first day of the Water Institute of Southern Africa's 2020 online conference by Jay Bhagwan, executive manager: water and waste management of South Africa's Water Research Commission. The annual conference runs from December 7 to 11, and is 100% virtual for the first time this year.

The presence of COVID-19 RNA fragments in sewage not only signals the presence of this coronavirus in infected people in specific locations, but also pre-warns authorities about asymptomatic cases, he explained. Importantly, these fragments are harmless and non-infectious, and so pose no threat to health.

Presenting an overview of the international response to COVID-19 from a wastewater epidemiology perspective, Bhagwan pointed to the Netherlands as pioneers of this research which he said was progressing rapidly, including in South Africa.

"The Water Research Commission, along with several other partners around the country, and even private laboratories, are testing the hypothesis of wastewater-based surveillance as an effective tool for predicting and tracking the pandemic.

"Where we see this surveillance adding a lot of value is that it offers an early-warning opportunity up to three to seven days in advance against clinical cases," he said.

A pilot study of five cities in the Netherlands demonstrated a clear increase in clinical cases of COVID-19 that coincided with the concentration of RNAs in the waste water. While significant, the findings went even further to show that the virus was detected in the waste water before any clinical cases were identified – "actually six days before". Today, the programme was contributing information and data in respect of hotspot areas to complement health interventions on a national scale.

Canada, Bhagwan added, was currently conducting hotspot surveillance following the easing of restrictions in that country, while Turkey had collected samples from 81 cities in a huge logistical exercise, subsequently shifting their focus to seven identified hotspot towns and cities.

In South Africa, the Water Research Commission had led the proof of concept around the importance of waste water in complementing other surveillance activities. Many other countries had demonstrated the efficacy of wastewater-based surveillance in respect of COVID-19, and it was being widely adopted by governments as a national intervention.

"With our dichotomy, we must use this platform to manage and protect our vulnerable communities from this virus," he urged.

VIRTUAL EXHIBITION TREASURE HUNT

Water Institute of Southern Africa

VIRTUAL EXHIBITION TREASURE HUNT

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Treasure Hunt Questions

1. Which DuPont Technology can remove gas from the liquid streams?
2. Name the “model” of the Hach instrument that can perform colorimetric tests together with the option of using two probes in the same unit.
3. When was SBS established?
4. Who offers quality information to business communities through magazines and digital media?
5. Name two of the product solutions Jojo offers
6. What’s the worlds strongest ph Glass called
7. Name two of the industries Xylem offers solutions to
8. Name three of the infrastructure projects TCTA has initiated
9. Who designs and manufactures machines for solid-liquid separation?
10. Name 2 of the big 5 dams in South Africa
11. What is the name of AECI Plant Health's unique artificial intelligence system
12. Who is the custodian of the well-being of the consulting engineering industry?
13. When was Golder founded?
14. Which company produces instruments for chemical analysis?
15. Approximately how many people does Rand Water supply water to?
16. Who provides the country with applied knowledge and water-related innovation?
17. Name one of eThekwini Municipality's collaborative partners
18. Which company uses chemical treatment to turn wastewater to valuable solid and liquid resources?
19. Name two of Marsi Water's partners
20. What does the abbreviation SASTEP stand for?
21. What is AECI's Four Step Framework?
22. What is Veolia's all-in-one water digital service called?
23. What is the name of Aqualytics Alarm that monitors water quality in a clear water reservoir?
24. What is Biorocks compact All-in-One Sewage Treatment System called?
25. When was Sizabanthu established?
26. Who has a Path to Membrane System Optimisation virtual booth?

WORKING TOGETHER FOR THE GOOD OF ALL

BY SUE SEGAR

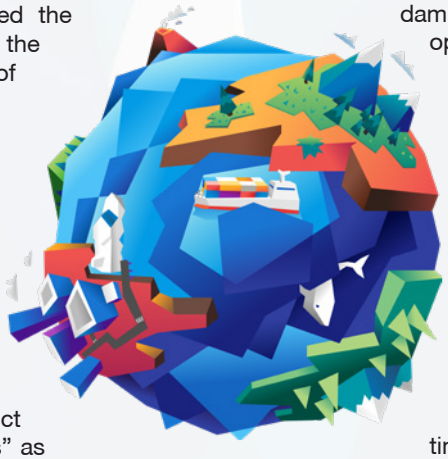
There are numerous benefits to countries working together to manage water across boundaries, and these benefits include the optimal use of water, as well as conflict prevention and ecological sustainability.

So said Dr Jonathan Lautze, from the International Water Management Institute, during his presentation entitled Trends in Transboundary Water Management.

"Colleagues over the years have said there are better ways of spending money in terms of the water sector, with more tangible benefits accruing from different things, like water sanitation and hygiene or more concrete investments than this new transboundary stuff we are doing," he said.

"So what are the benefits associated with this?"

In his presentation, Dr Lautze reviewed the experience of the SADC region over the past few decades in the management of transboundary waters.



In the early days, Transboundary Water Management was used for the "maximum utilisation of a common good", he said. "There was a focus on seizing particular opportunities.

"Nowadays it is used more for an integrated water resources management process for optimal water management in basins and aquifiers.

Transboundary Water Management had also been used across countries for conflict prevention to alleviate fears of "water wars" as well as to avoid downstream harm; and also for countries to work together in conservation and to ensure ecological sustainability.

Dr Lautze said it is common for basins or aquifiers to cross borders. "More than 60 percent of the land area (in Africa) is covered by transboundary basins. "In the early days, cooperation was mostly oriented about seizing opportunities around a dam development or minimising risks. In recent days the water world has broadened thought in engaging in shared water (management) ...,for optimal water management. Today, there are a lot of agreements on these basins and most basins now have River-Based Organisation (RBO) developments – and there are many positives coming out of that.

"This cooperation contributes to coordinated water management and conflict reduction."

Dr Lautze said while cooperation in West Africa was active in the 1960s, cooperation in the SADC region only really started in earnest in the 1990s and the orientation of the cooperation is "somewhat different".

Cooperation in the SADC region includes the Inkomati Tripartite Permanent Technical Committee between Mozambique, South Africa and Swaziland and the Lesotho Highlands projects, in the 1980s, as well as the Permanent Okavango River Basin Water Commission (OKAKOM), set up in the 1990s by Angola, Namibia and Botswana to jointly manage the water resources of the Cubango-Okavango River Basin as well as a number of more recent cooperative projects such as Save, Pungwe and the emerging Kinene-Cuvelai projects.

"In the early days, there was more focus on seizing these opportunities, for example, Kariba Dam was a specific dam, the Lesotho Highlands was where a real opportunity for joint development was seized … but more recently – since the 1990s and after - there has been a transition towards a more soft cooperation."

Dr Lautze said there had "undoubtedly" been some questions around the practical contributions of international RBOs. However, a range of experts had highlighted the benefits of such organisations including, mainly the efficiency gains in implementing water cooperation

"You can forgive some it, realising there is a gestation period (for them to start performing optimally). We need to give them time to grow and mature. But there are a lot of benefits attributed to them: The RBOs are also a good platform for donor coordination, programme planning, data exchange and policy harmonisation. They have also served to strengthen monitoring and adaptive management of the projects and have, without doubt, contributed to conflict reduction over water."

"One of the things we looked at is whether the RBOs are a return on investment and we found that the answer was yes ...RBOs, with somewhat minimal cost, have been able to trigger quite a lot of investment."

A key role that secretariat-based RBOs can play in SADC is to facilitate the collection and dissemination of data. Other roles are to work towards a common understanding of current condition; to foster a shared vision for future developments, to promote benefit-sharing options as a means to reduce temptation for unilateral approaches and harness the greater collective benefits of cooperation and, importantly, to reduce risk which is a big constraint to progress.

'NEGLIGIBLE' LEVELS OF MICROPLASTICS IN DRINKING WATER FROM RAND WATER

BY SUE SEGAR

Research into the presence of microplastics in the source and drinking water of South Africa's largest bulk drinking water supplier, Rand Water, has shown negligible concentrations of microplastics in three samples, with all other samples showing very low microplastics concentrations in comparison with other studies.

This was the conclusion presented by Rand Water's Yvonne Liee, who also found no evidence that the drinking water treatment processes at the treatment works reduced the number of microplastics particles from the source water to the final treated water.

Rand Water, the largest water utility in Africa, is tasked with supplying potable water to South Africa's economic hub of Gauteng province and other areas of the country.

The utility's water comes from numerous sources and is purified and supplied to local municipalities as well as for use in industry and mining.

Giving a global perspective, Liee said that in 2014, the annual plastic production exceeded 311million tons and, by 2050, this may increase to a massive 33 billion tons. She added that globally, microplastic pollution is currently perceived as an environmental hazard and one of ten emerging issues that the world faces today.

However, very few studies into the issue have been performed in Africa and, while more work has been done in marine environments, relatively little has been done into microplastics in freshwaters.

Microplastics are plastic fragments within the size range of 1 to 500 micrograms per metre and can be derived from primary or secondary sources. They include nurdles, the plastic beads used in plastic manufacturing, micro beads from cosmetics and fibres.

Liee said a paper paper published by the WHO concluded that currently the effects of microplastics in drinking water on human health are unknown.

Liee said there has been a lack of information on the prevalence of microplastic particles in the source water (surface water) used for potable water production, in South Africa and the resultant potential impact on tap water destined for human consumption.

Priority issues that require investigation include to determine the prevalence of microplastics in source water and the impact thereof on treated drinking water; and to determine the most commonly associated monomers/additives linked to microplastics in drinking water.

Turning to the study under discussion, she said the aim of the investigation was to serve as a high level scoping study to determine the extent of the prevalence of 1.)microplastics and 2.) their common associated monomeres/additives in the two largest drinking water treatment works.

Samples were taken from two water sources supplying the drinking water treatment works and taken at various monitoring sites such as after the water entered the drinking water treatment plant as well as at distribution networks and at taps.

"We … took unfiltered water samples and tried to detect for monomers/additives ...and fibres and fragment identification. The samples were filtered through 20 microgram mesh stainless steel. The samples were analysed by North West University. The method used for identifying fibres and fragments and for a range of monomers was the Fourier transform infrared spectroscopy analysis of microplastics."

Summarising the conclusions, Liee said three of the samples showed negligible concentrations of microplastics.

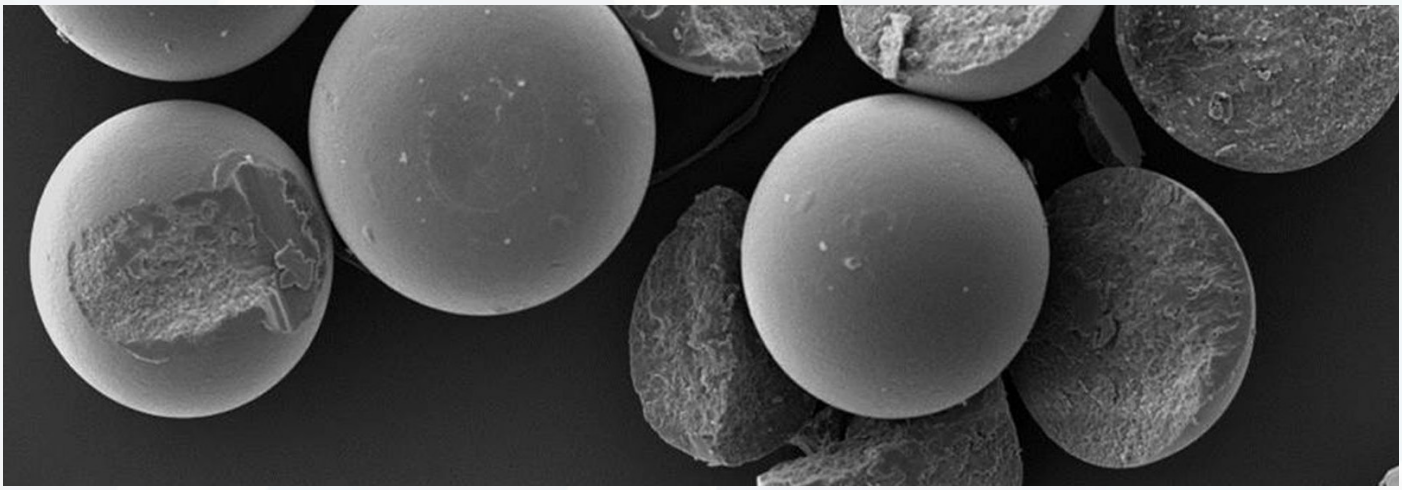
"The other samples all show very low microplastics concentrations when compared to other studies (under 1 particles per litre) in all of the drinking water samples taken.

"The microplastics concentration:

- in the source water ranged from 0,24 to 1,47 particles (either fragments or fibres) per litre;
- in the drinking water immediately post treatment from 0,56 to 0,9 particles per litre;
- in the distribution from 0,26 to 0.88 particles per litre;the scoping study showed the control sample to have 0.34 particles per litre."

Liee said the known monomers/ additives associated with microplastics could not be detected in any of the water utility's samples, neither in the drinking water, nor in the source water.

"Di-n-butyl phthalage, Benzyl butyl phthalate, Bis (ethylhexyl) phthalate, Styrene, Bispheol A and Vinyl Chloride, were all below the detection limits of the methods used," she said.



REMOVE BARRIERS TO PPPS

BY SUE SEGAR

The reuse of water for non-potable purposes offers a number of benefits, but there are substantial regulatory and practical barriers that need to be overcome if these benefits are to be realised at scale.

This was the main point put forward by Nick Graham a director at the Cape Town-based PDG Development Consultancy in his presentation titled Barriers and Opportunities for Water Reuse PPPs (Public Private Partnerships) in South Africa.

Graham, who co-authored a paper with the same title with colleague Brendon van Niekerk, said water reuse offers benefits, particularly, in freeing up water resources for other purposes and for providing technical and financial resources that are lacking in the municipal water sector.

He said the real risks of water shortages and of a chronic shortage of municipal capital funding present an opportunity for private sector involvement in funding water reuse programmes.

Graham said the circular economy component of the EU-SA Partnership for Growth Program – which funded his work – had chosen to focus on industrial waste reuse PPPs due to projected water shortages and to support existing policies of the South African government.

There had been a deliberate focus on industrial re-use, excluding direct potable reuse – because the industrial use of water (including power generation) accounts for about five percent of total water demand or 750 million cubic metres annually (16 percent of total municipal water demand).

In a study which included, among other things, a review of legislation, policy and sector reports, as well as local case studies, Graham found a number of regulatory barriers.

"The legislation governing PPPs and municipal services in SA is complex – but the same process is followed for any municipal PPP, regardless of size. So municipal officials perceive PPPs as being too onerous and time-consuming (they can take three to six years to complete)," he said.

"This pushes up transaction costs which can make projects unviable."

He pointed out that a proposed minimum threshold figure of R300 m meant that only large waste water treatment works and industrial users would be viable.

Procurement regulations also provide challenges for municipal PPPs in terms of unsolicited bids as well as adjudication of tenders where there might not be a payment by the municipality to the service provider.

A further legislative barrier is the lack of clarity in the National Water Act and the Waste Act around whether treated wastewater is "waste" or a "water resource" which creates uncertainty about the licensing requirement and thus is a regulatory risk.

"There is also lack of legislative clarity around the rights of downstream users to wastewater effluent flows in rivers (although this affects inland municipalities more than coastal ones.)"

Turning to ways of addressing these regulatory barriers, Graham said the first thing to acknowledge is that some water reuse PPPs might not be PPPs at all. "In South Africa, a contract must satisfy three criteria to be a PPP – the private party must perform a municipal function or use municipal land for commercial purposes, must assume operational risk and the party must receive a financial benefit from the municipality.

"This means that waste water PPPs will only fulfil this definition where the reuse plant is involved in the treatment of municipal waste water (which is a municipal service) or where the reuse plant is located on municipal property."

Graham said a positive development is that the PPP legislative framework is currently being reviewed by National Treasury, "including the development of different processes for large and small PPPs and merging some of the approved requirements for PPPS.

In terms of capacity barriers to water reuse, Graham said one disadvantage on a national level is the fact that the National Treasury Municipal PPP unit has less than ten employees "which is insufficient capacity". On top of this, the PPP unit provides "unnecessary supervision", he said.

On a municipal level, there has been a reduction in capacity in terms of the number and experience of remaining engineers in municipalities; technical and financial capacity in municipalities is weak and there is a lack of long-term infrastructural planning and implementation.. Contract management in municipalities is poor.

In terms of the private sector, while there is significant technical capacity, there is relatively little expertise in water and sanitation PPPs.

On a positive note, the DBSA, together with the DWS, is currently setting up a municipal water reuse project office which will be situated in the national government.

"Should this not materialise, alternative capacity building programmes should be undertaken in municipalities to support the packaging of projects and PPP management..."

Graham said the study identified three main financial barriers to water reuse PPPs.

"Firstly the cross subsidisation of water services means that certain users, including industrial water users can pay more than the cost of water supply to subsidize non-paying indigent water users. This means that municipalities might be reluctant to divert this revenue stream through the private sector taking on this function.

"A second issue is low water tariffs. Municipal industrial water tariffs are generally low and raw water tariffs are extremely low. This means that any tariffs … need to be competitively priced compared to existing tarrifs.

"Finally there are concerns from private parties about their ability to recover revenue from municipalities and customers."

Graham said that, for some years now, the DBSA in collaboration with the EU and National Treasury has designed a new blended financing solution specifically for wastewater reuse projects. The instrument is in the process of being designed and piloted. This, he said, is a positive development.

The planned mapping of locations of large industrial water users in relation to municipal wastewater treatment will be useful to identify promising geographic areas for PPP projects.

Graham said in order for water reuse to take place optimally, a number of things need to happen, including that:

- Regulations designed to protect municipalities must be scaled appropriately to increase project viability for the private sector;
- Municipal capacity needs to be supported, particularly in tender specification, adjudication and contract managements; and
- Cost-reflective water tariffs that reflect the value of water in a context of scarcity will increase the financial viability of water reuse PPPs for the private sector.

DRONES ADD NEW DIMENSIONS TO WATER SECTOR

BY MORGAN MORRIS

Belying their diminutive sizes, drones have proven to be very versatile, Rand Water has found.

Recently the water utility piloted the use of drone technology across a number of its projects, explained contracts manager, Mr Danny Kuya, in his presentation, aptly titled 'Piloting of Drone Technology Application in Rand Water's Area of Service'.

While drones are known to be safe, comparatively affordable, efficient and accurate, Rand Water needed to see if the technology could live up to its specific demands. The drones passed with flying colours, reported Kuya.

With the drones, the utility could create georeferenced survey maps for the planning of new pipelines, for instance. When fitted with a thermal camera, the drone could produce thermal profile maps for tracking water loss. It helped generate videos and photos to assess soil erosion and detect sink holes or alien invasive trees, among other things. It also aided the areal inspection of buildings within flood lines, as well as pollution spills.

Beyond the maps, the technology held numerous other benefits, including that it reduced workflow, could capture immense levels of details, and reduced the manpower needs on certain projects, said Kuya. Rand Water has, as a result, chosen to adopt the technology, which it will use to provide coordinated drone services to its many different operations.

SPACE-AGE EYE IN THE SKY DETECTS WATER LEAKS FROM 637KM OVERHEAD

BY DI CAELERS

With 100% accuracy, satellite technology can identify critical pipeline leaks to help halt the loss of water that negatively impacts South Africa's already precarious supply - and at one-tenth of the cost of traditional detection methods.

While artificial intelligence, robotics and algorithms may not appear to sit naturally alongside the issue of leaky pipes, Rand Water in Gauteng has instituted the use of this exponential technology to tackle what Mogan Padayachee describes as an exponential problem in South Africa.

Padayachee, head of innovation at the Rand Water group of companies, was addressing delegates on the second day of the Water Institute of Southern Africa's (WISA) 2020 online annual conference, explaining how leaks in 500km of Gauteng water pipes had been identified from a satellite 637km overhead.

So-called non-revenue water costs South Africa dearly, with estimates that as much as 41% of municipal water does not generate revenue due to issues including leaky pipelines. While figures vary between service providers, average physical losses in municipal systems are estimated to be around 35%, against a global best practice of less than half of that.

Padayachee said in his address that it was against this background that Rand Water made the decision to "push the boundaries" in order to minimise water losses from its pipeline network: "South Africa is a water-scarce country and we at Rand Water are importing water into the country from the Lesotho Highlands water project, treating it to the highest standards, and it's not a very good thing if we are then suffering significant losses in the distribution network."

The contracted company, InaSat, not only completed the process of analysing 1000km of pipeline in just two months with a 100% success rate, but also delivered the results at a cost of R10 000/km, or one-tenth of the price of other methods.

"Not only did they identify a leak in an underground chamber, indicating the sensitivity of the solution, but also differentiated between two underground concrete pipes running parallel, pinpointing the exact location of the leak," Padayachee revealed. The leaks were confirmed following physical excavation.

Quantified from a Rand point of view, he added that, based on an estimate of R8/kilolitre, potential monthly savings of between R400 000 and R800 000 could be effected per leak, depending on the severity.

"The fast turnaround time makes this technology an excellent investment for South Africa," Padayachee concluded.

WATER SUSTAINABILITY AND PROFITABILITY NEED NOT BE MUTUALLY EXCLUSIVE

BY MORGAN MORRIS

Water is comparatively cheap in South Africa, despite the country being listed as one of the 30 driest nations in the world, receiving only half the average global rainfall every year.

But the cost of water is trending upwards, cautioned industrial water specialist Mr Kirshen Naidoo in his presentation, 'The True Cost of Water: Industrial perspectives on water sustainability versus profitability'. Amid the droughts in Cape Town, the City of Cape Town at one stage threatened a 55.16% hike in water tariffs; following a public uproar, the city eventually settled on a more tolerable 10.10% increase.

But water security concerns and price hikes will continue, and will cut into local industries' profit margins, Naidoo said. After all, the World Economic Forum (WEF) has ranked water issues as the third highest risk for doing business in South Africa. The Southern African region is sensitive to climate change, and the water and wastewater infrastructure in South Africa is slowly failing. "The bottom line is that even if South Africa applies all of government's existing plans, there will still be an approximately 17% water supply deficit by 2030," he noted.

On top of this, industrial processes are notoriously water intense. If the average brewery uses 'only' 3-5 litres of water for every litre of beer it pumps out, other sectors are even more demanding. A single glass of wine requires around 120 litres of water in its making, while around 140 litres of water go into every cup of coffee we enjoy.

But there's little interest in industry in South Africa to turn off the tap. "The current cost of water does not incentivise industry to invest in water projects," says Naidoo.

But attitudes are changing. Companies realise that running out of water would equal the end of their businesses. In addition, public perception favours companies with 'green' footprints.

So some industries are making moves in the right direction, Naidoo pointed out.

A public-private partnership between Anglo American Thermal Coal, BHP Billiton and the Emalahleni Municipality in Mpumalanga led to the establishment of the world's acid mine drainage (AMD) treatment plant, Emalahleni WTP, which then supplies clean water to both the municipality and back to the mines. A water treatment plant for cleaning up high-calcium dolomitic water is saving a gold mine on the West Rand some serious money. And Nestlé Mossel Bay has famously cut back water consumption by 54% as early as 2009 with, among other things, modest investments in new technologies.

This is the way to go for all industries, cautioned Naidoo. "Investment in water as a function of long-term sustainability and profitability is a must."

TEAMWORK WILL BE CRITICAL AS GAUTENG EXPLORES SUSTAINABLE DRAINAGE SOLUTIONS TO RUNOFF

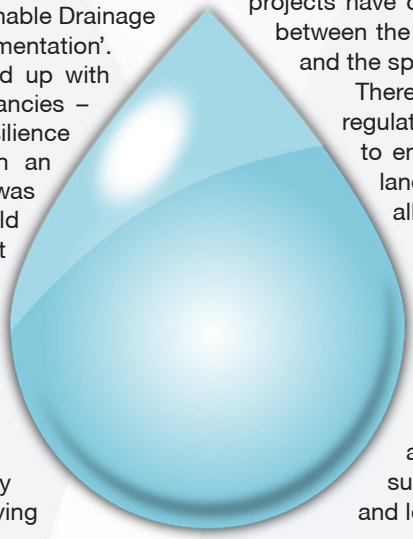
BY MORGAN MORRIS

Urban runoff – rainwater running off hardened surfaces like roads – is not just a major source of pollution and flooding, but also interrupts the natural uptake of water into soils, lowering the water table.

In Gauteng, for instance, it's estimated that annual runoff from urban surfaces in its three metropolitan areas – Tshwane, Ekurhuleni and Johannesburg – is equal to between 30-50% of the potable water purchased by each metro municipality every year. Which is why the province has started to explore the opportunities offered by Sustainable Drainage Systems (SuDS), as explained by Mr Stuart Dunsmore of Fourth Element Consulting in his presentation, 'Sustainable Drainage in Gauteng: Possibilities and Barriers for Implementation'.

For this study, Fourth Element had teamed up with the province and a number of other consultancies – including AquaLinks, NMA, Eco-Pulse, Resilience Consulting Engineers and Green Vision – in an Urban Rivers Alliance. The goal of the Alliance was to measure the impact, if any, that SuDS could have as a climate change adaptation in the light of increased awareness around water security.

SuDS go beyond conventional drainage systems that are designed to manage runoff into streams, explained Dunsmore. In contrast, SuDS aim to reduce the volumes of water running off into such streams and, for example, recharge groundwater aquifers by increasing the amount of water taken up by the soil. "But even more than that, you're trying to engineer that water into different components so that you can use them in a manner that's more effective, either to the environment, or to potential users down the line," he said.



To this end, the study had targeted SuDS in a township area in Kagiso in the West Rand; the Johannesburg CBD; and a suburban area in Ekurhuleni, close to the OR Tambao International Airport. Contrary to popular perception, SuDS have been widely implemented in Gauteng, although these projects have often been weakened by poor coordination between the municipal departments, private developers and the specialists involved, argued Dunsmore.

There are other barriers as well. New municipal regulations and by-laws would have to be drawn up to enforce sustainable drainage. The permitting landscape would also have to be altered to allow for more creative design.

But teamwork and coordination, Dunsmore would be at pains to point out throughout the presentation, are essential to the success or failure of SuDS. Such systems demand multidisciplinary skills and collaborations, involving stormwater engineers, landscape architects, hydrologists, hydropedologists and many others. Although the make-up of such teams would vary by project type, scale and location, he cautioned.

TOP WISA 2020 STUDENT AWARD GOES TO WITS UNIVERSITY'S WEBSTER MAGOWO

BY DI CAELERS

University of the Witwatersrand PhD student Webster Magowo took top honours in the student awards at the 2020 Water Institute of South Africa's (WISA) annual conference, winning free registration for next year's event, as well as a R3000 cash prize.

Magowo was recognised for his research topic, Co-treatment of acid mine drainage and Fischer Tropsch Wastewater using dissimilatory sulfate reduction. The three runners-up in the awards were the University of Cape Town's (UCT) Alice Harvey (MSc Eng), the Tshwane University of Technology's Leny Letjiane (MEng Chem), and PhD student Craig Tanyanyiwa, also from UCT.,

Aimed at encouraging student participation at WISA's annual conference, and rewarding postgraduate research excellence in the water sector, awards are usually presented for the Best Paper and the Best Poster. Because COVID-19 forced the conference online this year, a single winner was named, with three runners-up.

Other than cash prizes and some conference access privileges, the winners also receive a certificate.

Congratulating all the winners, Ashton Busani Mpofu, national lead of the SA Young Water Professionals network, stressed the importance of research and development in helping the country to realise Sustainable Development Goal (SDG) 6 of clean water and sanitation for all, and in growing the economy and reducing youth unemployment.

"We celebrate your achievements, especially because we recognise how challenging post-graduate studies can be, particularly in times like these when the world is plagued by COVID-19," he said.

Mpofu explained that the winners' work could be key in solving challenges in the water sector when "developed, demonstrated, and commercialised". He also urged other young professionals in the water sector to join the YWP-ZA, where the Imvelisi enviro-entrepreneurship programme was available to support their business development efforts.

"We need a change of mindset from being employees only to being entrepreneurs too, especially in respect of water and biodiversity innovations, if we are to meet SDG 6," he warned.

The panel of adjudicators included Dr Jo Burgess (Isle Utilities, UK), Dr Heidi Snyman (Golder Associates), Leonardo Manus (Department of Water and Sanitation), and Dr Sarah Slabbert and Nadja Green, both of BHI 32.

THANK YOU TO OUR SPONSORS AND EXHIBITORS FOR SUPPORTING #WISA2020