FLUID THOUGHTS

WRC CEO, Dhesigen Naidoo

Municipalities as the theatre of change

The municipal level challenges in South Africa are well known.

Implementation challenges, financial sustainability, social delivery protests and, more recently, impropriety scandals have become commonplace in the media and the public discourse.

Add to this the stark challenges of the Covid-19 pandemic, and the promise of a 'better life for all' seems under the most severe threat. As we expand outwards to the national and continental level, the accumulative negative effect is plain to see.

The United Nations (UN) Sustainable Development Goal (SDG) progress reports indicate that for Africa, and even better resourced South Africa by comparison, the development and delivery of water and sanitation solutions are not happening at the pace that will guarantee universal access to clean water and safe sanitation sustainably by 2030. This, unfortunately, is in line with the current global trends. All of which has prompted the UN Secretary General, Antonio Guterres, and UN Water to launch the SDG 6 Global Acceleration Framework and the Decade of Action (2020-2030) in order to catalyse a series of measures in the Global SDG project (for more on this see the September/October 2020 edition of ***the Water Wheel***).

The Global Acceleration Framework is characterised by five critical pillars. Three are the mainstays of finance, capacity building and governance, which remain critical success factors. The other two are new and, like the virus that prompted us into action, novel. These two pillars are data and information, and innovation.

"We want our citizens to be the beneficiaries of the best water supply, wastewater treatment and state-of-the-art affordable sanitation."

This is prompted by the realisation that trying to solve twenty-first century problems with twentieth century technology and nineteenth century operating rules is doomed to failure. We must harvest the best that the Fourth Industrial Revolution (4IR) toolbox has to offer us in the form of intelligent control systems, big data-enhanced design, planning and implementation, as well as artificial intelligence driven monitoring, evaluation and behaviour modification to better practice, smart and more efficient water use and waste treatment.

One of South Africa's ironies is that it is a top-20 producer of new water knowledge, technologies and solutions worldwide, with an unfortunately weak record of scaleup and appropriate commercialisation of these new groundbreaking inventions. This is in spite of having such forward-looking achievements such as the Water and Sanitation chapter of the Industrial Policy Action Plan, and a sophisticated Water Research, Development and Innovation (RDI) Roadmap embedded in the Water and Sanitation Master Plan.

The Local Government Technology and Innovation Forum, a partnership between the Water Research Commission and the South African Local Government Association (SALGA), is a critical intervention to reverse these negative fortunes. The forum seeks to enable four critical pillars.

The first is to set up and expand a network of testbeds for groundbreaking water and sanitation solutions emanating from South Africa and the global RDI partnership. We want South African districts, towns and cities to be among the leaders in sustainable water and sanitation solutions. We want our citizens to be the beneficiaries of the best water supply, wastewater treatment and state-of-the-art affordable sanitation.

We have a number of very important international partners, including the likes of the Bill & Melinda Gates Foundation, the Global Water Research Coalition, the Toilet Board Coalition, the International Water Association and many others that are keen to walk this journey with us. It will hopefully stimulate a positive knock-on effect in Africa and the developing world. We are hopeful that this will further stimulate the private sector to invest in developing and manufacturing these new products and solutions for both the South African and global markets.

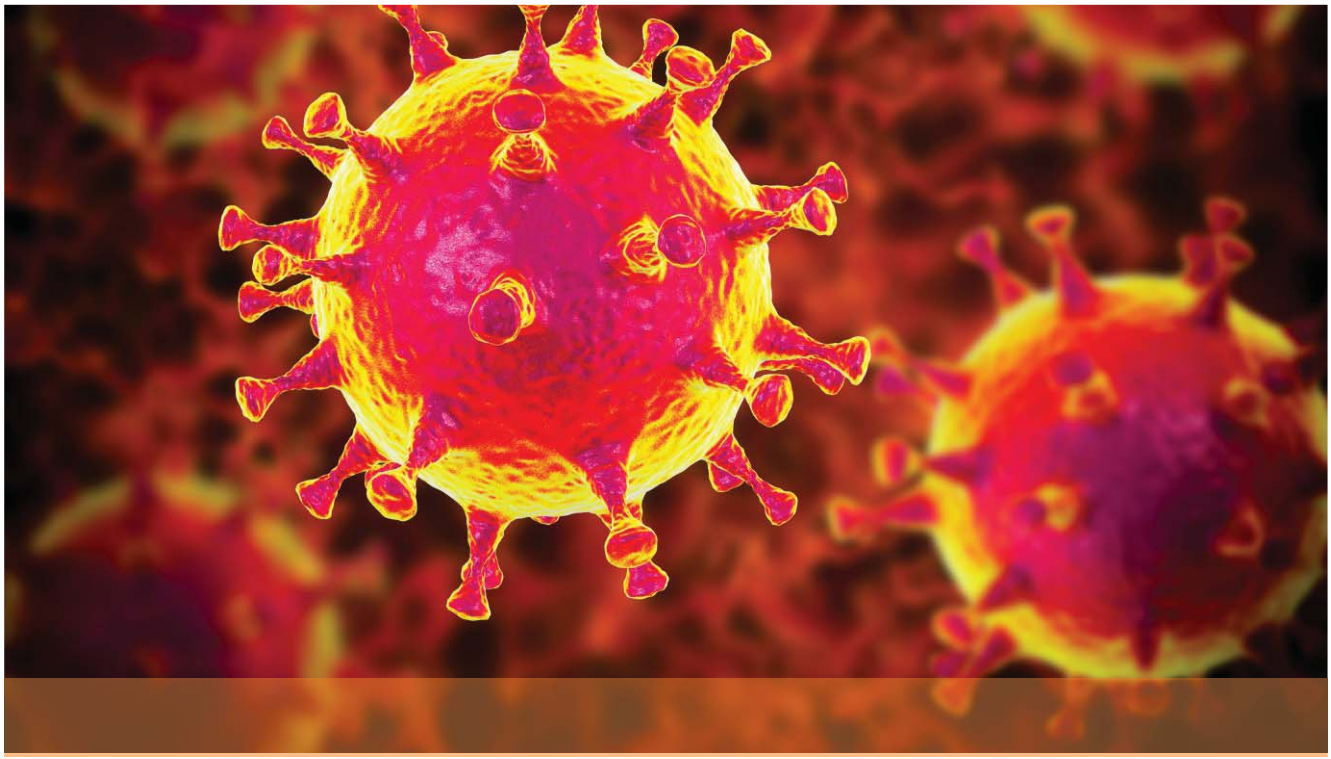
The demonstrator test-bed network in our own municipalities will significantly de-risk the enterprise and attract investors foreign and domestic. We can and should be world leaders in such domains as New Sanitation, next generation wastewater treatment where these new plants will become net energy

producers alleviating our energy security challenges, and producing clean water from seawater and acid minewater through smart low energy and low-cost desalination technologies already proven in our own laboratories. When we add to this the possibilities related to urban agriculture and water sensitive design, we have the promise of water, energy and local food security enhancements in every municipality in the country.

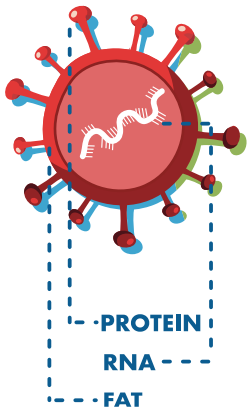
However, access to advanced solutions and 4IR tools are not enough. The other three pillars of the forum are a knowledge and learning partnership network among municipal officials, bridges to influence decision-making and the strength of a collaborative partnership to improve our chances for increased funding and resources to enhance water and sanitation delivery at local level – for all uses and all users.

The pathway to improved water security is a challenging one, especially since all long-term climate change scenarios for the southern African region point to a drier and hotter future. As a country we are already a net recipient of climate change refugees. Let us through this Local Government Technology and Innovation Forum help to stimulate the investments (financial and political) and actions by all parties that enable our municipalities to become the theatres of change and transformation to a better and greener future.

- WRC CEO, Dhesigen Naidoo, delivered this address at the Launch of the Local Government Technology and Innovation Forum in September.



Information resources on water and Covid-19



The following Covid-19 and water related resources are available:

- Water Research Commission http://www.wrc.org.za/corona-virus/
- International Water Association https://iwa-network.org/news/information-resources-on-water-and-covid-19/
- Global Water Research Coalition http://www.globalwaterresearchcoalition.net/
- World Health Organisation https://www.who.int/water_sanitation_health/news-events/wash-and-covid-19/en/
- Water Supply and Sanitation Collaborative Council https://www.wsscc.org/2020/03/31/covid-19-transmission-and-sanitation-and-hygiene-services/

NEWS

SA President calls on world leaders to prioritise environmental conservation

As countries across the world grapple with rebuilding their economies amid the destruction caused by Covid-19, President Cyril Ramaphosa has called on governments to prioritise environmental conservation.

President Ramaphosa made the call during his address at the virtual Summit on Biodiversity taking place on the sidelines of the 75th United Nations General Assembly in September.

"The Coronavirus pandemic has badly affected the ability of national economies to respond to challenges like environmental degradation and climate change. But even as we prioritise economic revival and reconstruction, we must maintain our collective commitment to environmental conservation," he said.

The President said this was even more important considering that there are strong linkages between environmental destruction and the emergence of new deadly diseases in humans.

"Biodiversity loss, deforestation, the loss of farmland, animal habitat loss and the consumption of wild species are creating conditions for infectious diseases that we will soon be unable to control.

"South Africa commits to working with the UN Environment Programme in the development of tools to track the future emergence of Zoonotic disease," he said.

South Africa is the third most mega biodiverse country in the world, with unique species and ecosystems found nowhere else on earth. South Africa as a signatory to the Convention on Biological Diversity, is working to conserve its biodiversity, promote its sustainable use and ensure the benefits of the commercial use of genetic resources are fairly distributed.

Source: SAnews.gov.za

SA firms commit to less food waste

The Consumer Goods Council of South Africa (CGCSA) has launched the South African Food Loss and Waste Voluntary Agreement, which commits food manufacturers and retailers to reduce food waste.

Launched in September, the Food Loss and Waste Voluntary Agreement was developed by CGCSA in partnership with the Department of Trade Industry and Competition (DTIC) and the Department of Environment Forestry and Fisheries (DEFF). It was co-funded by the European Union (EU) through the SA-EU Dialogue Facility.

Government's partnership with CGCSA and cooperation with the SA-EU Dialogue Facility have been instrumental in the development of the Voluntary Agreement, which will assist South Africa to reduce food waste, in line with the Sustainable Development Goals (SDGs) 2030. It will also showcase the value of public-private partnerships in developing innovative strategies to bolster the circular economy.

The agreement commits CGCSA food manufacturing and retail members to implement measures to minimise and reduce food waste in the country. Speaking at a virtual launch, Environment, Forestry and Fisheries Minister Barbara Creecy welcomed the initiative and its potential to ensure more sustainable consumption patterns in the country.

Creecy noted that water scarcity, land degradation and burgeoning food and packaging waste are some of the major environmental problems of our time. "Organic waste is a major component in any landfill and all efforts to divert this waste through ensuring better use of food products is a significant contribution to our joint efforts to promote resource efficiency," Creecy said.

CGCSA Food Safety Initiative Executive Matlou Setati said the current estimates show that about 10 million tonnes of local agricultural produce in South Africa is wasted each year.

"This is equivalent to an estimated R60 billion a year. In a country where an estimated 14 million people go to bed hungry every night, this is a monumental unnecessary waste, which cannot be allowed to continue," Setati said.

Source: SAnews.gov.za

Groundwater brings relief to Karoo town

Groundwater specialists from SRK Consulting have assisted Prince Albert Local Municipality in the Karoo to ensure a reliable and sustainable supply of groundwater to local communities at Leeu Gamka.

According to Ashley America, Manager Infrastructure Services at Prince Albert Local Municipality, the addition of three boreholes was able to resolve supply issues arising from the low yield from existing boreholes, and the poor water quality that strained the municipality's reverse osmosis (RO) treatment system. America said that Leeu Gamka had three communities requiring a more stable water supply – Bitterwater with 606 households, Newton Park with 26 households and the Transnet housing scheme with 40 households.

Leon Groenewald, principal hydrogeologist at SRK Consulting, said the most productive of the existing boreholes in the area was able to deliver an hourly yield of between 15 000 and 18 000 litres, supplying a maximum volume of 432 000 litres per day.

"This fell considerably short of the peak daily demand for Leeu Gamka during the summer season between November and January, which reaches 610,000 litres," said Groenewald.

To supplement the shortfall, the municipality were forced to use two other production boreholes which were unsustainable and low-yielding. Their poor water quality also meant the water required extensive treatment by the RO treatment plant before it could be rendered potable.

SRK began work with the municipality during the drought in 2017, when initial geohydrological work began, followed by drilling and testing of potential boreholes. This was funded by the Drought Relief Fund through the Western Cape Department of Local Government.

The first phase of the project involved an extensive geophysical survey and geological mapping. Boreholes were sited and a drilling contractor selected and supervised by SRK. Based on what the client required, the yields were tested and interpreted, to ensure that the pumping regime could meet the communities' water needs while remaining sustainable.

"Our drilling and testing programme produced three boreholes that could be used by the municipality, with a combined yield of 518,000 litres per day," he said.

The second phase of the project – which was completed earlier this year – involved the equipping and commissioning of the boreholes. SRK was again engaged by the municipality for phase two, for a range of services. These included borehole pump design and installation, pipeline design to connect boreholes to existing infrastructure, as well as project and contractor management.

SA research institute celebrates 75 years

The Council for Scientific and Industrial Research (CSIR) has marked 75 years of conducting research aimed at improving the quality of life of all South Africans on 5 October.

The council was established through an Act of Parliament in 1945, with the organisation's executive authority being the Higher Education, Science and Innovation Minister.

The CSIR plays a significant role in supporting both the public and private sectors through directed research that is aligned with the country's priorities, the organisation's mandate and its science, engineering and technology competencies.

Nothing this research excellence, Higher Education, Science and Innovation Minister, Dr Blade Nzimande, said that the CSIR has put South Africa on the global map by leading research and technological development in the country. "Over the years I have been observing, with great pride, the work that the organisation does; work that had made a huge contribution to our country. We are proud of what the CSIR has achieved in the past 75 years through science, technology, engineering and innovation.

"We also pay tribute to the leadership; the scientists and all the support staff, who over the years…have passionately, and are continuing to contribute to the transformation of the organisation", he said.

Source: SAnews.gov.za

GLOBAL

New malaria mosquito threatens mass outbreaks in Africa

Africa has just months to react to an invasive malaria mosquito that thrives in cities, before the situation escalates beyond control, experts warn.

Scientists predict that more than 125 million city dwellers across Africa will face a higher malaria risk from a type of Asian mosquito that is quickly moving across the continent. The mosquito, ***Anopheles stephensi***, is one of the few malaria mosquitos that thrives in urban areas because of its ability to find clean water to lay its eggs.

Malaria is traditionally considered to be a rural disease. In Africa, city centres can be completely free of malaria transmission, according to experts from the London School of Hygiene and Tropical Medicine (LSHTM).

But, the invading mosquito could drastically alter the location and movement of malaria in Africa, which records 94% of global malaria deaths, mostly in children under five. "I think it's really quite scary," says Jo Lines, professor of malaria control and vector biology at LSHTM. "It's part of our duty as [scientists] to be saying: 'Look here, something's happening here.' If we don't shout now it will be too late."

New research led by Marianne Sinka, a senior postdoctoral researcher at the University of Oxford, says that ***An. stephensi*** may already be adapting to its new environment and becoming active year-round.

"If it continues its incursion into the African continent unchecked, there is a very real possibility of mass outbreaks of malaria," Sinka's team says. "In a continent striving to improve and strengthen its health systems, such a huge burden could be catastrophic. Targeted vector surveillance is therefore urgently needed."

The research has been published in the Proceedings of the National Academy of Sciences of the USA (PNAS). To view the original research article, Visit: https://www.pnas.org/content/early/2020/09/08/2003976117#sec-7

Guidelines proposed for sustainable use of invasive trees

A team of international scientists, including several with current or previous affiliations with the South Africa Centre for Invasion Biology (CIB), have collaborated to propose a series of global guidelines for the sustainable use of non-native tree species to help protect biodiversity and ecosystems around the world already threatened by climate change.

The paper, published in the journal ***NeoBiota***, uses the Council of Europe – Bern Convention Code of Conduct on Invasive Alien Trees as a starting point to present eight recommendations aimed at maximising the benefits of non-native trees, while minimising their negative impacts.

The guidelines include using native threes wherever possible, or non-invasive non-native trees as opposed to invasive non-native trees; being aware of the risk of invasion and considering global change trends and developing and supporting global networks and collaborative research and information sharing on native and non-native trees.

The scientists suggest that the guidelines are a first step towards building a global agreement on the precautions that should be taken when introducing and planning non-native trees. The aim is that the guidelines should serve to complement statutory requirements under international and national legislation.

To view the original article, Visit: https://neobiota.pensoft.net/article/58380/

Source: CIB

Water scientists warn of risks in shift to monoculture crops, tree plantations

Conversion of large swaths of land to uniform tree plantations and single-crop species may lead to unintended consequences for the water cycle, putting ecosystems at greater risk for fires, floods, droughts and even hurricanes, warns a think-tank group of almost 30 water scientists from 11 countries.

Worldwide, policies are increasingly aimed at planting more trees and crops both to combat climate change and increase food and fuel production. Already about 40% of the world's ice-free land surface has been converted to forestry and agriculture – often with only a few choice tree species and crops where biodiversity once thrived. This trend is poised to continue or even accelerate.

But in an article published in ***Nature Geoscience***, the scientists argue that mixed-species diversity is crucial to the water cycle pathways that enable soil-plant-water systems to recover quickly from environmental stresses. Forestry and agricultural monocultures (growing a single species repeatedly on the same land) can constrain these pathways, adversely affecting conditions such as soil moisture and erosion, streamflow, evaporation, and groundwater quality--and ultimately reducing ecological resilience.

The authors urge policymakers and land managers to take into account critical water-vegetation interactions to guide decisions about what to plant and where. "When we modify landscapes to help combat climate change or meet human demands for food and energy, we need to be smart about it," said Irena Creed, a University of Saskatchewan hydrologist who co-led the think tank paper with University of Delaware researcher Delphis Levia.

"We need to emulate what was natural by not relying on just a few choice crops or trees but instead embracing biodiversity. When you narrow biodiversity to a few select crops, it makes the whole ecosystem vulnerable."

Creed explains that the rate, timing and magnitude of water released to the atmosphere varies with each plant species. "By having a diverse range in the rate of water movement, you are building a more diverse water system that can withstand water stresses such as droughts and fires," she said.

Read the paper here: www.nature.com/articles/s41561-020-0641-y

World aquatic scientific societies call for drastic action against climate change

Aquatic scientific societies around the world, including South Africa, have called for urgent action to be taken against climate change.

In a published statement the societies noted how the world's aquatic resources are now under their greatest threat in human history. "Human-caused climate change is accelerating the degradation of aquatic ecosystems and the services they provide. Aquatic ecosystems are among the most affected worldwide (e.g., in case of freshwater ecosystems, one measure of biodiversity, the freshwater living planet index for species populations, declined 83% from 1970 to 2014).

We, the world's aquatic scientists, spend our lives studying these systems. We see exceptional and disturbing changes in the world's aquatic ecosystems due to climate change and believe that we must continue to share peer-reviewed scientific findings with the public and policymakers to emphasise the seriousness of this threat and the need for immediate action."

Climate change impacts already occurring range from increased frequency, intensification, and severity of droughts, heat waves, floods, wildfires, and storms; melting glaciers; destabilisation of major ice sheets; shifting ocean currents, rising sea level; ocean acidification and deoxygenation; shifts in species ranges, including expansion of alien-invasive species; aquatic plant and wildlife disease outbreaks; mass coral bleaching events; and more, with a mounting toll on vulnerable ecosystems, human societies, and local and global economies. These events are precursors of even more damages to fisheries, biodiversity, and human society at large.

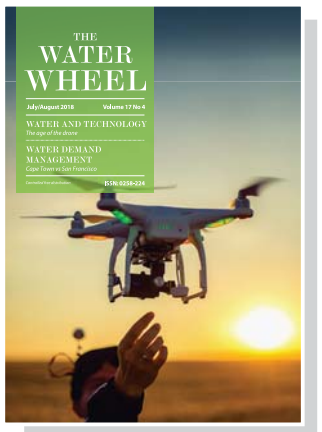
"If humanity wishes to avoid calamitous consequences for our aquatic ecosystems and humans that depend on them, the time to curb greenhouse gas emissions, sequester greenhouse gasses, and adapt to an already changing climate is now," the scientists said. "Intelligent, rapid movement toward such goals will provide great benefits to aquatic ecosystems and the humans that depend on them."

The scientist further propose a rapid transition towards energy sources and other products and services that do not release greenhouse gases, and research and policies that favour an efficient transition to a low carbon world to slow the degradation of aquatic systems.

"Done intelligently, movement to curtail human-caused climate change can result in advanced, novel technologies; strong economies; healthier aquatic ecosystems; greater food security; and human well-being."

THE WATER WHEEL

SUBSCRIPTION



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WRC MOVES TO PILOT STUDY TO MONITOR COVID-19 IN WASTEWATER

Following the conclusion of a successful proof-of-concept study to test various monitoring techniques, the Water Research Commission has moved to the next step to establish Covid-19 monitoring through wastewater in South Africa. The research programme is being undertaken in association with the South African Local Government Association (SALGA).

Many Covid-19 infections are asymptomatic and, unless tested, remain undetected. Recent studies have shown that environmental surveillance of SARS-CoV-2 biomarkers – called RNA – can be a low-cost solution for tracking COVID-19 outbreaks in communities. This is because, once in the body, the virus can be shed through faeces and urine, as well as through saliva and other respiratory discharges. The virus and/or its remnants are introduced into water resources and wastewater through the discharge of human waste, coughing and sneezing while bathing or showering, washing of hands or clothes, and discarding tissues and wipes into the toilet.

Therefore, the presence or absence of SARS-Cov-2 in wastewater entering a sewage treatment plant can determine the presence of infected individuals in a community, and can be used as an epidemiological indicator, especially where community testing is not possible. Critically, this will provide decision support for officials determining the timing and severity of public health interventions to mitigate the overall spread of the disease. A number of countries have since the outbreak of the Covid-19 pandemic introduced wastewater-based epidemiology.

Proof-of-concept study

For this reason, the WRC, with SALGA, launched a project earlier this year to test the concept of detecting RNA signals of the SARS-CoV-2 virus in wastewater samples in South Africa. The study served as a short-term, proof-of-concept study prior to the rollout of a national surveillance programme.

Wastewater was collected from ten wastewater treatments works in several provinces over a period of four weeks. Samples were also collected from a hospital and a prison. In addition, samples were collected from small wastewater treatment works serving industries and mines.

As an indicator for SARS-CoV-2 prevalence in non-sewered communities, four surface water grab samples were collected from the Jukskei River downstream of Alexandra informal settlements, the Hennops River, downstream of Tembisa informal settlement, as well as the Blougatspruit in the Cradle of Humankind. A surface water runoff sample was also collected from Alexandra.

Three virus recovery methods were tested, based on their ease of use and cost-effectiveness. All three these methods tested were effective in the recovery of the SARS-CoV-2 virus.

Main results

SARS-CoV-2 RNA was detected in 98% of wastewater samples collected. This confirms and demonstrates the power of wastewater surveillance of the SARS-CoV-2 virus responsible for Covid-19, and has demonstrated the proof of concept. An increase in viral load also corresponded with an increase in clinical cases in the same area. All the environmental samples tested positive for the presence of Covid-19 as well.

Sampling of combined sewage for a defined population, such as a prison, hospital or hostel can be useful for surveillance of increased viral load to give early warning of a possible surge in infections, the study has established. It is important, however, that regular samples be taken over time to establish trends and baselines, due to the inherent variability of sampling from smaller populations compared to a regional wastewater treatment plant. This could provide a cost-effective and less invasive means of continuous screening. Where increasing trends in viral load are noted, additional clinical test methods could be rolled out based on an early warning system.

Way forward

Phase two of this initiative, which involves pilot-scale monitoring, is expected to kick off before the end of the year. Partnerships for pilot-scale monitoring have been established through phase one between laboratories, municipalities, the Department of Water and Sanitation, private sector and research organisations. This phase will see the scaling and commissioning of a collaborative monitoring initiative in provision hotspots using the sampling and testing protocols developed in phase one.

To download the report, ***Proof of Concept study: Application of wastewater-based surveillance to monitor SARS-CoV-2 prevalence in South African communities*** (**WRC Report no. TT 832/20**)
https://bit.ly/3mji1YK