

FLUID THOUGHTS

Finding spring in the heart of winter



WRC CEO, Dhesigen Naidoo

The following message was conveyed at the 2021 graduation of MSc students at IHE Delft.

The year 2020 was almost uniformly, across the world, a Global Winter Of Discontent. We are still greeted on a daily basis by the updates of the COVID-19 pandemic's new infections and mortality numbers reminding us that in spite of a vaccine roll-out in most parts of the world, we are far from declaring a decisive end to 21st century plague. In fact, the hope that 2021 will be the last year of the epidemic is seriously in doubt.

And the other three horses of the modern apocalypse show little sign of abating. The first is the global climate crisis. We have been on a downward slide since Kyoto, with a renewed glimmer of hope in Paris. We then had to endure four very hard years as the fossil fuel lobby almost succeeded in relegating the Paris Agreement to the dustheaps of history. In fact, in these years the climate crisis led a quartet at the top of the World Economic Forum's Global Risk Register, a perception survey of the leadership of the global economy.

The other three members of this quartet are extreme weather events, biodiversity loss and the water crisis. The latter refers to overall water security, quantity and quality dimensions as a primary constraint to development and the attainment of the United Nations (UN) Sustainable Development Goals (SDGs) on the one hand. And the local, regional and global general security and conflict matters on the other. The implications of water geopolitics in a weakened multilateral water diplomacy environment are a cause for great concern.

At a much broader level, this is, in fact, the third horse of the apocalypse, the very weakened, highly fractured multilateral system. This is in the political arena, the development arena, the domain of global human rights, and the domain of international justice. The global trade system has in recent years fell into a deep gorge of trade wars; the United States-China trade conflicts have hogged the headlines, but this has been replicated in varying degrees across the world. Rounding off this is the deepening economic crisis. The pandemic called a halt to every level of economic activity everywhere in the world. The impact has been devastating, plunging the global growth rate close to the margins of an unprecedented -10%. This winter is dark, cold and hard.

But, the most dismal of winters always gives in a warming, a thaw, a rejuvenation – a Spring of Hope. Class of 2021, this Spring of Hope operates in three distinct theatres of operation. The first is the political arena. January 2021 kicked off with the Climate Action Summit. Hosted by the Netherlands, it was attended by 30 global leaders, 50 ministers and leaders from business, labour and civil society and youth leaders. It set out the aspiration of a global adaptation agenda on the one hand, and potential resurgence of a revived spurt of multilateral action on the other. UN Secretary General, Antonio Guterres, set out the call for 50% of climate finance to be redirected to adaptation actions holds great promise for water and sanitation development.

“The only way we are going to get close to the SDG 6 targets by 2030 is on the back of smart new innovations in water and sanitation.”

The second arena is economic recovery and development. The World Economic Forum convened virtually for its January 2021 meeting under the banner of “The Great Reset”. A powerful acknowledgement from the joint leadership of the global economy of the destructive nature of the current fossil fuel driven trajectory of the world's economic apparatus, and the need to the Great Reset. A rest in the direction of sustainable development, a stemming of biodiversity loss, a decline in the world's fossil fuel addiction and, perhaps most importantly, striving toward a less unequal world. Actions have followed rapidly, with major investment funds declaring a timeline on their exit from fossil fuel based and high carbon enterprises. A concrete example is Sweden's \$37.5 billion pension fund which has recently withdrawn its high carbon investments worth \$4.5 billion and will certainly catalyse a movement by its partner funds. A redirection of investments are not only for the corporates, but as the Economics of Biodiversity review led by Prof Partha Dasgupta points out, we must all exercise and mobilise our individual agency in this domain, as we know in the water world “every drop counts”.

The third stage is yours class of 2021 – that of science and innovation. The only way we are going to get close to the SDG 6 targets by 2030 is on the back of smart new innovations

in water and sanitation. We have to turn over the current constraint of trying to solve 21st century water challenges with 20th century technologies and 19th century operating rules. We have to take advantage of the new knowledge and innovations contributed to by this very 2021 IHE Cohort as the means to empower the political declarations and provide a toolbox to achieve the economic aspirations that are being expressed at the various pulse points, including the World Bank/IMF Spring meetings convened under the banner "Economic recovery: toward a green, resilient and inclusive future". This space has to transition to diversified water sources world operating in a One Water paradigm with recycling and reuse teaming with high demand efficiencies and point-of-use quality solutions. This will be accompanied with the 4th Industrial Revolution toolbox of digitalisation, automation and enhanced intelligence solutions. We look forward to the required investments in the potential already laboratory proven water-energy-food nexus solutions. All this with an enlarged cohort of water and sanitation practitioners – in number, representivity and discipline for the ideal 21st Century Water Team.

To conclude, UNESCO IHE Class of 2021, let me reflect on some characteristics of this special resource water and the lessons they hold. Lao Tzu, the founder of Taoism in the 6th Century BC reflected that "nothing is softer and more flexible than water, yet nothing can resist it". To underestimate water interventions

and its impact on society – both positive and negative - would be a serious mistake. The second is the acknowledgement that water is a great carrier of energy, as we observe in great storms and tsunamis, and yet its real power lies in persistence. Those great gorges carved by rivers bear testament to this quality of perseverance. In the water sector, with its great conservatisms and technology lock-ins, you as the young leadership will have to express much of this characteristic to turn around our global and local water challenges. The third characteristics I wish to cite is for me the most endearing one. Hydrogen bonding. This unique property allows water molecules to connect and collaborate in partnership while still in a high energy liquid state. This affords an unbelievable strength as anyone that belly dived into a swimming pool can attest. In this great quest to future water prosperity, the partnerships and collaborations built inside the water sector and between the water sector and various others – horizontally and vertically as with H-bonding will be a key to success.

IHE Class of 2021, you are the lead company in the Spring of Hope battalion. The current leadership and water practitioners look to you as the catalyst for positive change. Congratulations on your phenomenal achievements and good luck in the journey to build back better, build forward greener and help us get to a resilient, and more equal world.



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NEWS

SU warns against the reuse of laundry greywater following study



For the sake of the soil in which your plants must grow and thrive, think twice before deciding to reuse laundry greywater in your garden. If you really want to use it as part of your greywater system, at least then choose liquid washing detergent over washing powder, as it still degrades the soil, but not as much. That is the message from soil scientists at Stellenbosch University (SU), who published the first ever comprehensive research on the topic in the *Journal of Hydrology*.

The study was led by Dr Ailsa Hardie of the Department of Soil Science in the Faculty of AgriSciences at the university. It is based on the MSc work of one of the co-authors, Ncumisa Madubela. Dr Cathy Clarke and Vink Lategan, also of the SU Department of Soil Science, contributed to the study.

Laundry greywater is one of the largest and easiest sources of greywater to reuse, as it simply requires extending the washing machine drainage hose, whereas direct access to drains is required for

reusing other sources such as bathing water. It, however, has its drawbacks.

“When Day Zero loomed for Capetonians, many admirably responded by reusing greywater to irrigate their gardens. While it serves to keep some of plants alive, the reused laundry water isn’t benefitting the soil in which they are planted,” says Hardie. “The same chemicals in washing detergent that strip dirt and grime from clothing also strip beneficial humus from the soil. Humus is the best part of the organic matter in soil, and contributes to its health, fertility and water holding capacity,” she explains.

This “stripping effect” causes clay particles in the soil to disperse and blocks soil pores. This, in turn, causes a crust to form on the surface that seals the soil.

“It becomes difficult for water to soak into soils and increases runoff when it rains or when you water your garden. In essence you are then actually wasting water, because in time very little water gets to penetrate into the soil to reach plant

roots,” says Hardie.

The blocking of soil pores also decreases the water holding capacity of soils. In times of drought this makes soils even drier. Soils become increasingly saline (brackish) and alkaline.

“Plants cannot thrive in such soils, or take up water and certain essential nutrients,” explains Hardie. “The degradation sets in from the very first addition of laundry greywater to your soil. In time, it becomes very difficult to fix.”

During the course of the study, it was found that powdered laundry detergent greywater is far more harmful to soils than liquid laundry detergent greywater. This is because of the difference in their main chemical ingredients. Washing powder is very alkaline (pH 9-10) and contains a lot of sodium carbonate, while water is the main ingredient of liquid detergents. Both types contain a host of ionic and non-ionic surfactants, ion sequestering agents, bleaching agents and enzymes that help to remove soil and grime from fabrics.

“It makes sense that by their very nature detergents would also therefore degrade and strip soil when used for irrigation,” explains Hardie. “Powder detergent greywater should not be used to irrigate soils due to its aggressive soil degrading qualities. Liquid detergent-based greywater should be used cautiously,” says Hardie.

The study was conducted using soil samples from Cape Town and Stellenbosch, and showed that certain soils are more susceptible to the negative effects of washing powder-based laundry greywater than others. “We found that sandy soils are the most susceptible to the stripping effect that washing powder greywater has on soil humus,” says Hardie.

To access the original journal article, visit: <https://doi.org/10.1016/j.jhydrol.2021.126059>

New CEO for the SA National Biodiversity Institute

Cabinet has concurred with the recommendation by the South African National Biodiversity Institute (SANBI) Board to appoint Shonisani Munzhedzi as the CEO of the entity.

Both the Minister of Forestry, Fisheries and the Environment, Barbara Creecy, and Deputy Minister, Makhotso Soty, have welcomed Cabinet's concurrence of Munzhedzi's appointment.

"Munzhedzi's appointment comes amid the public consultation into the Revised National Biodiversity Framework 2019 to 2024, which is an important policy instrument for the management and protection of species and ecosystems. SANBI is closely involved in the preparation of the National Biodiversity

Framework, and a bioregional plan or biodiversity management plans," the Department of Forestry, Fisheries and the Environment said in a statement.

SANBI, an entity of the department, contributes to South Africa's sustainable development by facilitating access to biodiversity data, generating information and knowledge, building capacity, providing policy advice, showcasing and conserving biodiversity in its national botanical and zoological gardens.

"Munzhedzi brings with him a wealth of experience, having most recently served as the Deputy Director General: Biodiversity and Conservation in the Department of Forestry, Fisheries and the Environment. He has served in numerous

environment and conservation portfolios in his more than 26 years of experience in public service. This has included serving the department in areas of Climate Change Adaptation, Conservation and Biodiversity Management," the department said.

Munzhedzi served as the Senior General Manager responsible for Environment and Tourism in Limpopo province. He holds a Master's Degree in Environmental Management specialising in Conservation Management and a Masters in Business Leadership. He serves on the boards of the South Africa National Parks (SANParks), the African World Heritage Fund and the South African Wildlife College.

Source: SAnews.gov.za

President welcomes efforts to improve water infrastructure



South African President, Cyril Ramaphosa, has welcomed the renewed focus on improving municipal water infrastructure and related services.

The President said the provision of quality water to all communities is essential for human health and well-being, economic development and the realisation of the constitutional rights of all South Africans. The President made the observation at a meeting of the Presidential Infrastructure Coordinating Commission Council held earlier this year.

The council brought together the President, Deputy President and other members of the National Executive, Premiers, Executive Mayors, and leadership of the South African Local Government Association and state-owned enterprises. The council received a report and recommendations regarding the historical, large-scale strategic integrated projects (SIPs) and an update on South Africa's Infrastructure Investment Plan.

The meeting's key discussion was on municipal water infrastructure, a complex

area in which the council has identified challenges ranging from infrastructure failure (sewer spillages, potholes, leaks and solid waste on streets) to infrastructure service delivery interruptions (water cuts, electricity cuts, road closures and non-collection of refuse). Water infrastructure is also affected by a shortage of technical skills in local government, poor infrastructure management practices and inadequate budgeting and expenditure on maintenance.

The council resolved that it will enable the planning and coordination function of the water component of the District Development Model through the implementation of a National Water Programme Management Office, jointly owned by the Department of Water and Sanitation (DWS) and Cooperative Governance and Traditional Affairs (COGTA). It will also strengthen the planning of municipal water infrastructure to access blended finance through the Infrastructure Fund.

Source: SAnews.gov.za

GLOBAL

Climate change 'has dented global agriculture productivity'



Global agricultural productivity has declined by about 21% in the last 60 years as a result of climate change, a newly published study has found.

The decrease was most pronounced in warm regions such as Africa (30%) and Latin America and the Caribbean (26%), according to research published in *Nature Climate Change* which looked at data from 1961 to 2020. The study, by scientists from Cornell, Maryland, and Stanford universities, warns that global agriculture is now becoming even more vulnerable to climate change, despite advances in technology.

Ariel Ortiz-Bobea, professor of applied

economics at Cornell University and lead author of the study, noted: "These numbers don't mean that we are producing less than we did back in 1961 – we've actually produced more year after year. Instead, our study is saying that global agricultural productivity almost 21% lower than it could have been in a world without climate change," explained Ortiz-Bobea.

Researchers analysed annual official records of agricultural productivity in 172 countries, along with data on climate parameters. This showed them "how much agricultural productivity rose or fell in a given country, if a specific year was warmer, colder, wetter, or drier than normal," among other variables, Ortiz-Bobea explained.

Once they found this statistical relationship – known as an econometric model – they put it to the test in both the real world, and a parallel world where anthropogenic (man-made) climate change does not exist. To avoid bias, researchers kept the alternative world almost the same as the real one,

considering the last six decades in both with the same type of economy, the same use of fossil fuels, and even the same greenhouse gas emissions. "The only difference was that in the fictional world emissions didn't have the ability to alter the climate," said Ortiz-Bobea.

When comparing the two worlds, scientists discovered that climate change caused the equivalent of seven years of stagnation in agricultural productivity. This means that the level reached in 2020 is equivalent to the productivity that could have been achieved since 2013 in a world without climate change, according to a press release from Cornell University.

The slowdown in productivity comes despite significant improvements in agriculture, indicating that scientific and technological developments in agricultural are not translating into greater resilience to climate change, scientists warn.

Source: [SciDev.net](https://www.sciencedirect.com/science/article/pii/S1374869121000000)

Weather-related disasters displacing more people than conflict – UN

Weather-related crises have triggered more than twice as much displacement as conflict and violence in the last decade. This is according to the United Nations refugee agency (UNHCR).

In April, the UNHCR published data showing how disasters linked to climate change likely worsen poverty, hunger, and access to natural resources, stoking instability and violence. "From Afghanistan to Central America, droughts, flooding and other extreme weather events are hitting those least equipped to recover and adapt," said the UN agency, which is calling for countries to work together to combat climate change and mitigate its impact on hundreds of millions of people.

Since 2010, weather emergencies have forced 21.5 million people a year to move, on average.

Roughly 90% of refugees come from countries that are the most vulnerable and least ready to adapt to the impacts of climate change. These countries also host around 70% of people internally displaced by conflict or violence.

Citing the case of Afghanistan, UNHCR noted that it is one of the most disaster-prone countries in the world, as nearly all of its 34 provinces have been hit by at least one disaster in the past 30 years. The country is also ranked the least peaceful globally, owing to longstanding conflict

that has killed and injured thousands of people and displaced millions.

Recurring floods and droughts – along with population growth – have compounded food insecurity and water scarcity and reduced the prospects of refugees and internally displaced people being able to return to their home areas.

We need to invest now in preparedness to mitigate future protection needs and prevent further climate caused displacement," said UN High Commissioner for Refugees Filippo Grandi, earlier this year.

New tool will make it easier for countries to measure ecosystems



An innovative artificial intelligence (AI) tool that will make it easier for countries to measure the contributions of nature to their economic prosperity and well being was launched earlier this year by the United Nations and the Basque Centre for Climate Change (BC3).

Developed by the Statistics Division of the United Nations Department of Economic and Social Affairs (UN DESA), the UN Environment Programme (UNEP) and BC3, the new tool can vastly accelerate implementation of the new ground-breaking standard for valuing the contributions of nature that was adopted by the UN Statistical Commission in March.

The tool makes use of AI technology using the Artificial Intelligence for Environment and Sustainability (ARIES) platform to support countries as they apply the new international standard for natural capital accounting, the System of Environmental-Economic Accounting (SEEA) Ecosystem

Accounting.

The new open-source and user-friendly digital tool, called the ARIES for SEEA Explorer, enables, for the first time, rapid and standardised yet customisable ecosystem accounting anywhere on Earth.

“The ARIES for SEEA Explorer is a game changer for governments that want to implement the recently adopted SEEA Ecosystem Accounting standard,” stressed Stefan Schweinfest, Director of the Statistics Division. “This application allows countries to jump-start accounts compilation from global data sources, which they can refine with national data or model parameters.”

The ecosystem accounts produced by countries will track the extent, condition and services provided by nature’s ecosystems – such as forests and wetlands – in the form of physical and monetary accounts and indicators. The adoption of

the SEEA Ecosystem Accounting has been heralded as a historic step forward for the Sustainable Development Goals (SDGs) and to move beyond GDP in tracking global progress.

Risenga Maluleke, Statistician-General of Statistics South Africa and Chair of the UN Committee of Experts on Big Data and Data Science for Official Statistics said, “The launch of the ARIES for SEEA Explorer on the UN Global Platform is an important step to mainstream the measurement of ecosystems and their contribution to the economy and wellbeing into global, regional and domestic statistics that will feed into policy and decision making. Better measures of nature will contribute to better policies to save our planet.”

The ARIES for SEEA Explorer is available on the UN Global Platform: a cloud-service environment supporting international collaboration among all countries in the world by sharing scientific knowledge, data, methods and technology.

THE WATER WHEEL

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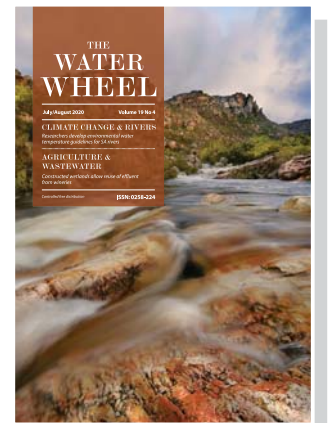
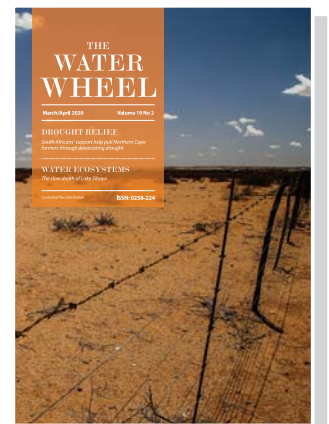
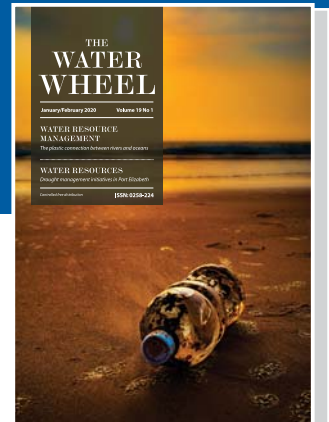
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NEW WRC REPORTS

Design flood estimation in urban areas in South Africa: Preliminary results from Tshwane case studies

Globally, more people now reside in cities than ever before, with more than half of the world's population living in urban areas since 2005. It is widely accepted that urban development results in a decrease in the permeability of a catchment and will therefore result not only in larger flood peak discharges with a faster catchment response time, but also in larger total flood volumes. However, this assumption does not take into account the constructed water drainage and reticulation systems, and the possibility of retention and attenuation in urban systems due to property boundary walls and/or the levelling of naturally sloping areas, which are typical in many South African urban areas. The need has therefore arisen for the development of a validated and verified estimation procedure to accurately estimate design floods from both formal and informal urban settlements in South Africa, especially in areas with little or no reliable streamflow data. The major aims of this project included improving the understanding of hydrological processes in the South African urban and sub-urban environments; and developing a calibrated design flood estimation method for urban and sub-urban areas, either by updating existing methods, or developing a new method, by focusing on two case studies in urbanised areas of South Africa. A small catchment in Tshwane was selected to use as a pilot study area in order to establish an applicable methodology for the model configuration and calibration applied in this project.

WRC Report no. 2747/1/20

Development and assessment of regionalised approaches to design flood estimation in South Africa

There is a need to update and modernise methods used for design flood estimation in South Africa as many of the methods were developed more than 40 years ago and hence there are longer hydrological records to use in the updating of the methods. The original aim of this study was to develop an improved and refined regionalised Probabilistic Rational Method (PRM) for South Africa, and this objective was expanded to include the development of a Regional Index Flood (RIF) method and a comparison of the performance of the two approaches was undertaken. A critical aspect of regional flood frequency analysis is the identification of homogeneous flood producing regions. Both Region of Influence and Clustering approaches were investigated and forty-two relatively homogeneous flood producing regions were identified using clustering and manual adjustments. The mean annual flood (MAF) and 10% Annual Exceedance Probability C-value (C10) for the Rational Method coefficient were selected as scaling variables to produce growth curves for both methods and regionalised regressions were developed to estimate the scaling factors, and hence estimate flood quantiles, at ungauged sites in South Africa.

WRC Report no. 2748/1/20



Operationalizing community-led water services for multiple uses in South Africa

In spite of considerable government investments in water services provision in rural South Africa, service levels are declining. High rates of dysfunctional municipal boreholes, a maintenance backlog, and communities' neglect, illegal connections, if not vandalism, underscore the need for complementary water services

models that can restore the dwindling trust in municipalities. The project 'Operationalizing community-led multiple use water services (MUS) in South Africa' (or MUS project) aimed to fill this gap by generating evidence whether and how communities' active participation in planning, design and construction can cost-effectively mobilise local knowledge and innovation, resulting in more and more sustainable livelihoods at scale. In such a model, government and communities co-manage water services. Funded by the African Water Facility of the African Development Bank, the project was designed as an evidence-based change process, managed by the Water Research Commission (WRC). The NGO Tsogang Water and Sanitation demonstrated the step-wise participatory planning, design and construction processes at community-level as a socio-technical facilitator providing technical and institutional support. The International Water Management Institute (IWMI) compiled the evidence of the change processes at community, district, provincial and national levels.

WRC Report no. TT 840/20

Climate change impacts on the safety of concrete arch dams in South Africa

The reality of climate change can no longer be ignored as evidenced by the observed temperature increases. In South Africa the temperature increase is projected to reach more than 3°C by 2050. Existing concrete arch dams were not designed anticipating climate change. Therefore, the temperature rise coupled with possible dry or wet weather will progressively lead to the deterioration of the structural integrity of concrete dams. This study has shown that concrete arch dams are likely to be overstressed in future leading to cracking. This may compromise their structural integrity. Concrete arch dams impound 39% of South Africa's total volume of water in storage reservoirs. Therefore a 'no regrets' approach is recommended to ensure their safety in the long term. Dam surveillance programmes need to incorporate climate change impacts, to ensure that the onset of possible dam failure is detected and resolved before it becomes catastrophic.

WRC Report no. 2749/1/20

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