FLUID THOUGHTS

WRC CEO, Dhesigen Naidoo

The aloe ferox may not be this season's crop

This Fluid Thoughts article has been co-authored with economist and analyst, Xhanti Payi.

The aloe plant made yet another appearance in the budget speech this year, meant to symbolise an ongoing challenge in our country – growth and emphasing that, like the aloe, growth will be slow, long lived and resilient to water scarcity.

"For the Aloe Ferox to grow to its full potential, we need to do things that will help in the medium to long run". A long-term view supported by an economic resilience strategy is therefore key. The Minister of Finance then went on to mention the importance of the right amount of water, and how our money must be invested properly. There was a further announcement that Government would inject R10 billion into the infrastructure fund over the next three years to support the R200 billion capacity that is to be built under the Development Bank of South Africa.

"The Water Masterplan's comprehensive approach to realise a better water security future for South Africa is driven by a funding model that is highly susceptible to the Sovereign Credit Rating."

The National Treasury document, *Economic transformation, inclusive growth, and competitiveness*, offers some appreciation for the tautomeric relationship between water and the economy. The economy must invest in water security to enable further economic growth. The document cites the 2019 Budget review, noting that water infrastructure projects have been allocated R90,4 billion between 2019/2020 and 2021/22. That number is now R106,9 billion, allocated for the term 2020/21 to 2022/23, in spite of the fact that the National Water and Sanitation Masterplan is costed at over a trillion Rand. Recognising this, the government has touted the idea of not only private sector participation in the water sector, but now also private sector funding.

The downgrade of South Africa's investment rating by Moody's recently to sub-investment grade, as well as the further downgrade by Fitch Ratings, presents serious constraints to the government's own fiscal plans to fund water infrastructure. The impact of the downgrade is expected to be prolific. The Water Masterplan's comprehensive approach to realise a better water security future for South Africa is driven by a funding model that is highly susceptible to the Sovereign Credit Rating. Large infrastructure projects, like the Lesotho Highlands Water Project Phase II and the Umzimvubu Dam, have debt capital funding models with state guarantees. The contagion effect of a sub-investment grade rating is obvious, and puts both the institutions as well as the projects at the mercy of the markets and the DFIs. This puts both our ability to deliver on the social projects, like the SDGs, as well as make water available for economic growth and development at risk.

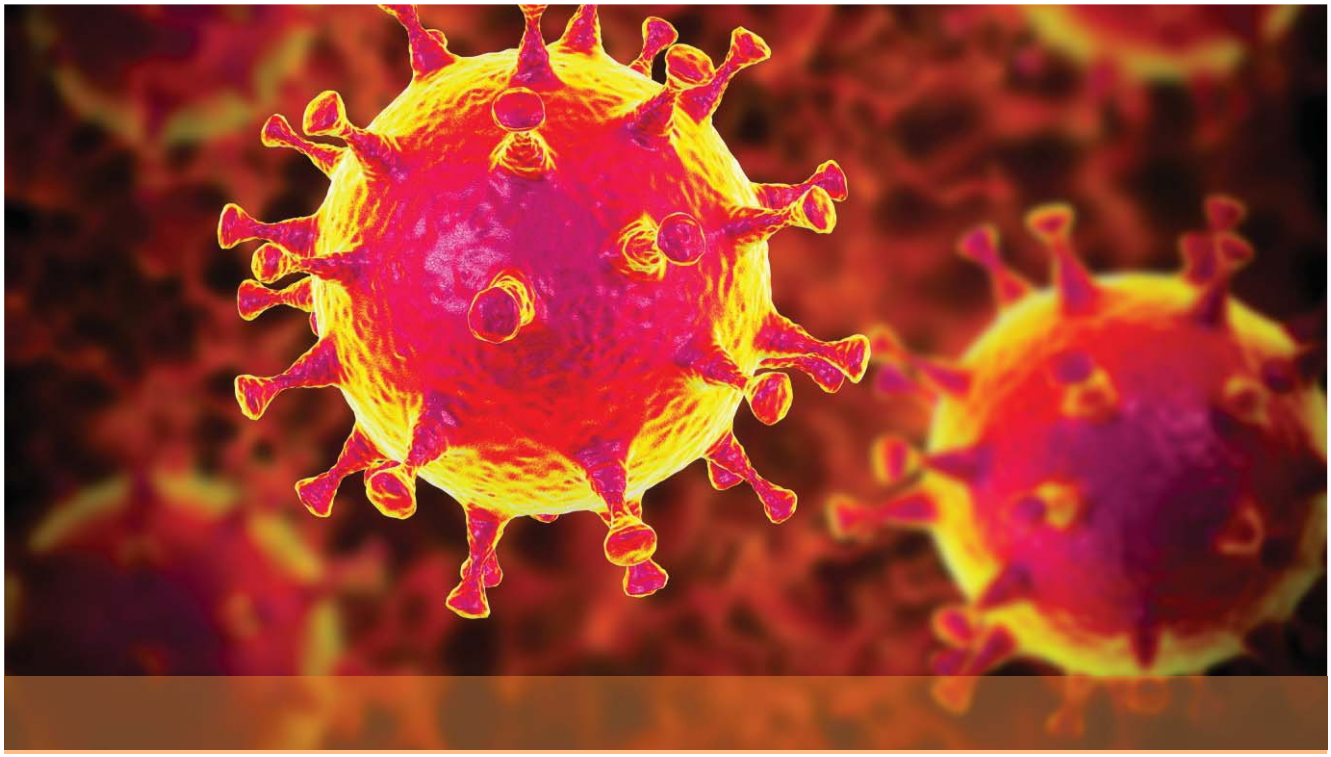
Then there is the second domain of new technologies and innovations. The 4IR toolbox that has the potential to take our planning, monitoring and control systems to a completely new level. Earth observation and remote sensing combined with smarter management of Big Data will enable real-time water and wastewater management prompting efficiency of use, more sustainable access and much higher levels of water security. The Brown Revolution, with new waterless and low water toilet systems feeding into non-sewered decentralised waste treatment, will not only ensure South Africa's ambition to meet the goal of universal access to safe and dignified sanitation, but also has the potential for us to supply a global market whose current shortfall in sanitation access is upward of two billion people.

If we add to this the great science that is enabling the beneficiation of the human waste to produce high value products – energy, chemicals, proteins and lipids – we have the genuine possibility of a new industrial platform with high performing businesses feeding a global market and creating new jobs and livelihoods and jobs for millions of South Africans.

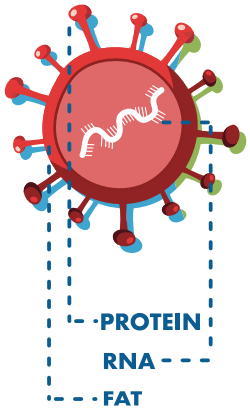
These have already been recognised as priorities in the Industrial Policy Action Plan (IPAP). But, to get these off the ground requires investment. Substantive investment – local and foreign! With potentially high returns. This enterprise is greatly affected by the knock-on effects of a Sub-investment grade sovereign credit rating. Makes one quite moody.

The question is how we avoid what water scarcity could cost us in GDP, which the World Bank has estimated to be up to 6.6% in some regions of the world. The question government must contend with is how a new model for water resource planning that not only takes into account the complexity presented by the ratings downgrade, but sees an opportunity that arises from the changing paradigm in the water sector globally, and thus water resource planning.

The Aloe Ferox may be a species in danger. What is true though, from minister Tito Mboweni's formulation, is the need to invest our money properly and wisely. If this is to be true in water, a more robust and collaborative strategy is needed. This may include a much more dramatic review of our institutional framework.



Information resources on water and Covid-19

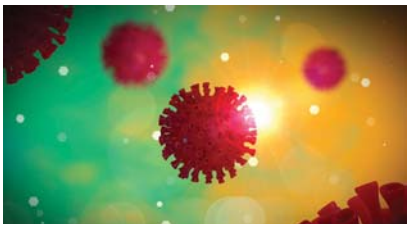


The following Covid-19 and water related resources are available:

- Water Research Commission
- International Water Association
- Global Water Research Coalition
- World Health Organisation
- Water Supply and Sanitation Collaborative Council

NEWS

Innovation Hub calls for innovative African solutions to flatten the curve



The global Covid-19 pandemic has caused countries across the world much health, social and economic distress, as even the most developed and advanced regions struggle to contain the spread of the highly contagious virus.

Amidst the distressing circumstances, the world has also seen creative and innovative ideas stemming from the urgency of the situation. "South Africa is no different, and we are taking this opportunity to call on local innovators to help our country fight this virus with solutions that take into account our unique challenges," says The Innovation Hub CEO, Advocate Pieter Holl.

The Innovation Hub (TIH) is calling on local innovators, entrepreneurs, scientists, SMMEs, research institutions, universities, and the public to submit their solutions relating to preventing the spreading of the novel coronavirus. Through its Open Innovation Solution Exchange programme, a platform and process which connects solution-seekers to solution-providers, TIH is offering successful applicants the opportunity to test, develop, incubate and commercialise their solutions.

Submissions should address the direct and indirect societal effects of Covid-19 and be proven concepts that need maturation, or existing solutions that can be adapted. "Furthermore, it is important that the solutions address the South African context. As a country, we are unique in many ways. Our solutions should be too," says Advocate Holl. Examples of solutions include, but are not limited to:

- Disinfection of the environment
- Information sharing tools and platforms
- Medical solutions
- Social distancing techniques
- Essential goods delivery
- Remote working solutions
- Solutions in the context of townships, rural areas and taxi ranks

Submissions can be made online at www.openix.co.za until 31 July 2020, and will be judged on a variety of scientific, technical and commercial criteria.

WRC Board member to lead newly-established Thabo Mbeki School

Deputy Chairperson of the Water Research Commission (WRC) Board, Prof Sibusiso Vil-Nkomo, has been appointment the interim Director of UNISA's newly established Thabo Mbeki School.

The School is associated with the Thabo Mbeki Foundation, and has been established with its collaboration. Prof Vil-Nkomo brings to UNISA national and global knowledge of academia as well as expertise in leadership, management and new knowledge generation. Prof Vil-Nkomo is the co-founder and chairperson of the Mapungubwe Institute for Strategic Reflection (MISTRA) a leading South African Think Tank. The MISTRA was ranked as having had a global impact – placed as one of the Top 10 Best New Think Tanks Globally, according to the 2013 Global Go-To Think Tanks Report produced by the Think Tanks and Civil Societies Programme at the University of Pennsylvania (TTCSP). MISTRA continues to attract leading national and global thinkers.

Upon acceptance of this appointment at UNISA he said: "This is a historic development to name the first trans-disciplinary School of significance after a living former President. Thabo Mbeki is an economist, leader, diplomat, peacemaker, scholar as well as an intellectual of high regard. This has been long overdue. We must create the Thabo Mvuyelwa Mbeki School as a magnet of excellence that is nationally and globally competitive. The School must combine theory with experiential learning and research. It must take its rightful place to be globally ranked because of its outstanding academic and applied work that is driven by leading academics and experiential teaching experts. UNISA cannot compromise on this distinguished name that is second-to-none in the world. The Thabo Mbeki Foundation has made a laudable contribution to the advancement of usable knowledge by sharing the name of the Former President with UNISA and supporting its founding."

Prof Vil-Nkomo obtained his BA degree (Magna Cum Laude) in Public Affairs and Economics from Lincoln University, USA. He was granted his MA and PhD by the University of Delaware. He taught and developed academic programmes at Lincoln University, Clarke University, and University of the Witwatersrand.

He has provided expert advice to the United Nations Economic Commission for Africa on the analyses of economic growth and inequality in Southern Africa. He continues to serve on boards, chair and advise on the development of major businesses and science councils like Subtropico Pty, LTD, Agricultural Research Council (ARC), and the WRC. He was among the founders of the successful Business Enterprises at the University of Pretoria and Continuing Education (now known as Enterprises at the University of Pretoria).

Development of new dragonfly atlas underway

South African researchers are developing an atlas and phenology of dragonflies and damselflies in South Africa.

This project will produce a comprehensive atlas for the group of insects known as Odonata in South Africa. Odonata encompass dragonflies and damselflies, both potential indicators of healthy freshwater ecosystems.

JRS-supported efforts to use dragonfly status as a management and conservation indicator in Africa began in 2012 with a grant award for the development of a dragonfly freshwater health tool. A second JRS grant was awarded in 2016 to the University of Cape Town's Animal Demography Unit (ADU) to create an atlas and phenology of dragonflies and damselflies in South Africa to fill data gaps and to serve the needs of data users.

Led by Dr Leslie Underhill and supported by ADU's own citizen science project, OdonataMap, the ADU made strides toward achieving objectives during the first half of this project and Underhill will continue to lead this project, which is now managed from the Freshwater Research Centre (FRC). The FRC-University of Cape Town collaboration is expected to complete the atlas and related products in 2021, establishing Odonata as a practical indicator of freshwater ecosystem health, providing and promoting useful tools for decision-makers and advocacy, and improving freshwater health assessments.

The project, hosted at the FRC, will pick up where the University of Cape Town-hosted efforts left off to complete "The Atlas and Phenology of Dragonflies and Damselflies in South Africa". Specific objectives and activities include growing the number of Odonata records, using the DBI and distribution data to define Vital Odonata Areas of South Africa, contributing to the seasonal phenology of these species for inclusion in global climate change discussions, and mobilising all data and products. Amendments to the original project plan include the removal of a Red List of Odonata in South Africa (undertaken by the South African National Biodiversity Institute), the addition of PhD support, and efforts to increase database awareness and expand OdonataMap.

This project will close the remaining gaps in knowledge and data access in South Africa, and support freshwater resource mapping, climate change research, and more.

This project will help mainstream the conservation of the Odonata and the freshwater habitat they depend on. With the completion of the atlas and data tools, detailed information about the Odonata in Environmental Impact Assessments in South Africa could become the norm, as might the uptake of this information by government and into policy decisions regarding water resources, the FRC says on its website.

"The knowledge gained and shared will also support climate change research and other studies that require baselines against which change can be measured. As the atlas grows, so will the importance of Odonata as an indicator taxon for freshwater quality, and the number of people in Africa able to use this knowledge for the development of policy and development guidelines. Efforts will also be made to increase awareness of the database and the importance of Odonata and establish an OdonataMAP initiative across Africa."

GLOBAL

WHO accelerates research and innovation for new coronavirus

The World Health Organisation (WHO) has convened a global research and innovation forum to mobilise international action in response to the new coronavirus (2019-nCoV).

Harnessing the power of science is critical for bringing this outbreak under control," noted WHO Director-General, Dr Tedros Adhanom Ghebreyesus. "There are questions we need answers to, and tools we need developed as quickly as possible. WHO is playing an important coordinating role by bringing the scientific community together to identify research priorities and accelerate progress."

The forum, which was held 11-12 February in Geneva, Switzerland, was organised in collaboration with the Global Research Collaboration for Infectious Disease Preparedness. The forum brought together key players, including leading scientists as well as public health agencies, ministries of health and research funders pursuing 2019-nCoV critical animal health and public health research and the development of vaccines, therapeutics and diagnostics, among other innovations.

Participants discussed several areas of research, including identifying the source of the virus as well as sharing of biological samples and genetic sequences. Experts are building on existing SARS and MERS coronavirus research and identifying knowledge gaps and research priorities in order to accelerate scientific information and medical products most needed to minimise the impact of the latest coronavirus outbreak.

The meeting produced a global research agenda for the new coronavirus, setting priorities and frameworks that can guide which projects are undertaken first.

Source: WHO

Using sewage to monitor scale of coronavirus outbreak

More than a dozen research groups worldwide have started analysing wastewater for the new coronavirus as a way to estimate the total number of infections in a community, given that most people will not be tested.

The journal ***Nature*** reports that the method could also be used to detect the coronavirus if it returns to communities, say scientists. So far, researchers have found traces of the virus in the Netherlands, the United States and Sweden.

Analysing wastewater is one way that researchers can track infectious diseases that are excreted in urine or faeces, such as SARS-CoV-2. One treatment plant can capture wastewater from more than one million people, says Gertjan Medema, a microbiologist at KWR Water Research Institute in Nieuwegein, the Netherlands.

Monitoring influent at this scale could provide better estimates for how widespread the coronavirus is than testing, because wastewater surveillance can account for those who have not been tested and have only mild or no symptoms, says Medema, who has detected SARSCoV-2 genetic material — viral RNA — in several treatment plants in the Netherlands. "Health authorities are only seeing the tip of the iceberg."

"The South African actuality programme, Carte Blanche, featured in insert on wastewater monitoring.

Click here to watch.

Heat stress may affect 1.2 billion people annually

By the year 2100, heat stress from extreme heat and humidity will annually effect areas now home to 1.2 billion people, assuming greenhouse emissions remain the same, researchers report.

That is more than four times the number of people affected today. It is also more than 12 times the number who would have been affected without industrial era global warming.

Rising global temperatures are increasing exposure to heat stress, which harms human health, agriculture, the economy and the environment. Most climate studies on projected heat stress have focused on heat extremes but not considered the role of humidity, another driver.

"When we look at the risks of a warmer planet, we need to pay particular attention to combined extremes of heat and humidity, which are especially dangerous to human health," says senior author Robert E. Kopp, Director of the Rutgers Institute of Earth, Ocean and Atmospheric Sciences and a professor in the earth and planetary sciences department at Rutgers University-New Brunswick.

"Every bit of global warming makes hot, humid days more frequent and intense. In New York City, for example, the hottest, most humid day in a typical year already occurs about 11 times more frequently than it would have in the 19th century," notes lead author David Li, a former Rutgers postdoctoral associate now at The University of Massachusetts.

The body's ability to cool down properly through sweating causes heat stress. Body temperature can rise rapidly, and high temperatures may damage the brain and other vital organs. Heat stress ranges from milder conditions like heat rash and heat cramps to heat exhaustion, the most common type.

The study, published in the journal, Environmental Research Letters, looked at how combined extremes of heat and humidity increase on a warming Earth, using 40 climate simulations to get statistics on rare events. The study focused on a measure of heat stress that accounts for temperature, humidity and other environmental factors, including wind speed, sun angle and solar and infrared radiation.

Annual exposure to extreme heat and humidity in excess of safety guidelines are projected to affect areas currently home to about 500 million people if the planet warms by 1.5 °C. and nearly 800 million at 2 °C. The planet has already warmed by about 1.2 °C above late 19th century levels. An estimated 1.2 billion people would be affected with 3 °C of warming, as expected by the end of this century under current global policies.

To read the original article, Visit: https://iopscience.iop.org/article/10.1088/1748-9326/ab7d04

Global water event cancelled

World Water Week assembles over 500 co-convening organisations and 4 000 participants from more than 130 countries in Stockholm every year.

This world-leading conference on water is now cancelled due to the global spread of COVID-19 and the measures taken by national and local authorities to contain the spread of the disease. World Water Week was due to take place 23-28 August in Stockholm.

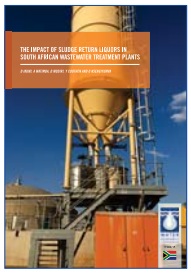
World Water Week is organised by Stockholm International Water Institute (SIWI) and has been held annually since 1991. However, the organisation has decided to cancel this year's conference after closely monitoring the spread of COVID-19 around the world. Given that the COVID-19 outbreak has been declared a pandemic by the World Health Organisation (WHO), holding a major event like World Water Week would pose a critical threat to the health of visitors and would result in an unacceptable risk of spreading the disease.

The decision was taken formally by the Board on March 31. SIWI's Executive Director, Torgny Holmgren, states: "We are, as always, committed to serving our community in the best possible way. Organising the world's leading conference on water comes with big investments in time and money for everyone involved. We believe that an early decision is better than a wait-and-see-approach – for everyone."

World Water Week is the latest in a number of global events that have had to be cancelled due to the COVID-19 pandemic. In South Africa, the biennial conference of the Water Institute of South Africa, due to take place at the end of May has now been postponed to December 2020.

For more information, Visit: www.siwi.org

NEW WRC REPORTS



The impact of sludge return liquors in South African wastewater treatment plants

The main goal of the research study is to improve the knowledge on the impact and mitigating measures of the sludge return liquors from anaerobic sludge digestion on the wastewater treatment process. During the anaerobic digestion, the organic matter in the sludge is converted into biogas with the stored nutrients in the biomass being released into the water phase. This sludge return liquors should be recycled to the main process train, usually to the head of works or biological reactors, instead of being discharged into ponds or water bodies without any treatment. The additional load from the sludge return liquors may result in a deterioration of the plant effluent quality, due to an overloading of the plant, increase the energy requirements (for aeration) and increase the chemical dosage (metal salts to precipitate phosphorous). Therefore, it is crucial to understand the side-stream technologies available and recognised worldwide, as efficient means to reduce nitrogen and phosphorous concentrations in the sludge return liquors.

Report no. TT 800/19

An integrated approach to assessing and implementing ecological water requirements

South Africa has a rich history of research on Ecological Water Requirements (EWR), even before the development of the National Water Act (Act 36 of 1998, NWA) introduced concepts such as the Ecological Reserve. The implementation of EWR in integrated water resource management has been lacking, largely due to a lack of capacity but also in some regards due to the lack of methods and research on how to integrate the EWR within existing water resource management strategies. Integration, in the context of this project, was defined as the technical integration of driver and responder data together with the stakeholder vision for a catchment using a holistic method. This method has the capability to include riverine, wetlands and groundwater information and to determine what the risks to achieving the catchment vision or endpoints are. Therefore, this project used a case study catchment to look at integration and implementation of EWR using a holistic methodology.

Report no. 2738/1/20

Development and assessment of an integrated water resources accounting methodology for South Africa: Phase 2

The current status of water resources in South Africa requires a change in emphasis from infrastructure development to better water management, resulting in more effective and efficient use and allocation of water resources. It is widely recognised that good water management is strongly dependent on the availability of good data and information. The intention for this study was to build on the work completed in an earlier project (WRC Project K5/2205). In addition to reviewing water accounting frameworks, these projects had two general objectives. The first was to demonstrate the use of a water resource accounting framework in order to help understand water availability and use at a catchment scale. The second was to develop an integrated and internally consistent methodology and system to estimate the water availability and sectoral water use components of the water resource accounts on. This is also true for successful cooperative governance and stakeholder participation.

Report no. 2512/1/19

Development of water-energy-food nexus index and its application to South Africa and the Southern African Development Community

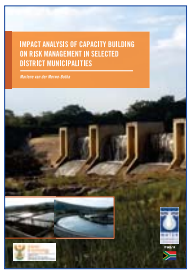
Since 2011 significant attention has been given to the water-energy-food (WEF) nexus in academic, policy, regulatory and development fraternities. The WEF nexus is a multi-centric lens through which to assess sustainable development and integrated resource management. This approach has direct links to the Sustainable Development Goals (SDG), principally SDGs 2, 6 and 7. Because the WEF nexus has constituents that are measured in different units, and at different spatial and temporal scales, there is a need to normalise indicators from each of these sectors before integrating them. One such method is the development of a composite indicator (or index), and this report presents the development of an index with the WEF nexus as its guiding framework. The methodology that has been employed in constructing the proposed composite indicator is that of the Joint Research Centre's *Competence Centre on Composite Indicators and Scoreboards* (JRC-COIN).

Report no. 2959/1/19

Knowledge review and agenda setting for future investments in research on water governance in South Africa

Water governance, simply put, is a set of systems that control decision-making with regard to water resources development and management. An analysis of global trends in water governance shows a need to address a worsening water crisis, compounded by climate change, rising urbanisation and population growth. Closely aligned to these trends, but distinct in its own trajectory, South Africa's water governance dynamics have evolved through a period of considerable socio-political change marked by inequitable resource allocation and water scarcity. This report presents an overview and analysis of the state of water governance research in South Africa from 1990 to 2019, with the overall aim of supporting the future research agenda for the Water Research Commission (WRC).

Report no. 2911/1/20



Impact analysis of capacity building on risk management in selected district municipalities

A capacity building support project was implemented during 2014-2016 which assisted selected District Municipalities in KwaZulu-Natal and the Eastern Cape to prepare risk-based plans using existing tools and guidelines, while developing technical capacity through a learn-and-adapt approach. The municipalities experienced a number of water services and human resource challenges at the time. The project methodology made provision to measure the impact of the capacity building project by comparing the Blue- and Green Drop results 'before' and 'after' the project. With the halt of the national Drop Certification programme, the impact could not be measured. Subsequently, the WRC commissioned a special study in 2018 with a two-fold purpose: 1) to determine the impact of the risk-based capacity building pilot project at the selected municipalities; and 2) to conceptualise a framework for the roll-out of risk-based capacity building on national scale, by considering the lessons learnt from the WRC capacity building pilot project, as well as other support studies.

Report no. TT 803/19

Resource efficient and socially responsible approaches for the integrated management of mine waste: Understanding the risks, opportunities, enablers and barriers

An alternative mine waste management approach, and one that is more consistent with the goals of sustainable development, focuses on the generation of mine wastes that can be re-purposed for other uses. This so-called valorisation approach goes beyond the recovery of targeted value recovery, both removing intra- and inter-generational waste burden and simultaneously optimising efficient utilisation of mined resources. This study set out to support the development and implementation of such an approach for the management of large volume mine waste in the Southern African context, by developing an enhanced understanding of the key drivers, barriers and opportunities involved.

Report no. 2580/1/19

Mlalazi estuary and floodplain: Hydrology and vegetation dynamics

South Africa has 280 estuaries, of which about 75% are classed as Temporarily Open/Closed Estuaries (TOCEs). The ecology of TOCEs is very much dictated by mouth closure events, the frequency of closures, how long the mouth remains closed each time and how much backing up of water occurs behind the closed mouth. This study focused on the Mlalazi Estuary. Its purpose was to understand and model the evolving relationship between fluvial and marine conditions that control the mouth dynamics and estuarine vegetation. TOCEs are very much influenced by catchment inflows – both the frequency and magnitude of inflow events. These influence the mouth closing process and the natural beaching. A component of this study focused on the rainfall of the Mlalazi catchment area and the patterns of flows entering the Mlalazi estuary/floodplain basin to establish a reliable estimate of the depth-duration-frequency of flows and sediment into the estuary using a calibrated and validated hydrological model.

Report no. 2541/1/19

Climate change and South Africa's blue carbon ecosystems

Blue carbon habitats include living and non-living biomass of mangroves, salt marshes and seagrasses. These habitats form the interface between land and sea, and provide numerous ecosystem services such as coastal protection, fish nursery habitats, nutrient filters and carbon storage. In South Africa, blue carbon habitats occur in sheltered estuarine environments where their integrity and biodiversity are threatened by increasing freshwater abstraction, development pressures, poor water quality, climate change and sea level rise. This study generated knowledge on blue carbon stored by South Africa's estuarine habitats. It quantified the extent and loss of these habitats and their ecosystem services and describes responses to climate change. The final report presents the trends of surface elevation in two salt marsh and two mangrove systems and discusses the long-term survival and expansion of mangrove forests and surrounding salt marsh areas. The research contributed to the National Biodiversity Assessment of 2018 and included information on the distribution and health of estuarine habitats. It also informed the compilation of estuary management plans required by the Integrated Coastal Management Act.

Report no. 2769/1/19

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