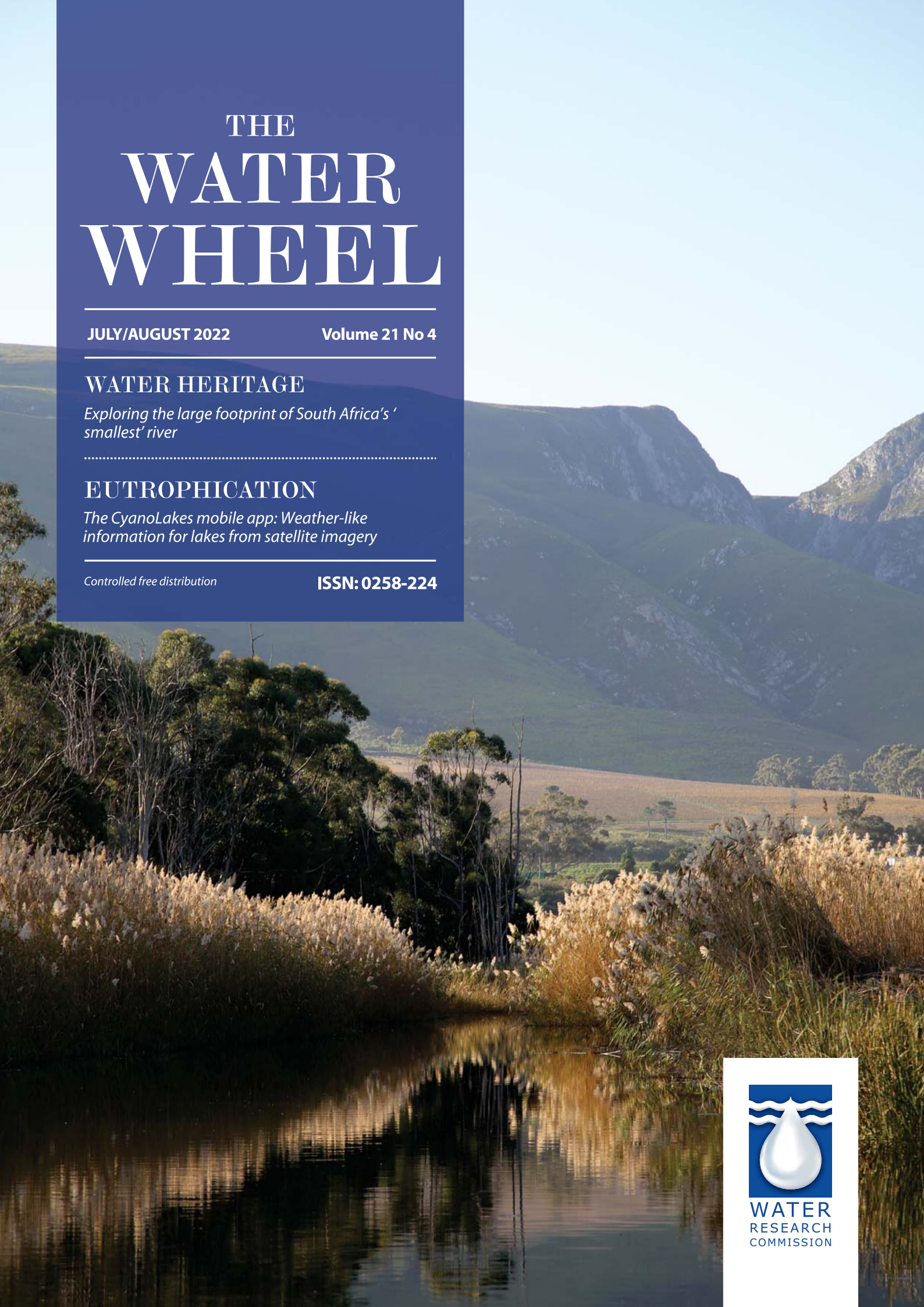

THE WATER WHEEL

JULY/AUGUST 2022 Volume 21 No 4

WATER HERITAGE

Exploring the large footprint of South Africa's 'smallest' river

EUTROPHICATION

The CyanoLakes mobile app: Weather-like information for lakes from satellite imagery

Controlled free distribution

ISSN: 0258-224

WATER RESEARCH COMMISSION

THE WATER WHEEL

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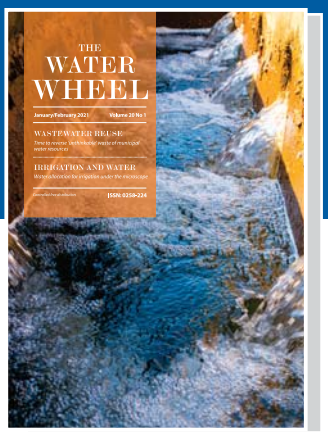

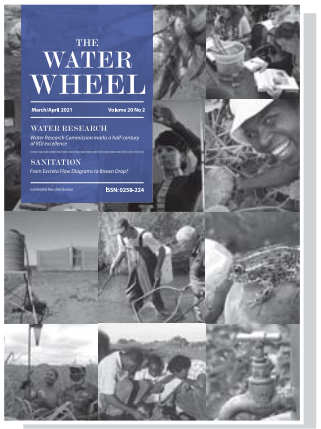

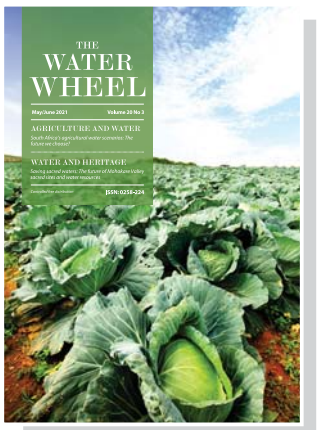

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The Water Wheel

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WATER RESEARCH COMMISSION

Contents

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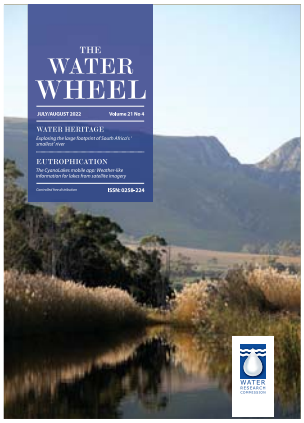


In a semi-arid country such as South Africa, even the smallest river has a socio-economic role to play. Read about the Klein River on p10. Cover photo by Petro Kotzé.

NEWS

Memorandum signed to reduce sewage pollution in Crocodile River

A Memorandum of Understanding has been signed between the Dutch Water Authorities, Inkomati-Usuthu Catchment Management Agency, Mpumalanga Provincial Department of Cooperative Governance and Traditional Affairs, City of Mbombela Local Municipality, Emakhazeni Local Municipality, Nkomazi Local Municipality, South African Local Government Association (SALGA), Municipal Infrastructure Support Agency (MISA), and Mpumalanga Treasury to improve the performance of the wastewater treatment plants to combat the pollution of the Crocodile River, which flows into the Kruger National Park.

The Deputy Minister of Water and Sanitation (DWS), David Mahlobo, who attended the event, said in his address that he did not come just to oversee the signing of the MOU but expects the parties to compile an action plan and implement it. "We do not have a national water crisis at present. People in South Africa will not run out of water; the problem is that water will not be usable because of pollution. Too much water in South Africa is polluted and polluters must pay."

The MoU sets out how the regional, local and provincial parties will co-operate with one another for the successful implementation of the Combating of Pollution in the Crocodile River within the Inkomati-Usuthu Water Management Area (referred to as the Crocodile River Project).

Cape Town residents urged to report missing manhole covers as winter rains set in

The City of Cape Town has called on residents to report stolen and broken sewer drain manhole covers so that they can be replaced in the shortest timeframe possible to help reduce sewer overflows on rainy days.

The City's Water and Sanitation team has spent about R2,6 million on replacing more than 4 900 sewer drain manhole covers that were stolen or broken in various areas across the city between July 2021 to May 2022. This figure has increased compared to the 3 382 manhole covers reported missing or stolen in the 2020/21 financial year.

"Manhole covers are an important part of our sewer infrastructure, which should only be opened by staff when they inspect the network or have to unblock the pipeline. These must not be stolen or removed," said Mayoral Committee Member for Water and Sanitation Councillor Zahid Badroodien.

Typically, there is a trend that sees an increase in sewer overflows in winter because of the combined impact of various factors, such as rainwater and foreign objects entering the sewer network. Open manholes is one way that illegally dumped waste and rainwater can enter the sewer network. Generally, waste items that are flushed, poured down sinks and drains, and which cause blockages and overflows, are already affecting the sewer system.

"During heavy rain, overflows increase because illegal dumping of rubbish, old unwanted items, stones/rocks, sand, building rubble, etc, also wash into the sewer network system via open manholes. Coupled with this, more rainwater enters via these open manholes and from illegal stormwater-to-sewer cross-connections on properties, where rainwater is channelled from roofs, gutters, and paved or hard yard surface areas into sewer drains. All these factors contribute to blockages or reduces the capacity of the pipes to convey wastewater, and damage infrastructure like pump stations, resulting in overflows and flooding," noted Badroodien.

The Cape Town water and sanitation team is doing extensive proactive work in various areas across the city to help reduce sewer overflows. This includes cleaning main sewer pipelines in most flood-prone areas using jetting machines to clear blockages, inspecting illegal stormwater to sewer connections at properties and ongoing public awareness education through the Bin it, Don't Block it campaign.

Low recovery rate of irregularly paid monies a concern for portfolio committee

Responding to a report it received on the status of disciplinary cases in the Department of Water and Sanitation, the Portfolio Committee on Water and Sanitation raised a concern on the low pace of the recovery of irregularly paid funds.

In a statement published in May, the committee expressed the view that accelerating the rate of recovery of those funds would ensure that they are directed to service delivery and to ensure that people receive water as promised.

"While the committee welcomes the information that about R300 million has been recovered by the department and an additional R622 million has been saved by the department since 2014 as a result of civil, legal and criminal actions resulting from cases of corruption and financial misconduct, it is of the view that much more can be recovered if investigations and prosecutions are concluded expeditiously."

In line with this, the committee welcomed the commitment by the Minister of Water and Sanitation, Senzo Mchunu, to fight corruption within the department. The committee further called on the department to enhance collaboration and interaction with law enforcement agencies to ensure that investigations are fast tracked.

Meiringspoort river survey raises alarm over invasive fish

The Groot River that runs through Meiringspoort is part of the greater Gouritz system, which is the largest river system within the Cape Fold Ecoregion. The Groot River is home to four of the eight indigenous freshwater fish species that occur in the Gouritz system and is recognised as an important fish sanctuary. The indigenous fish species are the small-scale redfin P. asper, the slender redfin P. tenuis, the chubbyhead barb Enteromius anoplus and the Cape kurper Sandelia capensis, writes CapeNature ecologist, Martine Jordaan.

A freshwater fish survey was conducted in the poort following a report of the presence of alien and invasive sharptooth catfish in the river. CapeNature faunal ecologists sampled seven sites in three days and detected healthy populations comprising several size classes for all three indigenous minnow species.

The trip also yielded the first State of Biodiversity Report record for the indigenous moggel Labeo umbratus in the Groot River. On a less positive note, the presence of invasive sharptooth catfish was confirmed at half of the sites surveyed. Based on the presence of a mainly subadult population, it is evident that the catfish are breeding in the Groot River.

The results of this study will serve to inform not only long-term monitoring but also provide a basis for future conservation interventions to ensure the survival of the indigenous fish fauna of this very special river.

WATER DIARY

Global water sector
23 August – 1 September 2022
World Water Week will be held online and in Stockholm, Sweden under the theme 'Seeing the unseen: The value of water'.
Visit: https://www.worldwaterweek.org/

Global water sector
11-15 September 2022
The International Water Association's World Water Congress and Exhibition will be held in Copenhagen, Denmark.
Visit: www.worldwatercongress.org

SA water sector
28-30 September 2022
The biennial conference of the Water Institute of Southern Africa is taking place virtually and at Sandton Convention Centre under the theme 'Navigating the course'.
Visit: https://wisa2022.co.za/

Wetlands
25-28 October 2022
The National Wetlands Indaba will be hosted by the Free State Wetland Forum (FSWF) and supported by the SA Wetland Society with the theme 'Wetlands action for people and nature'.
Visit: https://indaba.org.za/

Municipal engineering
2-4 November 2022
The 85th conference of the Institute of Municipal Engineering in Southern Africa will be held at Birchwood Hotel and Conference Centre in Gauteng.
Visit: www.wisa.og.za

GLOBAL

Intensifying climate change impacts leaving donors short of funding

Funding needed for UN humanitarian appeals linked to extreme weather has increased eight-fold over the past two decades, with donor countries falling desperately short of meeting the demand, according to a new analysis.

Reports by the Intergovernmental Panel on Climate Change (IPCC) have made clear that climate change impacts are already widespread and intensifying, and that developing countries are paying the highest price. But since 2017, about half (54%) of all UN appeals for climate disaster requirements such as droughts and floods have gone unmet, according to the ***Footing the bill*** report released by the charity Oxfam. For every US$2 a country responding to extreme weather asked for, they received only around $1 — a shortfall of up to $33 billion, the report says.

Oxfam and other campaigners urged governments at UN climate talks in Bonn, Germany, to pledge funding for loss and damage in addition to existing climate finance and aid commitments. The talks, which took place in June, are seen as a precursor to the COP27 climate summit in Egypt in November.

According to Oxfam's report, estimated loss and damage costs could increase to between $290 billion and $580 billion a year by 2030, rising to the trillions by 2050. Much of this will be shouldered by developing countries, which are most vulnerable to the effects of climate change. Annual extreme weather-related funding appeals amounted to at least $1.6 billion for 2000-2002 and increased by 819% to reach $15.5 billion in 2019-2021, the report says.

The cost of extreme weather-related events in 2021 alone is estimated at $329 billion globally, the third-highest year on record behind 2017 and 2005, the report says. This is nearly double the total aid given by rich nations to developing countries that year.

Ethiopia, Kenya, Somalia and South Sudan are currently facing extreme hunger, fuelled by climate change, and yet are responsible for only 0.1% of global emissions, the authors note. The entire continent of Africa accounts for less than 4% of emissions.

To access the Oxfam report,
Visit: https://bit.ly/3ohCJeJ

Women's water burden rose as COVID lockdowns hit

Demand for household water increased by as much as a third during pandemic lockdowns, forcing girls and women to spend more time searching for water for families without access to running water, analysis shows.

COVID-19-related restrictions highlighted inequalities in access to safe water, sanitation and hygiene (WASH) in the Pacific Island countries, which have some of the world's lowest rates of access to drinking water and sanitation services.

"Women's water burdens have always been heavy and anecdotal evidence indicates that they remain that way in Pacific Island countries," says Vivian Castro-Wooldridge, senior urban development specialist at the Asian Development Bank's Pacific department. "Additional burdens have come from women looking after children and other family members spending more time at home due to lockdowns, meaning more water is used and therefore must be collected and managed," Castro-Wooldridge said.

Researchers asked people in 14 countries in Africa and South Asia about their biggest concerns regarding water, hygiene and sanitation during lockdown periods. More than half of respondents said no communal WASH facilities were available, accessible or secure. The survey was conducted by WaterAid, with the University of Leeds and the African Women's Development and Communications Network (FEMNET).

Respondents expressed concerns over water and sanitation infrastructure not only in public spaces, but also in healthcare and quarantine facilities, pointing out the lack of clean water and handwashing stations. Just 5% of people said hygiene services at quarantine facilities were adequate. One in seven people said facilities were not gender segregated, while 17% said there was a lack of menstrual hygiene management infrastructure.

COVID-19 has shown that gender must be integrated into future emergency water and sanitation policies and programmes, said Desideria Benini, a researcher who worked on the WaterAid survey.

Benini said that incorporating gender into pandemic and emergency responses would "not only save more lives regardless of social differences, but also address the root causes of people's vulnerability, ensuring equitable, universal and sustainable access to WASH".

Source: SciDev.Net

Gel grabs drinking water right out of dry air

More than a third of the world's population lives in drylands, areas that experience significant water shortages. The new gel film could offer a solution to help people in these areas access clean drinking water.

The materials that facilitate this reaction cost a mere US$2 per kilogram, and a single kilogram can produce more than 6 litres of water per day in areas with less than 15% relative humidity and 13 litres in areas with up to 30% relative humidity. The research builds on previous breakthroughs from the team, including the ability to pull water out of the atmosphere and the application of that technology to create self-watering soil. However, the researchers designed these technologies for relatively high-humidity environments.

"This new work is about practical solutions that people can use to get water in the hottest, driest places on Earth," says Guihua Yu, professor of materials science and mechanical engineering in the Cockrell School of Engineering's Walker Department of Mechanical Engineering at the University of Texas at Austin. "This could allow millions of people without consistent access to drinking water to have simple, water generating devices at home that they can easily operate."

The researchers used renewable cellulose and a common kitchen ingredient, konjac gum, as a main hydrophilic (attracted to water) skeleton. The open-pore structure of gum speeds the moisture-capturing process. Another designed component, thermo-responsive cellulose with hydrophobic (resistant to water) interaction when heated, helps release the collected water immediately so that overall energy input to produce water is minimised.

Other attempts at pulling water from desert air are typically energy-intensive and don't produce much. And although six liters doesn't sound like much, the researchers say creating thicker films or absorbent beds or arrays with optimisation could drastically increase the amount of water they yield. The reaction itself is a simple one, the researchers say, which reduces the challenges of scaling it up and achieving mass usage.

"This is not something you need an advanced degree to use," says lead study author Youhong "Nancy" Guo, a former doctoral student in Yu's lab, now a postdoctoral researcher at the Massachusetts Institute of Technology. "It's straightforward enough that anyone can make it at home if they have the materials."

The film is flexible and can be moulded into a variety of shapes and sizes, depending on the need of the user. Making the film requires only the gel precursor, which includes all the relevant ingredients poured into a mould.

The US Department of Defence's Defence Advanced Research Projects Agency (DARPA) funded the work. Drinking water for soldiers in arid climates is a big part of the project. However, the researchers also envision this as something that people could someday buy at a hardware store and use in their homes.

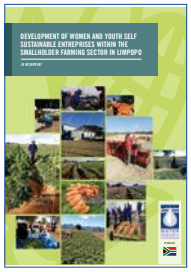
NEW WRC REPORTS

Contributions of an ethically-grounded and value-based approach to water governance – the case of two contrasting catchments

The nature and characteristics of water, being a resource that affect all aspects of human endeavour, biological and ecosystem health, implies that the consequences of systemic governance failures would likely have ethical and value implications, and thus the need to consider the contributions of ethics and value-based approach to water governance in South Africa. This is critical because values underpin the way people interact with and lay claim to water, and it has been argued that much of the conflict around water are indeed value conflict. Therefore, an ethical approach to water governance is fundamental because it helps to clarify value claims, the implication of interaction of values in specific contexts, as well as enabling a deeper reflection and analysis of the implications of policy and governance decisions on water allocation, ecosystem protection and ways in which water is being governed. Using the Lower Sundays River catchment and the lower section of the Upper Vaal River catchment as case studies, this project develops an ethical and value-based approach to water governance in South Africa. The intention is to bring ethics and value-based analysis to the domain of water governance, and to shed light on its contribution to realising the foundational values of equity, sustainability and efficiency enshrined in the National Water Act.

WRC Report no. 2934/1/22

Web link: https://bit.ly/3z1vD3T



Development of women and youth self-sustainable enterprises within the smallholder farming sector in Limpopo

A study was carried out with the aim to develop a Sustainable Model for Agricultural Enterprises Led by women and youth. The specific objectives were to: characterise agricultural enterprises led by women and youth (socio-economic, critical success and failure factors, water sources and use, commodities of choice) in Limpopo; investigate a potential model for multi stakeholder interaction (especially the need for water for ecological and social good) for agricultural enterprises led by women & youth in Limpopo; investigate the potential commodity production and value chain by agricultural enterprises; investigate the potential commodity production & value chain by women and youth agricultural enterprises within the scenarios of different water management systems (rain-fed, irrigation and ecological use groundwater); develop a model to sustain economic development by enhancing the long-term sustainability of women & youth agricultural enterprise (creation projects, propose new institutions, water management interventions, strategies, and to propose new institutions).

WRC Report no. TT 877/22

Web link: https://bit.ly/3P9tGbl

Technical and financial feasibility of alternative renewable energy sources and technologies in irrigated agriculture

Although a number of large commercial irrigated production enterprises has implemented solar and hydro schemes at farm level, there are still conceptions that alternative energy is expensive, vulnerable and not as reliable or sustainable as grid electricity, raising questions regarding the feasibility thereof at relatively small scale and in different parts of the country. There are still many questions regarding the feasibility of renewable energy in the irrigation sector, despite the success of currently implemented schemes. The need for a scoping research study regarding the technical and financial feasibility of alternative renewable energy sources and technologies in irrigated agriculture was therefore found necessary. The general objective of this research was to determine an overview of the technical and financial feasibility of alternative renewable energy sources and technologies in irrigated agriculture.

WRC report no. 2969/1/22

Web link: https://bit.ly/3PqlP7I

Risk-based and site-specific industrial use water quality guidelines

The current series of South African Water Quality Guidelines (SAWQGs) (DWAF, 1996) has been an extremely important contribution to water resource management in South Africa. It reflects the scientific thinking at the time it was produced. In 2008 a process was started to review and update the guidelines. The objective of this project was to develop a risk-based philosophy and site-specific methodology for assessing water quality requirements and fitness for use of water for industrial use. The specific aspects addressed include firstly the development of the basis of the risk approach and quantification methodology for the risk assessment; and secondly the development of the informatics for a technology demonstrator decision support system that addresses the main decision contexts for industrial water use.

WRC report no. TT 874/1/22 (Volume 1: Decision support system) and TT 874/2/22 (Volume 2: Technical support)

Web link: Volume 1:https://bit.ly/3aFZ2qZ and Volume 2: https://bit.ly/3ATHrqa

CISMOL – Monitoring groundwater in the Hout catchment

During the last decade, an exciting trend has been recorded worldwide, with thousands of lay people from, in, and across different countries becoming engaged in citizen science (CS) projects, through various modes and channels of collecting, commenting, transcribing and analysing data. However, CS has been predominantly pursued within the realms of the natural sciences. Groundwater is an increasingly important source of water supply to agriculture, households, and industry. Groundwater is generally well protected against pollution, can be exploited anywhere depending on the local conditions, and has a year-round availability. With population growth and increasing climate variability, groundwater also plays an increasingly important role in South Africa (RSA) to enhance water and food security. Monitoring groundwater in the Hout becomes critical as it contributes to the body of knowledge on changes over time in groundwater levels, climate variabilities measured for instance by amount of rainfall or river flows.

WRC report no. 3017/1/22

Web link: https://bit.ly/3RqbUCp

Revision of the pricing strategy for water use charges: implementation of the Waste Discharge Charge System (WRCWD)

South Africa continues to face water scarcity and climate change pressures within a constrained national fiscal and economic context. The reduction in water quality increases the cost of water, threatens human health, limits food production, reduces ecosystem functions, and hinders economic growth. In response to the country's poor water quality in strategic catchments, the Waste Discharge Charge System has been developed as a key instrument in supporting water quality management of the country, with the Waste Mitigation Charge (WMC) being a critical financial resource to support catchment water quality management. This Strategy has been in development for over a decade, and implementation is critical to realising success and improvement in the quality of our water resources. The purpose of this report is to relook at the assumptions and principles used in the development of the Waste Discharge Charge System and test the Mitigation Formula for its robustness in catchments and application.

WRC report no. 3016/1/22

Web link: https://bit.ly/3yynKBL

Contributions of an ethically-grounded and value-based approach to water governance – the case of two contrasting catchments

In South Africa, there is a gradual move towards the governance of water resources in the context of social-ecological systems (SES), which recognises the coupling, interrelationship, and complex interactions between societal and ecological components of the SES. In this regard, there has been a growing body of knowledge that supports the governance and management of water resources in the context of SES. However, there is little parallel research efforts aimed at developing an ethics and value-based approach for distilling ethical criteria and principles for navigating the array of complex issues such a systemic and holistic view of water governance raises. An ethical approach to water governance is fundamental because it helps to clarify value claims, the implication of interaction of values in specific contexts, as well as enabling a deeper reflection and analysis of the implications of policy and governance decisions on water allocation, ecosystem protection and ways in which water is being governed. Using the Lower Sundays River catchment and the lower section of the Upper Vaal River catchment as case studies, this project develops an ethical and value-based approach to water governance in South Africa. The intention is to bring ethics and value-based analysis to the domain of water governance, and to shed light on its contribution to realising the foundational values of equity, sustainability and efficiency enshrined in the National Water Act.

WRC report no. 2934/1/22

Web link: https://bit.ly/3z1vD3T

Integrating nano iron production into the acid mine drainage neutralisation treatment process

This study set out to explore, through a preliminary investigation of the feasibility of generating nano iron from acid mine drainage (AMD), and the effects of this on the downstream neutralisation process parameters and outputs, particularly gypsum which constitutes one of the major wastes from the eMalahleni Mine Water Reclamation Plant, which treats wastewater from the coal mining industry for reuse. Recovery of by-products from AMD, and/or the wastes generated from the treatment of AMD, can both reduce costs of waste disposal and offset costs of the treatment process, whilst also being consistent with the principles of sustainable development and related concepts such as resource efficiency, the circular economy and industrial ecology.

WRC report no. TT 884/22

Web link: https://bit.ly/3APRaxS

To download any of these reports click on the web link provided, Visit: www.wrc.org.za or Email: orders@wrc.org.za