

WATER RESEARCH



Water Research Commission marks a half-century of RDI excellence

In 2021 the Water Research Commission will officially celebrate its 50th year of existence. Dhesigen Naidoo reflects on the Commission's achievements and the opportunities that lie ahead.



South Africa is a dry country and has been throughout modern history. Ingenuity, knowledge and innovation have had to be mainstays of water security from the very beginning. The indigenous inhabitants in the form of the Khoi and San were successful only because they developed smart ways to store and transport water in our largely semi-arid country where only 10% of the land area constitutes the headwaters for more than 50% of all of our scarce water resources.

After the severe South African droughts of the 1960s with storage capacity in many dams dropping to less than a third, the government implemented widespread water restrictions. The most dramatic restrictions were applied to consumers dependent on the Vaal Dam which, at its lowest, was less than 27% full. A Commission of Enquiry into Water Matters was

constituted in 1966 and its report was published in 1970.

The report highlighted the important role of water research in the optimum utilisation and management of the country's water resources. "To gear modern knowledge to water resource development and utilisation there must be effective coordination of the research being undertaken by various organisations... In view of the importance and interdisciplinary requirements of water research, the Commission deems it essential that a specific committee for water research be established." As a direct result, with the promulgation of the Water Research Act (Act no. 34 of 1971), on 1 September of that year the Water Research Commission (WRC) came into being with a grand total of 7 employees.

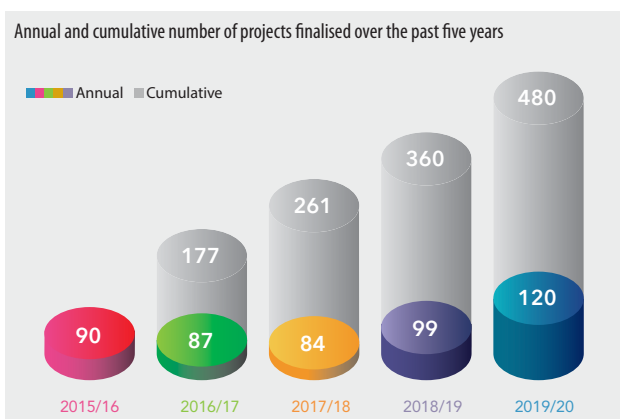
Since then, the WRC has enjoyed 50 successful years of servicing the water knowledge and innovation needs of come after South Africa with major contributions to the global environment. The Commission has over this time become a 'glue institution' for the South African water research and innovation community of practice comprising some 3 000 researchers, innovators and entrepreneurs operating from universities, public research entities, large corporates and SMMEs. It has also contributed to global institutional development being a founder member of the International Water Association (IWA) and the Global Water Research Coalition (GWRC). The WRC can claim to be a pioneer in the domain of reverse osmosis as a treatment methodology, piloted dry cooling for electricity generation as a world first, and before had international recognition for the work it funded on the environmental reserve and many others.

For many years, particularly in the last decade, the WRC has been a beacon of transformation in this still new democracy. We have important markers such as having the vast majority of project leaders being from the category of black, women and youth. The students supported on WRC projects are predominantly black and majority female. This has been achieved with the generous mentor contributions of senior researchers and innovators. This has also facilitated an important diversification of the research and innovation enterprise with a higher emphasis on impact and innovation. It represents a model that should be replicated throughout the South African National System of Innovation.

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The Water Research Commission today

Today, the WRC’s annual budget exceeds R300-million of which two thirds is applied to research and development. The water research levy remains the Commission’s main source of revenue. These levies are derived as a percentage placed on bulk water consumption. In essence, the WRC provides and funds applied knowledge and water-related innovation for the improvement of the lives of the citizens who help fund the research to start with.



The annual and cumulative number of projects finalised by the WRC over the past five years.

The three business divisions in the Research and Development branch of the WRC



The three main research and development areas of the WRC.

Additional leverage funding is provided by research partners. Research activities are grouped under three main thematic areas, namely water resources and ecosystems, water use, wastewater and sanitation futures, and water utilisation in agriculture.

In the last five years alone, the WRC finalised 480 research projects, indicating a significant contribution to knowledge in the water sector. The impact of this research, development and innovation can be seen across the water and sanitation sector, from the delivery of quality drinking water and safe sanitation to communities; enhanced water and effluent practices in industry and mining; decision-support for irrigation schemes and for various agricultural sectors; technologies to augment conventional water supply such as fog harvesting, artificial groundwater recharge, wastewater reclamation and desalination; to enhancing fundamental understanding of climate change and improved protection and management of natural resources.

From the start the WRC has had as one of its core objectives the development of human capital in the water sector. The result has been the establishment of a small, but productive water science and technology community of practice, which is rated as being in the top twenty globally. Many initial students on WRC projects have gone on to lead their own research, with many becoming global leaders in their field. In recent years, the WRC has adjusted its portfolio to enhance training and mentoring of new research leaders. More than 60% of research leaders on new projects are now from designated groups and most are younger than 50 years old. This is both assisting with the national transformation project as well as building the next generation of researchers.

The body of water-centred knowledge created by the WRC and its research partners has also been fundamental in the shaping of water legislation and policy in South Africa. The WRC played a critical supporting role in much of the work leading up to the national water policy of 1997 and the drafting and early implementation of the National Water Act (Act no. 36 of 1998). The Commission also helped to mobilise significant in-country capacity in the water sector to support the water policy and processes involved in promulgating the NWA.

Many years of cutting-edge WRC research had no place in the water legislation that preceded the NWA, but it was sufficiently advanced to be taken up into the new water law principles, the policy and legislation. These include studies in the areas of environmental flows, integrated catchment management, free



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basic water and small-scale irrigation, among others. The WRC was also able to fund consultancy research projects or initiate direct research projects to assist with various technical aspects and questions that arose during the drafting process.

The National Water and Sanitation Master Plan, launched by the Department of Water and Sanitation in 2019, has reaffirmed the role of research, development and innovation in developing a robust water sector that can support socio-economic opportunities for the country while managing South Africa's scarce water resources in a sustainable manner.

The WRC of tomorrow

There is significant convergence in all global analyses that from an economic, social, environmental, political and security viewpoint the increase of water scarcity on the back of decreased availability as well as deteriorating water quality is a crowning global crisis. South Africa is not immune to this. As a response, the WRC has heightened its efforts to not only grow scientific and technological knowledge in the water and sanitation domain, but to translate this repository of knowledge to tangible, accessible and affordable products and services for use on the ground. The aim is for research, development

and innovation initiatives to not only improve the quality of life for poor communities, but to create fertile ground for industrialisation and entrepreneur development in South Africa.

A significant new focus area has been next generation, non-sewered sanitation. The WRC leads in demonstrating new sanitation solutions that require little to no water and/or beneficiaries sanitation waste. This is mainly being done through the South African Sanitation Technology Enterprise Programme (SASTEP), which the WRC manages through the support of national and international partners. SASTEP supports and accelerates the application and uptake of the latest, cutting-edge toilets through evidence-based policy adjustments, demonstrations, testing and science-based improvements towards localisations and industrialisation. This includes technologies supported by the Bill and Melinda Gates Foundation's 'Reinvent the Toilet' programme. The revolutionary toilet systems have water-saving or water-recycling features, are aspirational in design, and, most importantly, eliminate pathogens and sludge production at point-of-source without the need for sewers.

The WRC is taking advantage of the technological innovations and change brought on by the Fourth Industrial Revolution. Recent and continuous projects have seen the development of remote sensing tools for the monitoring of agricultural lands and freshwater ecosystems for example, while exploring the opportunities around the water-energy-food nexus and the creation of water-sensitive cities.

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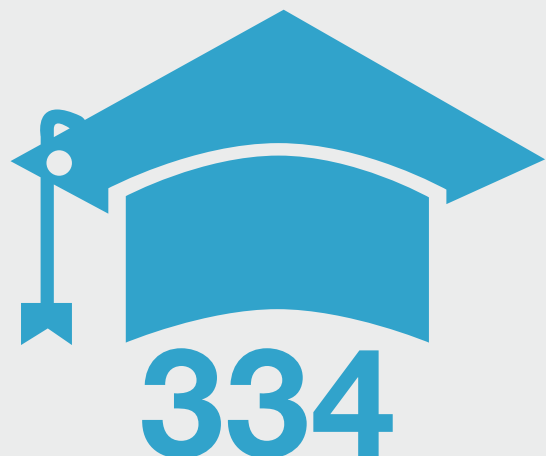
The Commission has also broadened its research scope to one that actively involves communities in the research projects and engages key partners to upscale and maintain interventions post-project. In the 2019/20 financial year alone, more than 100 research projects had a direct impact on the lives and livelihoods of communities through water-related initiatives and capacity building. Among these has been the successful implementation of so-called MUS systems in villages in Vhembe, in Limpopo province. MUS or multiple use schemes are low-cost equitable water-supply systems that provide communities with water for both domestic needs and high-value agricultural production, including rearing livestock.

The novel coronavirus (Covid-19) caused significant disruptions around the globe. While lockdown restrictions disrupted ongoing research work some WRC funding was redirected towards fighting the pandemic. This included the provision of laboratory and research work services on the monitoring of SARS-CoV-2 in wastewater and faecal sludge as means of estimating the prevalence and burden of Covid-19 infections in communities.

The WRC Covid-19 intervention is comprised of three phases, the first being the establishment of the proof of concept of presence of COVID-19 in wastewater and sanitation samples, as well as establishing sample collection and testing protocols so that monitoring results can be reliable and compared. This phase has been successfully completed. The second phase, which is currently underway, focuses on the establishment of a wider capacity of laboratories in South Africa and puts into operation more communities into surveillance. The third phase will enable the facilitation of the establishment of a national surveillance programme supported by hotspot mapping. In a related project, wastewater-based epidemiology principles have been applied to non-sewered communities in South Africa, through the sampling of rivers and surface runoff in one of the first projects of its kind in the world.

Through five decades of activities the WRC has firmly entrenched itself in the water and sanitation sector in South Africa. It remains dedicated to the creation of a water secure society for all of South Africa's citizens.

Number of PhD and Masters students in 2019/20



The WRC mandate

- To promote, coordinate, cooperate and communicate in the area of water research and development
- To establish water research needs and priorities
- To stimulate and fund water research according to priority
- To promote effective transfer of information and technology
- To enhance knowledge and capacity building within the water sector