

The state of our rivers is a clear reflection of the health of our environment

By [Dr Eunice Ubomba-Jaswa](#)

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This year's World Environment Day on 5 June was marked under the global theme Only One Earth and calls for collective, transformative action on a global scale to celebrate, protect and restore our planet. The commemoration brings into stark focus our reliance on natural resources and, in tandem, our responsibility to nurture these resources.



Dr Eunice Ubomba-Jaswa, research manager at the Water Research Commission

Harmony and balance – living off the land and protecting it – are central to this equilibrium and when compromised pose a risk to our lives and economies. The Covid-19 pandemic, recent floods in Kwa-Zulu Natal and droughts in the Eastern and Western Cape are brutal reminders of how our dysfunctional relationship with nature can be both costly and deadly.

Furthermore, recent reports confirm that the freshwater planetary boundary has been crossed. In essence, the amount of freshwater used by humanity has been exceeded in relation to what is available (rivers, lakes and groundwater) and returned to the environment after use. Planetary boundaries as defined by scientists in the Stockholm Resilience Centre are “boundaries within which humanity can continue to develop and thrive for generations to come. Crossing these boundaries increases the risk of generating large-scale abrupt or irreversible environmental changes”.

Lack of information and awareness

To live in harmony with nature and to reduce the risk of ecological disasters, we must be aware and informed of changes in our environment both naturally and from human impact. Yet the most recent Sustainable Development Goals (SDGs) Monitoring Cycle revealed that over three billion people globally are at risk because they have insufficient knowledge about the health of surface and groundwater resources. This lack of information and awareness has a direct impact on individual, household and community health but also on the health of the environment and long-term sustainable development.

Clean, reliable water is vital to human and environmental health. It is also a fundamental component of our socioeconomic development with implications for health and wellbeing, food production, affordable energy and industrial development. In South Africa, central to our water supply is our vast network of rivers. Though vital to our overall water supply, river health in South Africa has generally declined. A variety of factors have contributed to this decline including over-extraction of water; industrial and agricultural pollution; wastewater treatment works and stormwater; invasive alien species, habitat and biodiversity loss; and climate change.

River Ecstatus Monitoring Programme

However, even in the face of decline, healthy rivers and wetlands remain a core component of water security and are a determining factor in climate change mitigation. The South African River Health Programme (RHP) initiated in 1994 by the Department of Water and Sanitation (DWS) and later renamed the River Ecstatus Monitoring Programme, serves to provide detailed information on the condition of South Africa's river ecosystems and to respond in a timely manner with effective remedial actions when river statuses are identified as declining or poor.

Improved knowledge about the current state of our rivers can therefore guide us to clear actions that will help us to better

balance human health and economic needs with the sustainable use of natural resources. To further close knowledge gaps and support national monitoring programmes, the Water Research Commission (WRC) is funding several projects across the country that will enable us to better understand the impact of human activity on river water quality.



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Combining community and scientific knowledge

In Gauteng, a combination of chemical analysis and stakeholder participation is being used to solve the longstanding Hennops River pollution. Without a current comprehensive assessment of the state of pollution in the river, chemical measurements from river water samples will be valuable to understand the extent and sources of pollution. At the same time, knowledge from communities and stakeholders who are dependent on rivers will be critical to understand the river ecosystems. Ensuring stakeholder participation will also create a sense of responsibility and positive co-existence with the river that considers the economic needs of communities while actively addressing pollution.

Balancing economic activity and environmental sustainability

The development of industries is paramount for economic growth. Manufacturing, mining and agricultural activities are all important contributors to the country's gross domestic product. These sectors also require vast amounts of water and produce waste that ends up in rivers. Additionally, rapid urbanisation and subsequent informal settlements means that urban rivers represent a unique ecosystem in which pollution occurs regularly, leading to significant changes in the chemical and biological characteristics of surface water.

Despite ongoing pollution, the impact of urbanisation on the diversity and structure of microorganisms in rivers has not yet been well documented. Research from the Juskei River – which is subjected to extreme pollution from urban and industrial waste – may provide some indication of the diversity of novel microorganisms that exist in the river and how they behave in polluted water as they adapt, grow and use pollutants as a source of energy.

Human and ecosystem health is also directly at risk from industrial pollution. Industrial activities often generate considerable quantities of wastewater which contains potentially toxic elements (PTEs) such as arsenic, mercury, lead and chromium. These toxic metals may seep into plants or evaporate into the atmosphere, returning as acid rain. For communities using rivers in areas with mining activities this knowledge could prevent severe illness. Having portable tools to detect contaminants for people living in the area who use the river is therefore critical. In this project, PTEs in water, sediment, soil and vegetables from Blood River in Seshego, Limpopo and the Mokolo River in Lephalale, which are close to mines, will be determined to assess the associated risks to humans through food production and consumption.

Impact of pollution on public health

Freshwater pollution with microplastics has also become a major environmental concern. Microplastics can potentially transfer trace metals, organic pollutants, and other additives throughout food grown with or near contaminated water, with unknown implications for human health. An inter-disciplinary approach will help develop a better understanding of the risks posed by microplastics in rivers as carriers for the spread of harmful bacteria and viruses. Water samples from the Umgeni River in the KwaZulu-Natal and Swartkops River in the Eastern Cape Province – which are important sources of water for several communities – will be taken for the detection and quantification of microplastics. This research will hopefully further our understanding of the impact of microplastics in rivers as sources and transmitters of harmful microorganisms. The project will provide a tool for determining sources and hotspots of microplastic pollution in rivers.

Contaminated water can lead to severe health conditions for both humans and aquatic species. Most disturbing is the

emergence of new contaminants in wastewater and water supply channels including pharmaceutical products. Frequently used antibiotics in both humans and animals and excreted as waste from the body is channelled into wastewater treatment plants through sewer systems and stormwater runoff, and eventually discharged into receiving water bodies. Through a project in the Msunduzi River (KwaZulu-Natal), a simplified water quality model for simulating emerging contaminants along water channels is being developed that could help mitigate the entry of these contaminants into water supply systems.



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Untreated polluted urban runoff

The rapid expansion of informal settlements on the outskirts of cities and towns has also resulted in an increase in the volume of untreated polluted urban runoff that flows into various river systems. Although such polluted waters are known to harbour numerous opportunistic pathogenic fungi including yeasts, relatively little is known about the occurrence and interactions of these fungi in South African urban river systems, such as the Plankenbrug/Eersterivier system in the Stellenbosch region. Rapidly evolving ecosystems, and new diseases have intensified the need to focus on unknown infectious microorganisms which could have public health implications. Prior knowledge could limit any potential negative impact on human health, especially for people living in ever-expanding informal settlements.

River habitats play an integral role in development, health and wellbeing. We can learn a lot by conducting environmental impact assessments that are honest. This means calculating the true cost of our actions as humans on the environment and where necessary finding alternatives to natural resources. Citizen science (the involvement of non-professional scientists in scientific research and data gathering) offers individuals, communities and environmental groups the opportunity to collect water quality data using simple to use monitoring devices thereby filling river water quality gaps.

Reimagining our relationship with rivers

Armed with quality data and knowledge, government, businesses, institutions and communities have the opportunity to rethink and reimagine our relationship with our rivers and work to restore and revive them. Let us use our rivers as the bedrock for understanding how to sustainably benefit from our natural resources and protect the right to a clean and healthy environment for current and future generations.

ABOUT THE AUTHOR

Dr Eunice Ubomba-Jaswa is a research manager at the Water Research Commission.

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