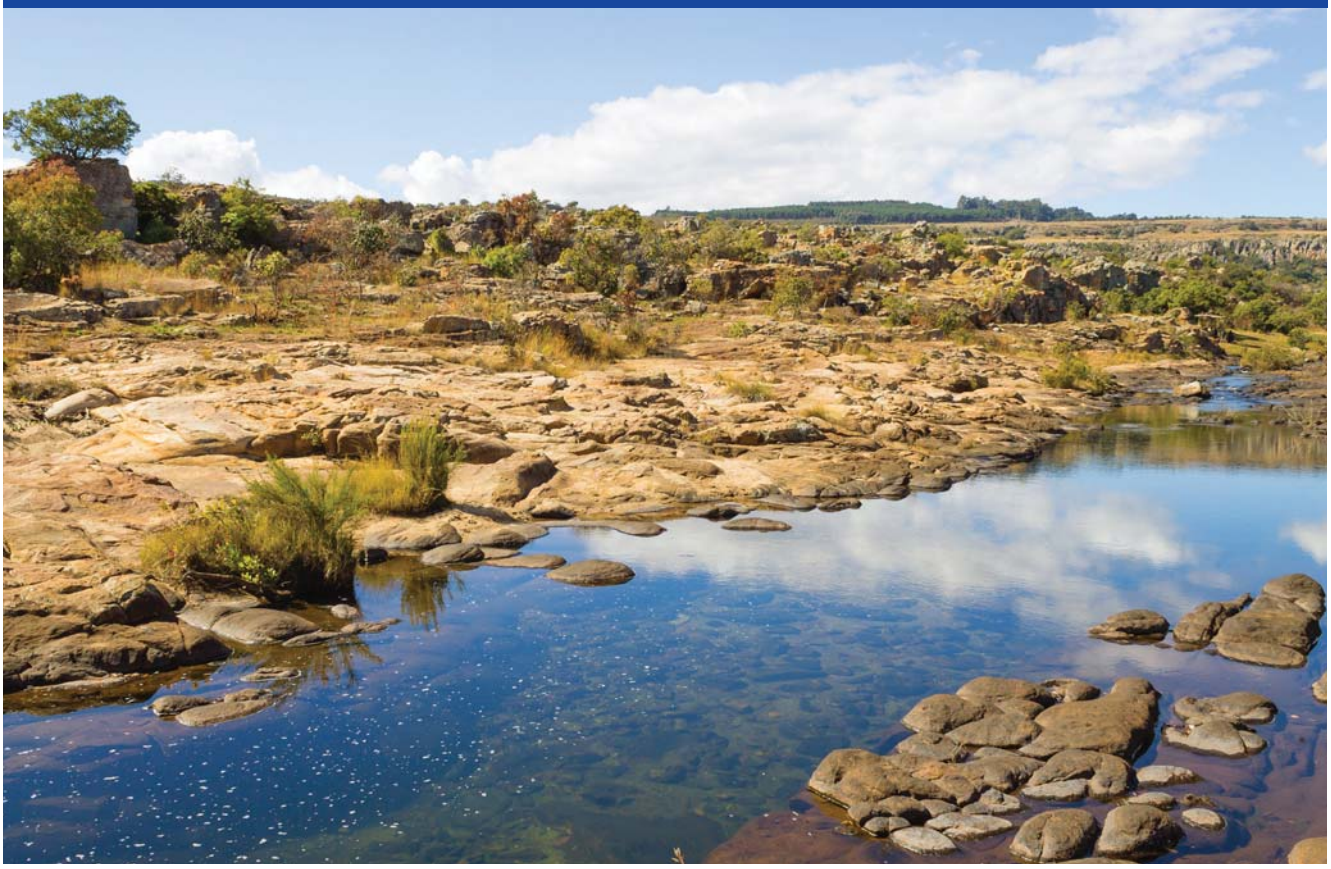
WATER QUALITY AND ECOSYSTEMS

New water quality guidelines published for aquatic ecosystems

After 28 years, South Africa has a new set of water quality guidelines for its aquatic ecosystems, thanks to a project funded by the Water Research Commission. The revised guidelines are software-based and can facilitate rapid decision-making in the management of the country's water resources.



In the 1990s the then Department of Water Affairs and Forestry led a project to develop procedures and to derive a set of water quality criteria for safeguarding freshwater ecosystems in South Africa. The resultant first edition of the Water Quality Guidelines for Aquatic Ecosystems, published in 1996, was part of an ongoing effort to improve the decision support tools required for the management of the country's water resources.

The 1996 water quality guidelines are widely used in South Africa, however, they have been criticised for four fundamental reasons. Firstly, they have been criticised for not being explicitly risk-based and not taking an explicit risk approach in their development and implementation. An important implementation outcome of not being risk-based is what has been referred to as over- or under-protection. In this regard, the current guidelines are being used as trigger value, above which an action, usually a corrective one, needs to be taken, and below which all is assumed to be fine.

Secondly, the 1996 guidelines were developed prior to the promulgation of the National Water Act in 1998. This means that they are not aligned to important strategies, initiatives and approaches for balancing the protection and use of South Africa's water resources as envisaged in the act and in the national water resource strategies. Critical among these are the classification system, the ecological Reserve, the resource quality objectives (RQOs) as well as source directed control measures such as licensing and the waste discharge charge system.

The 1996 guidelines, for example, have a single target generic water quality value, which is not helpful given that the current approach accords water resources different levels of protection, e.g. Class I, II, III and ecological categories A to D, with descriptive and quantitative RQOs. From a spatial perspective, such a single target value is also not helpful because it does not take into account spatial variability within the country. In addition, the old guidelines do not reflect existing water quality monitoring networks that support water resource management decision-making.

Since the 1996 guidelines were published, much research has been undertaken locally and internationally in the field of water quality, with new and emerging pollutants of concern being identified. Thus, the need was identified to update the guidelines to reflect the latest scientific developments and knowledge in the field. The 1996 guidelines finally been criticised for not supporting rapid decision-making processes and not being easily updatable.

How the revised guidelines addressed these limitations

The revised guidelines follow a multi-tier approach. Tier 1 refers to generic guidelines similar to the 1996 guidelines, but with reference to the ecological categories A to F. This implies that guideline values are developed for each ecological category. Tier 1 guidelines are developed for 23 inorganic salts, 42 organic compounds and 26 pharmaceuticals.

Tier 2 guidelines are derived at ecoregion level II to account for spatial variability and factors such as climate, physiography, geology and soils as well as altitude. In addition, the guidelines at Tier 2 are developed for both physico-chemistry and biological response, thus accounting for the community-based effect of the ecosystem on water quality change. The physical-chemical variables were mainly driven by available data within the current Department of Water and Sanitation water quality monitoring networks. As such, some ecoregion level II were data-rich, while others were data-poor This highlights the urgent need to invest in water quality data collection and monitoring.

Tier 3 assessment is triggered when risk is suspected based on the results of Tier 1 and 2. Tier 3 provides a means for a site-specific water quality risk assessment by collecting detailed site-specific information. A key feature of Tier 3 assessments is that they are event or scenario based. The reasoning this approach is that improving water quality implies a focus on the event or scenario driving water quality change rather than on the symptoms. For Tier 3 assessment, risk is conceptualised as a measure of the likelihood (probability) of an event / scenario / issue occurring and its adverse effects or consequences as well as the associated uncertainty.

The guidelines are implemented within a software-based decision support system (DSS) flexible enough to allow for rapid decision-making regarding the risk posed by pollutants of concern. The DSS interface allows for easy navigation and takes DWS capacity and capability into account. As the guidelines are software-based, they are easily updatable, and support educational and research purposes.

The 2024 guidelines have been aligned with the current approach to water resource management in many ways. First, the need for different protection levels, aligned to ecological categories, is recognised and implemented. Second, the guidelines recognise the importance of spatial variability and site-specificity in water quality decision-making. Third, risk associated with events, scenarios or other risk-triggering activities such as development projects can be assessed using the DSS. The DSS can also support decision-making in different contexts, e.g. water quality licensing, impact assessment, monitoring progress towards the resource quality objectives, etc.

Recommendations for policy and implementation

The project made the following recommendations for policy and implementation of the guidelines:

Capacity building – As the revised guidelines have been developed using a different approach and within a new DSS, there is a need for capacity building across various sectors of society. Such capacity building would facilitate the use of the guidelines in different contexts and by different sector stakeholders.

Invest in water quality monitoring and data – While much effort has gone into water quality monitoring in the country, the study suggests that additional investment is needed in water quality data collection, including establishing additional monitoring networks and building capacity within DWS, its agencies as well as other institutions responsible for data collection at catchment scale.

Risk-based decision-making – Risk is an important element in water resource decision-making. With the developed DSS, water resource managers and practitioners can assess acceptable levels of risk given protection level and other resources. It is thus important that policies within the sector should place a premium on risk-informed decision-making in ways that ensure balanced use and protection of water resources, and capacity should be strengthened in this regard.

The DSS can be downloaded here, https://bit.ly/4afBvq0