POLICY BRIEF

March 2018
The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

Enhancing the sustainable use of groundwater

Groundwater is poised to play an increasingly important role in South Africa's water-supply mix. Sustainable management and use of this resource is critical. Thus a new sustainable groundwater decision framework has been developed. This framework aims to improve the sustainable use of groundwater.

Background

Sustainable groundwater use requires a balancing act between pumping water out of the aquifer (discharge) and the water being recharged back into the aquifer. This water balancing act is known as the **capture principle** approach.

The purpose of this project was to promote the capture principle approach to enhance sustainable groundwater use. Among others, the project developed a new tool (a decision framework) to put the capture principle approach into practice. This framework offers an improvement over existing water balance based methods to quantify groundwater resources. The framework can also be used as a regulatory tool as it contributes to preventing the over-utilisation of existing groundwater resources.

Policy context

The framework has positive implications for the National Water Resource Strategy II, the Groundwater Strategy, and the water use licensing for groundwater use and the validation and verification process.

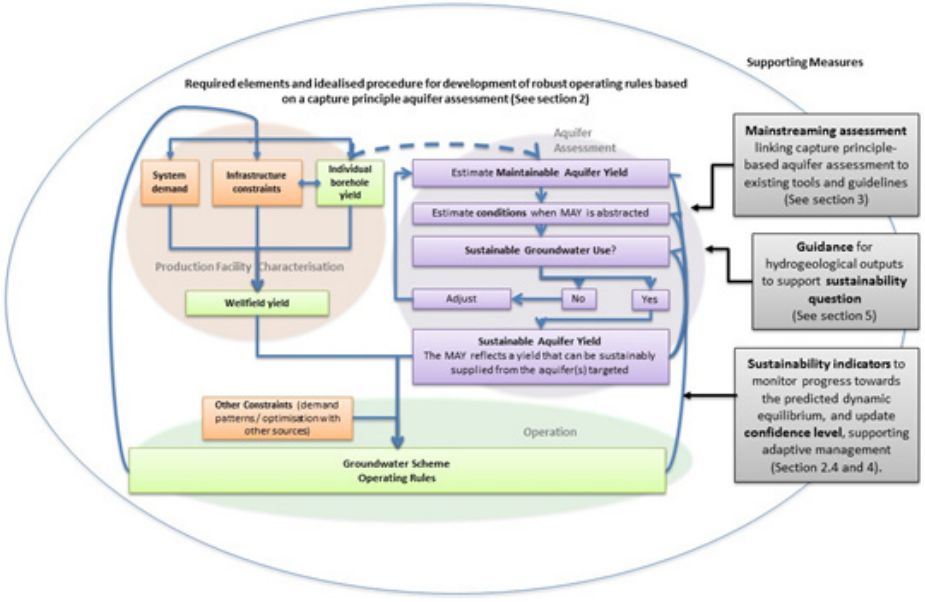

Figure 1. Decision framework for sustainable groundwater use

Methodology

The study first investigated the degree to which the capture principle approach features in existing tools and guidelines. Although several of these tools and guidelines use water balance-based methodologies for quantification of groundwater sources, they also contain methodologies appropriate for parts of a capture principle-based groundwater assessment.

The resulting decision framework tool is an amalgamation of the recommended approach for the development of wellfield operating rules, which would support or incorporate implementation of the capture principle approach to sustainable groundwater use, with supporting measures.

Benefits of the new framework

There are various existing tools aimed at the sustainable management of groundwater, e.g. safe yield, sustainable yield estimations. Using these tools, management must proceed on less than ideal information and decisions are adjusted as groundwater use continues. This is awkward to regulate.

The benefit of the capture principle approach is that it offers a more comprehensive tool towards the sustainable management and regulation of groundwater. Using this tool regulators can now make more informed decisions about the current and future state of sustainable groundwater use.

Case studies

Various aspects of the capture principle, and of the established decision framework were tested in two case studies:

- The West Coast aquifers in the region of Langebaan and Saldanha Bay, in the Western Cape;
- The Maloney's Eye Steenkoppies Compartment, near Magaliesberg in the West Rand District Municipality, Gauteng.

The case studies demonstrated the trade-off between groundwater abstraction and reduced discharge, as follows:

- In the West Coast aquifers case study, the maintainable aquifer yield at the West Coast District Municipality wellfield, derived from the capture principle-based assessment, is significantly higher than previous estimates (3.5. to 5.5 million m^3/a compared to 1.1 million m^3/a) while taking the following limitations into account: preventing ingress from the Berg River; preventing dewatering of the confined aquifer.
- In the case of the Maloney's Eye Steenkoppies aquifer, the relationship between abstraction across the aquifer and discharge at Maloney's Eye has been quantified. As there are direct users of the aquifer and users of the discharge at Maloney's Eye, this relationship can be used to determine allocation to each user group.

Key messages from the study

It is recommended that this framework becomes the recommended approach for managing groundwater. Assessments using this approach are especially critical in the case where the discharge point is close to the recharge point.

It is recommended that South Africa transitions to an approach in which the Department of Water and Sanitation manages numerical models of all the major aquifers for abstraction management and resource protection. This is the only way to change the status quo, fully implement the capture principle approach to sustainable groundwater use, and avoid the prevalence of water balance approaches in regional studies.

To order the report, *The capture principle approach to sustainable groundwater use* (**Report No. 2311/1/17**), contact Publications at Tel: (012) 761-9300, Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.