POLICY BRIEF

March 2019
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.

Limpopo River Basin – Quantifying historical and future water resources

The complexity of water resource management poses many challenges. Water managers need to solve a range of interrelated dilemmas, such as balancing quantity and quality, flooding, drought, maintaining biodiversity and ecological functions and services. The Limpopo River is arguably one of the most important transboundary rivers in southern Africa. A Water Research Commission (WRC) study sought to improve the estimate of available water resources in the Limpopo River Basin by examining the upstream-downstream hydrological linkages at the basin scale using improved scientific approaches that address the existing paucity of requisite data.

Background

Sustainable water resource management planning and development requires reliable quantification of the water amount, distribution and quality within river basins. With the demand on water resources rapidly growing across the globe, there is also urgent need for accurate monitoring, forecasting, and simulation of hydrologic variables, especially in major river basins such as the Limpopo.

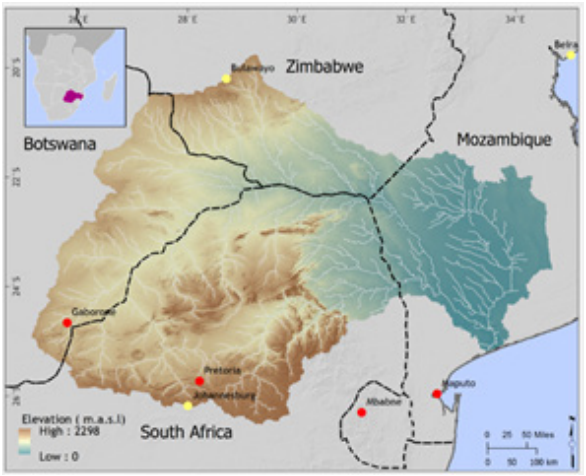
However, the available data is frequently far from sufficient – in terms of availability, accuracy and spatial/temporal resolution – for the understanding of both natural and anthropogenic processes (and for their complex linkages) in a river basin. Such challenges also make it very difficult to use the data for the practical application of estimation of water resources availability.

The Limpopo River Basin cover about 416 300 km^2 of the African continent, straddling four southern African countries: South Africa, Botswana, Mozambique and Zimbabwe. The WRC project had the following four, main objectives:

- To develop a more homogenous hydrologic dataset that facilitates the more consistent application of water resources modelling approaches across the basin.
- To identify, establish and quantify the upstream-downstream hydrological linkages in the basin.
- To estimate on the basis of simulated historical natural flows incorporating prediction uncertainty, the water resources potential of the basin.
- To estimate the impact on the water resources potential from climate change based on existing modelled future projections.

This study assessed the availability (sources and accessibility) and quality (spatial and temporal coverage, representativeness, usability) of the data that can potentially be used in a study of this kind. The study therefore provides a descriptive repository that any worker or practitioner in the basin would refer to for potential data.

The data was gathered and developed into a mathematical model of the basin. The model is guided by the understanding of the processes and their linkages in defining and determining the hydrology and water resources of the basin for the current and future periods.



The Limpopo River Basin.

Main results and recommendations

The study identified and delineated seven main surface water source areas at the sub-basin scale in the Limpopo River Basin based on relief and annual rainfall totals. These thus coincided with the elevated terrain associated with the various mountain ranges in the basin.

In South Africa, these are the Soutpansberg, Blouberg, Wolkberg, Waterberg and Magaliesberg ranges, and in Zimbabwe the Mtandabatsa and Matopos ranges.

These source areas would of necessity need to be protected in order to sustain the integrity of the water resources of the basin. The process of water loss from the channels as it is transmitted downstream from the source to the mouth in the Indian Ocean through a semi-arid and arid environment and through the floodplains in the basin is also important.

As such, as a first step, the main alluvial aquifers of the basin were identified and delineated to indicate the places where channel transmission losses potentially occurred.

The significant disparities in the availability, accessibility, quantity and quality of data among the four riparian states greatly hampers management options, planning and development decisions. It is recommended that a central repository for hydrological data or sources of such data is established, not only for the Limpopo River Basin, but for the region in general. The Limpopo Information Management System is an excellent starting point in this regard.

The project experienced the general lack of available hydrologic data especially in Zimbabwe, Mozambique and to some extent in Botswana. Compared to other riparian states, South Africa has better rainfall and flow gauging networks but the quality of data is not necessarily better. In light of the above, the project was unsuccessful in its endeavor to develop a more homogenous set of hydrologic data that might benefit basin-wide water resources modelling approaches.

When using model simulations to make decisions, managers must consider the fact that the model is forced with inaccurate and insufficient data, prompting the need to adopt flexible management approaches. Water demand is an important aspect in water resource development, planning and management. However, these are also uncertainties related to the projections of future water requirements which should also be factored into this discourse.

Scientists, water practitioners and decision-makers need to have a sincere and frank conversation on how research outputs can be timeously taken up by users so as to improve the livelihoods of beneficiary communities.

Related report:
Towards the quantification of the historical and future water resources of the Limpopo River Basin (**Project no. K5/2439**).
For more information, email: orders@wrc.org.za or Visit: www.wrc.org.za.