

Environment

Real-time assessment and implementation of the Ecological Reserve

A WRC-funded study towards improving the assessment and implementation of the Reserve has been completed.

Ecological reserve

In South Africa, the ecological reserve (ER) is defined as a function of the natural flow which, because the natural flow in a system is not known at any point in time, is creating problems with real-time implementation. To estimate the natural flow, real-time hydrological models with accurate daily rainfall are needed but such rainfall data are lacking in many catchments and would not be resolved in the short or medium term.

The Olifants River in north-east South Africa ceased flowing in 2005, placing a need for an integrated focus on all of the easterly-flowing rivers of the Lowveld. Most of these rivers appeared to be deteriorating in terms of water quantity and quality despite the 1998 National Water Act (NWA). Most of these rivers flow through the Kruger National Park (KNP) and form part of international systems.

Real-time natural and ecological flows

Water users, especially irrigators, would like to know in advance how much water will be available to them over the next growing season. Existing water resources models can give estimates of available water in the short term but cannot indicate how much water will be required for the ER because the future flow is not known. Possible solutions to the problem of estimating real-time natural flows and predicting ecological flows into the future were addressed in a WRC study.

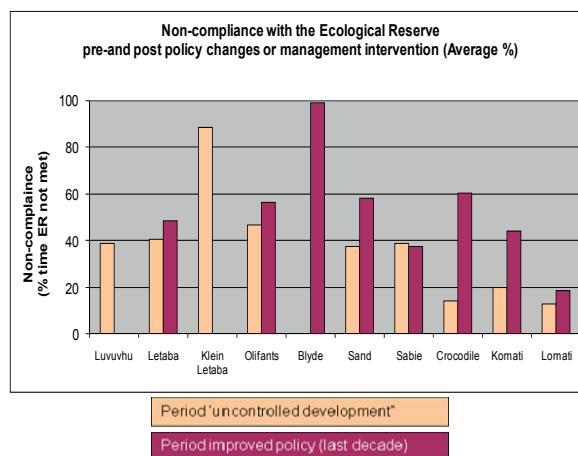
Assessment of compliance

A report on the assessment of potential reasons underlying non-compliance is available for regulators, water users, operations and maintenance staff, researchers and other stakeholders, but the problems associated with an

assessment of compliance needed to be explored. This study assessed the state of compliance with the ER as a benchmark for sustainability in the rivers mentioned and some of their tributaries.

Under-estimate non-compliance

Non-compliance could be under-estimated due to the individual days when Reserve flows might not have been met.



The analysis shows the % time the ER was not met, based on intersection of the flow direction curves (FDC) produced from historical gauged flow data against the FDC for the ER of each river. In no instance was there complete compliance with the ER since hydrological records began, whilst the highest level of non-compliance (88% of the time) was shown for the Klein Letaba. Recent management interventions in the Inkomati WMA suggest that the situation will improve substantially in the next decade, in the Crocodile and the Groot Letaba rivers.

Wet and dry seasons

Using daily flow data (less drawbacks as monthly averaging),

the incidence of non-compliance increased under this analysis, even in the case of the relatively pristine Sabie River. The analysis revealed almost 100% non-compliance with the ER for the Blyde River during the winter dry season months, inspite of the dam built to meet in-part the ER requirements for the Olifants River. Unexpected reserve non-compliance occurred during the wetter summer months for the Groot Letaba and the Olifants rivers. The analysis explored the volumetric magnitude by which the ER was infringed, and despite distinct results for each river, there was a general trend of increasing disparity in volumetric requirements of ER and the volume that actually flowed as the dry winter months progressed.

Monitoring and forecasting

Monitoring of the ER is only possible for a period over which reliable estimates of natural flow are available, which in most cases is up to September 2005. (i.e. real time natural flows are not available), another constraint relates to the infrastructure for monitoring.

Whilst this document details the rationale for the ER and suggests novel methods in which compliance with meeting the ER can be monitored and assessed retrospectively, new methods were also proposed based on naturalisation of the flow hydrograph using case studies. This can be incorporated into real-time monitoring and forecasting in hydrological modelling systems.

In short these include the lack of planning and integration of ER determination methods with operations and the difficulties associated with real-time predictions of ER requirements.

These factors severely constrain planning, monitoring and the management action to mitigate non-compliance.

Implications for Governance

In order to monitor Reserve compliance and to provide a reasonable prediction of future ER requirements practitioners, government and academics need to be mindful of the realities of attempting to operationalise the Reserve. There are constraints but water resources managers need to be given guidance and support, particularly, as CMAs come on line and take over functions that have direct bearing on meeting the commitment to the Reserve.

Legal aspects

If there are transgressions with respect to meeting the ecological Reserve, management actions would be to find the source of the transgression and to discuss these with the transgressor(s) and make them aware of the problem and then take remedial action. This is fairly commonplace in some Lowveld catchments.

Further reading:

To obtain the report, *Towards improving the assessment and implementation of the reserve: Real-time assessment and implementation of the ecological reserve* (**Report No: KV 282/11**), contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.