

A recently completed Water Research Commission (WRC) project investigated the available ecological water requirements for estuaries in South Africa. The study confirms the uniqueness of estuaries in terms of their responses to reduction in quantity and quality of freshwater inflow and highlights the importance of continuous monitoring and cooperative governance to address non-flow related impacts and improve estuary health.

Background

Estuaries form the interface between the marine and freshwater environments. They are complex, dynamic and productive ecosystems. Estuaries provide numerous ecosystem services, such as regulating (erosion control), provisioning (food and water), supporting (nursery areas) and cultural services (recreation and tourism).

In South Africa estuaries range from permanently open tide-dominated systems to permanently open river-dominated systems, temporarily open/closed systems, estuarine lakes and estuarine bays.

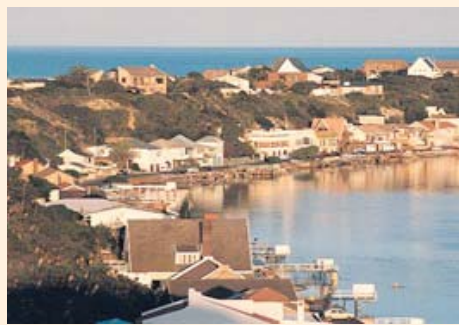
Freshwater abstraction for human activities affect the health and provisioning of ecosystem services supplied by aquatic ecosystems. Estuaries are sensitive to a reduction in freshwater inflow, which is the main driver of their dynamic, variable nature.

Input of discharge from wastewater treatment works and agricultural return flow can result in increased freshwater inflow to estuaries. Ecological water requirements (EWR) quantifies the water quality, quantity and timing required to ensure the adequate functioning of estuaries.

Since the eighties South Africa, along with the United States and Australia, have been leaders in advancing methodology used to determine EWRs. Most methods currently in use are holistic and adaptive, recognising that it is necessary to provide water for aquatic ecosystems from source to sea and for all water-dependent ecological components.

Estuaries are unique and have different responses to altered freshwater inflow. Therefore, studies of individual systems need to be undertaken. This WRC study – and its final report – provides a summary of available EWR studies completed in

South Africa. It also provides insight into the response of estuaries to altered freshwater inflow.



Development is placing increasing pressure on South Africa's estuaries.

Completed EWR studies

Completed EWR reports for estuaries were obtained from the Department of Water and Sanitation, CSIR and other consultants and scientists.

EWR studies have been completed for 39% of South Africa's estuaries since commencement in 1999. Initially studies were completed for individual estuaries or as part of catchment studies that assessed the EWR for rivers and estuaries. There has now been a move to managing estuaries at the scale of a water management area.

Due to lack of long-term monitoring data, time and budgetary constraints most (69%) EWR studies were completed as desktop assessments. Comprehensive reserve determinations have thus far been restricted to large permanently open systems as these catchments have a greater mean annual runoff and are therefore targeted for water abstraction schemes.

Main results

The following highlight the main lessons learnt

from the explored EWR studies:

- Each estuary is unique in terms of its EWR.
- Water can be released from dams to supply the EWR, but cannot mimic the entire natural flow regime.
- Floods are needed to flush out and reset estuaries.
- Increased flow, for example, wastewater input, increases mouth breaching resulting in unstable conditions in temporarily open/closed estuaries.
- Deterioration in water quality is a growing concern.
- The importance of groundwater input to South African estuaries is unknown.
- The offshore marine environment also has an EWR, but this does not form part of the current legal framework.
- A catchment-to-coast integrated water management approach is necessary to ensure connectivity.
- Cooperative governance is required to address non-flow related impacts and improve estuary health.
- Field and long-term data are needed for high confidence EWR assessments.
- Monitoring must take place in a strategic adaptive management cycle.

Conclusions

The study confirmed that South Africa's holistic approach to determining EWRs is at the forefront of methods internationally. The procedure is well documented and soundly embedded in an understanding of the structure and function of South Africa's estuaries.

The use of multidisciplinary scientific teams and panel workshops are integral to the method and are a strength. Failure to support the process with adequate data is a potential weakness.

Further reading:

To order the reports, *Assessment of completed ecological water requirement studies for South African estuaries and responses to changes in freshwater inflow (Report No. KV 352/15)*, contact Publications at Tel: (012) 330-0340, Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.