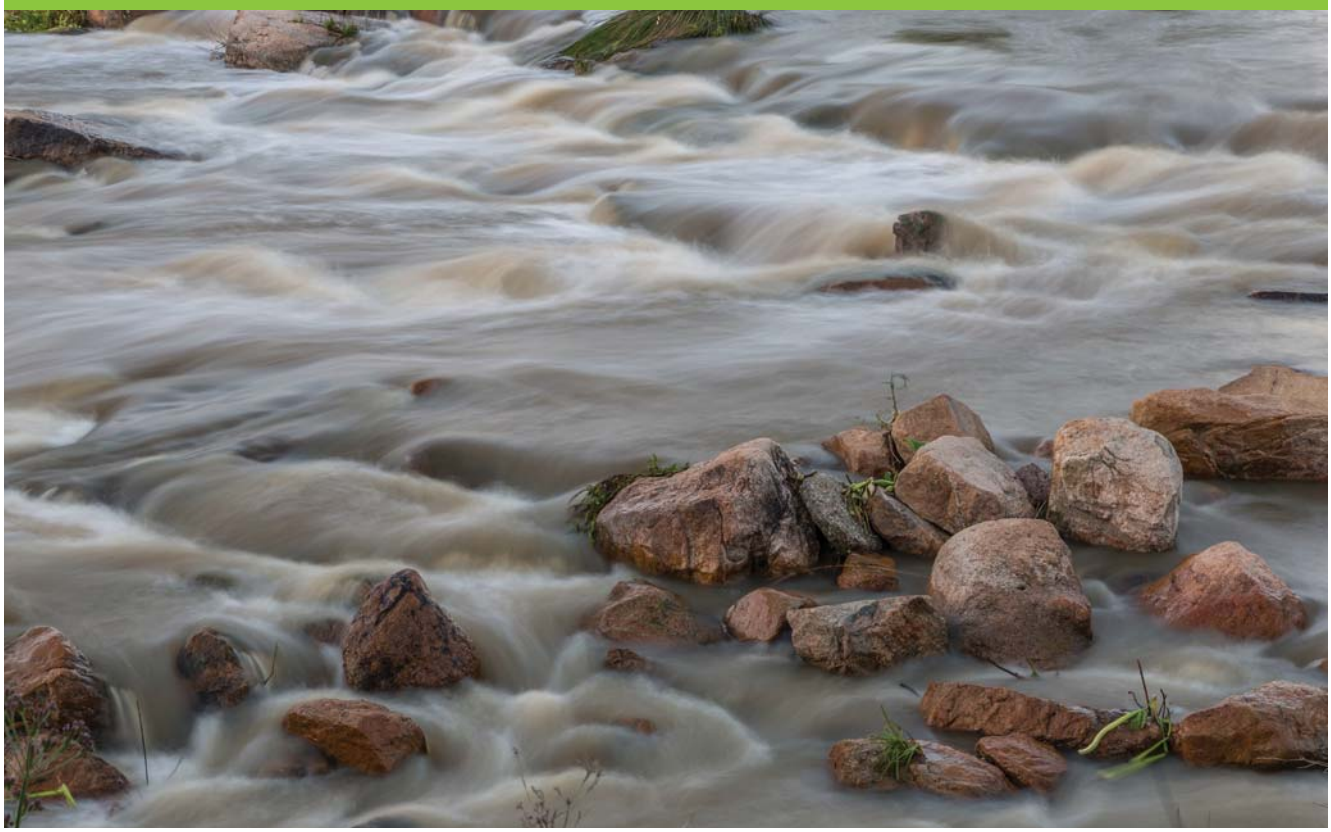
FRESHWATER BIODIVERSITY

Mapping for the future: Taking stock of priority freshwater priority areas

A decade after a comprehensive atlas of freshwater ecosystem priorities areas in South Africa was produced, planning is underway to update and improve it. Article by Jorisna Bonthuys.



There is no doubt that South Africa's freshwater ecosystems are under pressure and have already been degraded. Currently, our wetlands and associated river systems are in a critical state, with over 65% reported to be damaged and 50% estimated to have been destroyed.

This situation is even more alarming when future pressures on water resources are considered – the demand for water is predicted to escalate dramatically over the next few decades.

South Africa's water resources are already scarce and limited in extent. South Africa is one of the driest countries in the world, with an annual average rainfall of less than 500 mm, a significantly lower amount than the world annual average of 860 mm. A fifth of South Africa receives less than 200 mm rain a year. The country's average rate of potential evaporation is more than three times the rainfall.

Many parts of the country are also expected to become drier as a result of climate change, threatening local water supplies. Demand outstrips supply in parts of the country and compounds water issues.

Identifying freshwater priority areas remains key to ensure water security, as does the uptake of this information to ensure effective decision-making and planning.

Spotlight on freshwater ecosystems

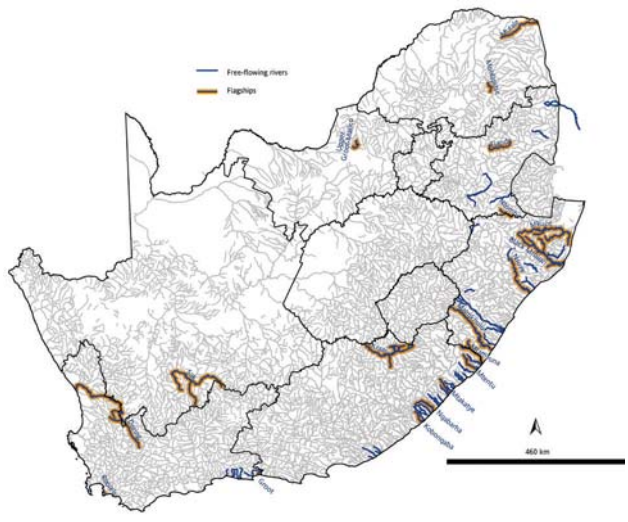
South Africa's national atlas of freshwater ecosystem priority areas, commonly known by its acronym NFEPA, was first published in 2011. It is a data-rich, visual tool that helps planners and policymakers identify strategic spatial priority areas for conserving rivers, wetlands and estuaries.

This information is visualised in maps of those areas considered the most important for sustaining the integrity and functioning of freshwater ecosystems and which ones should be kept in a natural or near-natural condition. The NFEPA project ran as a partnership between research institutions, government agencies, and non-government organisations.

Its outputs included the atlas (showcasing the maps), an implementation manual (a practical guide on how to use the maps in policy mechanisms), management guidelines for the different map categories, and a technical report (explaining the science that underpinned it).

The research that underpins these outputs was undertaken by the Council for Scientific and Industrial Research (CSIR), the South African National Biodiversity Institute (SANBI), the WRC, the Department of Environmental Affairs, the Department of Water Affairs, WWF South Africa, the South African Institute for Aquatic Biodiversity and SANParks.

Now efforts are underway to produce a second version of the atlas. This version will be informed by the best available science and knowledge generated over our freshwater areas over the last decade. This planned review was the focus of a symposium titled 'NFEPA review: A decade of service', organised by the WRC earlier this year. The need for improving national-level data of priority freshwater resource areas, through ongoing research and monitoring, was discussed in detail during this event.



The NFEPA project identified South Africa's large free-flowing rivers.

Taking stock of the NFEPA project

The NFEPA project delivered the country's first systematic conservation plan for freshwater ecosystems. "The atlas highlighted that freshwater resources are conservation priorities in their own right," lead author, Dr Jeanne Nel, said.

At the time, the priority areas were identified based on a range of criteria dealing with the maintenance of vital ecological processes as well as the conservation of ecosystem types and species associated with rivers, wetlands and estuaries.

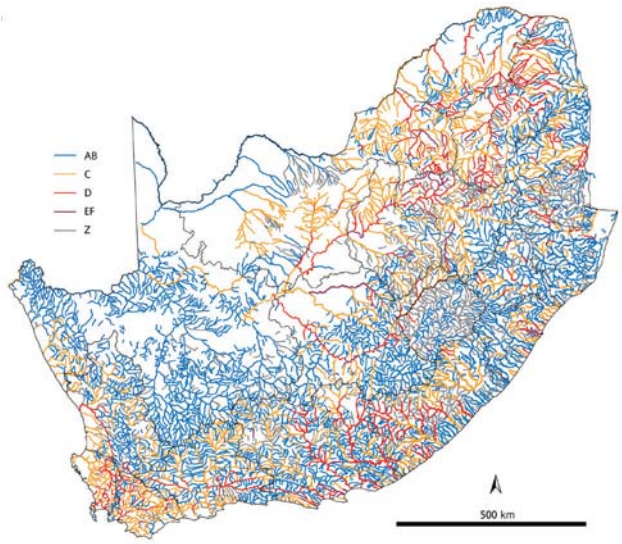
"One goal was to identify freshwater ecosystems, such as rivers and wetlands, that should be prioritised for biodiversity protection," Nel explained. "Another was to promote the adoption of co-produced outputs by relevant agencies."

The project was a joint effort between the water and biodiversity sectors to incorporate freshwater ecosystem goals into water resource planning and management. The project was run by a project team comprising both researchers and managers. They incorporated the expertise of over 100 stakeholders in this project.

Spatial data informed the selection of the priority areas which were reviewed in a series of workshops. The map products were designed with user needs as well as the relevant policy and legal contexts in mind, Nel explained.

"The project supported efforts to ensure that healthy ecosystems continue to form the cornerstone of our water resource classification system and the development of catchment management strategies," Nel said. "The maps generated have informed planning and decisions about land use and the expansion of the protected area network, among others"

The maps also informed water resource planning and management at a primary to sub-quaternary catchment scale.



River condition in South Africa as identified by NFEPA, with blue indicating unmodified, natural rivers and red and purple indicating largely and seriously modified rivers, respectively.

The Sabie River is one of the most biologically diverse rivers in South Africa.

"These visual tools provided context for decision-making at the local and site scale," freshwater ecologist Nancy Job from SANBI indicated.

The atlas has since been well embedded in relevant freshwater assessments, including in national and provincial strategies and planning processes, and by consultants in environmental assessments, Job highlighted.

There have also been applications of NFEPA by different departments. The Department of Water and Sanitation is, for instance, working on actions to declare strategic water source areas as well as critical groundwater recharge areas. Strategic water source areas for surface water cover about 10% of the country. These areas provide 50% of South Africa's total mean annual runoff and most of its groundwater recharge, sustaining most of the perennial rivers.

Efforts are also underway to implement resource directed measures in main stem rivers of the Berg, Breede and Gouritz, as well as middle and upper water management areas. These efforts were outlined by Yakeen Atwaru from the Department of Water and Sanitation's chief directorate responsible for water ecosystems.

Unpacking NFEPA's shortfalls

NFEPA received several "constructive criticisms" based on the accuracy and omission of some ecologically sensitive areas, Nel indicated.

There has been good application of the freshwater priority areas in biodiversity planning and land-use planning and decision-making processes. However, there has been limited improvement in the monitoring and management of these areas. This is partly due to the ongoing absence or reduction of scientific staff in key institutions and funding issues.

"Some institutions have raised concerns about the lack of confidence of the wetland priority area maps – these need to be a key priority for the updated version," Job said. "The river freshwater priority areas have, in contrast, been quite reliable in the first version of the atlas. They received quite extensive expert review. The National Biodiversity Assessment 2018, however, noted that some of our information is still based on data last collected in the field in the 1970s."

Dr Albert Chakona from SAIAB noted that dedicated surveys are needed in some provinces for freshwater fish. Availability of credible fish data, where the species identification is validated with voucher samples and genetic data, is a challenge. The Western Cape and parts of the Eastern Cape are the only provinces with extensive updated data. There is a need for dedicated resources that allows for fine-scale geographic sampling and taxonomic verification. In some provinces, information has not been updated since the 1970s. The identification of priority areas is, therefore, based on, at times, outdated data.

Despite the momentum that NFEPA generated, the impetus seems to have declined between 2016–2018, primarily as a result of declining funds at national and provincial departments. This negative trend in funding had a negative impact on staff appointed to do the implementation and monitoring, as well as operational costs to facilitate monitoring, Job pointed out.

2020 and beyond

New knowledge has been generated over the last decade, including updated information on wetlands and freshwater species generated for the National Biodiversity Assessment 2018 and about Ramsar sites. These sites are recognised as wetlands of global importance.

There is also updated information available about the country's protected area network, taxonomic updates of fish species, and DEFF's environmental impact assessment screening tool guidelines for ecosystems and species.

The process of translating national-scale products to finer scales has been relatively well done for rivers, inland wetlands, important fish areas, but not yet for water resource classes. Findings of the need to establish climate change buffer areas must also be considered. The reconciliation of the overall class of a catchment and the local scale information also needs consideration, participants highlighted.

"The next version of the atlas could consider a hierarchy of important freshwater sites, starting with sites with legal protection," Job said. "It could also approach prioritisation with estuaries and catchments in mind and include an update of wetland classification and condition."

Updating the wetland priority areas is considered a vital component of this planned review. Job said: "The river priority areas have, in contrast, been quite reliable in the first atlas. However, longer-term priorities include refining the river ecosystem classification and riparian zone mapping."

The next version must also be aligned with the protection of the strategic water resource areas through various efforts, said Pamela Kershaw from DEFF. "These areas form the foundational ecological infrastructure on which a great deal of built infrastructure for water services depends," she said. "They are also an important mechanism for long-term adaptation to the effects on climate change on water provision, growth and development."

Yet the National Biodiversity Assessment 2018 showed that

freshwater ecosystems and species need more management and protection. "These areas, part of working landscapes across the country, should be integrated into planning, oversight and governance," Job emphasised. "In light of predicated global and regional changes in weather patterns and ever-increasing resource pressures, we should protect the remaining areas that are still intact and functioning. It is crucial to develop a long-term collaborative framework of work focusing on priority freshwater areas, with partnerships for monitoring and evaluation," she said.

The management of national freshwater ecosystem priority areas requires a balance between protecting them and the ecosystems services they provide, and continued human activities. Due to low levels and uneven distribution of protection, they are highly vulnerable to inappropriate development.

Maintenance, restoration and rehabilitation of ecosystems, ecological processes and biodiversity are the most cost-effective ways to guarantee the water quantity and quality flowing from strategic water source areas, Kershaw added.

There remains a gap between the tools, implementation and a measurable impact in alleviating the key identified pressures. These gaps will require a substantial investment of human and financial resources, both by the government and the private sector.

Skumza Ntshanga, DEFF's chief director of biodiversity and conservation, said South Africa has a comprehensive suite of spatial planning tools available which should be used to secure freshwater priority areas. There currently is not a silver bullet for protection. All legislative avenues should be used, she said.

Dr Boyd Escott from Ezemvelo KZN Wildlife proposed that water resource management should be embedded into the Spatial Planning and Land Use Management Act (No. 16 of 2013). This approach is needed to prevent unregulated developments at the expense of priority freshwater areas, he said. Currently, the zoning of such areas has not made allowance for water resource management.

"Town planners need spatial management tools including guidelines to inform actions that take strategic water source areas into consideration," Escott said. "We need a (data) layer specifically developed for spatial planning purposes that can help town planners which specifies what can be done and where."

"A new phase of research is required," Nel added. "Research for this new phase should be linked to implementation activities, for science to inform policy."

- Both the atlas and implementation manual are available from the WRC or can be downloaded from http://bgis.sanbi.org.

Our threatened aquatic ecosystems

- Estuaries and wetlands are the most threatened and least protected ecosystems in South Africa.
- Freshwater fishes are the most threatened species group in the country.
- Estuaries have the highest proportion of threatened ecosystem types (86%), followed by inland wetlands (79%) and rivers (64%).
- Rivers and inland wetlands have the highest proportion of types in the critically endangered category (42% and 61% respectively)

Source: SANBI's National Biodiversity Assessment (2018)

Healthy rivers are essential to the conservation of biodiversity in South Africa.