



GLOBAL WATERS



Resilient Waters protects and preserves biodiverse hotspots such as the Kruger to Canyons (K2C) Biosphere through support to community-based environmental monitors. Photo credit: Resilient Waters

Building Resilience into a River Basin

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Imagine a river basin — the rivers, tributaries, creeks, and wetlands that gather water and deliver it to the sea — as the vital network that all things, living and nonliving, are connected to and dependent upon. This complex ecosystem is ever-changing from human and natural forces, and its management is complicated by the fact that it often crosses political boundaries — state to state, province to province, and country to country.

Southern Africa's Limpopo River Basin, the fourth largest on the continent, supports more than 18 million people in four countries — Botswana, Mozambique, South Africa, and Zimbabwe. The basin is also home to most of the region's largest cities and economies and boasts a rich diversity of flora and fauna. But the pressures on this transboundary system — which include pollution, climate change, and population growth — are immense. As a closed basin, the river basin's inability to provide enough water to meet the growing demand has profound implications for livelihoods, wildlife preservation, and food production.

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USAID launched the five-year, \$32 million Resilient Waters Program in 2018 to improve transboundary natural resources management and increase the water security and resilience of communities and ecosystems that depend upon the Limpopo and nearby Okavango basins.

Along the Limpopo River, USAID is tackling severe water and sanitation challenges in targeted municipalities and protected areas from the river's source in South Africa to its mouth at the Indian Ocean on the coast of Mozambique. These challenges range from industrial pollution and its impact on the health of the river and the environment and inadequate sanitation upstream, to saltwater intrusion and depleted groundwater downstream. More frequent droughts, stronger cyclones, and intensified flooding related to climate change are further straining this vulnerable resource.

Reducing Contamination Upstream

Combating pollution is one of Resilient Waters' priorities for improving access to safe drinking water and sanitation services at key points in the Limpopo River Basin. "In South Africa, climate change effects, such as shortages in potable water due to prolonged droughts and minimum rainfall, have necessitated a change in sanitation sector planning," says Lusanda Agbasi, acting director for the National Directorate for Sanitation at South Africa's Department of Water and Sanitation. "This means reconsideration of on-site sanitation and decentralized sanitation technologies as viable options for the longer term."

Case in point is Polokwane, South Africa, a burgeoning municipality in the middle of the basin. The majority of Polokwane's residents are not connected to sewerage systems, and like many of the region's rapidly urbanizing areas, the city has outgrown its existing wastewater treatment options. Further complicating matters, without a formal system for emptying, transporting, treating, or disposing of fecal waste originating from households not connected to the sewer network, Polokwane's untreated waste is either overwhelming the limited number of wastewater treatment plants or being dumped illegally, contaminating waterways. A lack of infrastructure and regulation endangers the local water resources and supply and threatens water security for downstream users. To address the impacts on river resources upstream of the basin, Resilient Waters recently partnered with Polokwane Municipality to enhance its knowledge base for decision-making around fecal sludge management or non-sewered sanitation for the municipality.

Using an evidence-driven approach, this collaboration is piloting a series of tools — a climate delivery assessment, sanitation safety plan, fecal flow diagram, and an urban resilience toolkit — to improve the management of fecal sludge. Leonellha Barreto Dillon, a senior partner at Seecon and an expert in sanitation safety planning, is working on the pilot project in Polokwane, and says that greater recognition of the impacts of poor sanitation on water resources is needed. "The impact of unsafe fecal waste flows on people, and the environment is unknown, and therefore, not fully integrated in decision-making on sanitation management within the [Polokwane Municipality] Water Services Authorities."

With support from the Regional Department for Water and Sanitation, Polokwane Municipality has committed to improve and refurbish its sanitation infrastructure.

The evidence to improve fecal sludge management, collected through this pilot project, is expected to be integrated into the municipality's overall planning and decision-making for sanitation service and infrastructure upgrades.

These newly embraced approaches have applicability well beyond Polokwane. "The lessons learned will be used to feed into the development of the fecal sludge management strategy for South Africa at large, because there are many other cities and other areas experiencing similar problems," says Chief Technical Advisor for Resilient Waters Nkobi Moleele.

Because the Resilient Waters program is regional, Chief Partnerships Advisor Kule Chitepo adds, "Whilst we do have interventions that might be local in a particular country, we always want to see what the downstream and transboundary implications are of that localized or national activity. We're also very interested to see how that contributes to building [the] resilience of the basin as a whole in terms of downstream implications of upstream or urban areas like Polokwane."

Adapting to Change and Conserving Biodiversity

While it is crucial to safeguard the scarce water resources of the Limpopo River Basin from contamination, it is equally important to conserve and protect the high-elevation catchment areas that serve as water towers for the entire basin.

"The reason why a high-altitude catchment area is important is that it produces a lot of water per unit area for the basin [100 times as much as low-lying areas], but also these high-altitude areas are major storehouses of biodiversity," says Moleele. Protecting diverse ecosystems upstream improves the quality and quantity of water flowing downstream, contributing to the sustainability of the community livelihoods that are dependent on these ecosystems.

To manage vulnerable areas more sustainably, Resilient Waters provided grants to local organizations working within a number of protected areas to improve catchment management; support sustainable use of natural resources; and help governments, park personnel, and communities prepare for climate change pressures on biodiversity and water supplies.

For example, the Waterberg Biosphere Reserve, home to 5,500 species of plants as well as the endangered black rhino and wild dog, serves as an important water tower for three major catchments flowing into the Limpopo River. Resilient Waters is equipping staff with skills spanning field work, surveying, and Geographic Information System usage that will inform the implementation of a Strategic Environment Management Plan. A grant is also helping to engage traditional leaders and local municipalities to conduct socio-economic and water, sanitation, and hygiene surveys to determine upcoming climate change adaptation activities.

"This Strategic Environmental Management Plan is trying to look at all these challenges holistically with a view to ensure that water for all these different purposes is assured," says Moleele.

To the east of the Waterberg lies another high-altitude catchment area, the Kruger to Canyons (K2C) Biosphere. This area is home to two of South Africa's biggest

tourist attractions in the basin, Blyde River Canyon and Kruger National Park, and it functions as a critical water source for a number of agricultural hubs. Pollution, invasive species, contaminated mine drainage, and poor waste management and sanitation are all threats to water security in the reserve. Resilient Waters supports the biosphere's community-based environmental monitors to conduct village patrols, monitor river health, and raise awareness among the adjacent communities to increase the availability of clean water both locally and downstream. A recent clean-up campaign that involved more than 100 community members has led to some promising changes in waste collection and disposal practices. The program also supports restoration activities in the rivers, wetlands, and grasslands of the catchment.

Environmental stewardship is not limited to the high-catchment areas, however. The Limpopo River Basin is also home to numerous other parks and preserves, including the Greater Limpopo Transfrontier Conservation Area, shared among Mozambique, South Africa, and Zimbabwe, which connects almost a dozen parks and biodiversity hotspots adjacent to Kruger National Park, including Mozambique's Limpopo, Banhine, and Zinave National Parks and Zimbabwe's Gonarezhou National Park.

Climate change is wreaking havoc on these unique landscapes; the weather has become hotter and drier, depleting food supplies for grazers and watering holes. As part of its mandate to strengthen the ability of communities and key institutions to adapt to climate change, Resilient Waters co-hosted a training workshop with UNESCO on Climate Risk Informed Decision Analysis for South Africa's parks department, local NGOs, and other regional institutions. These parties now have access to more than 40 global climate models and visualization tools that enable them to make data-driven decisions on local and regional water resources management. Putting its newly acquired knowledge into action, Kruger National Park management used the content of the training workshop to start planning for climate-related impacts on freshwater ecosystems. Resilient Waters also supported the participation of professionals from across southern Africa in the UNESCO Mozambique Flood and Drought Monitoring training, which uses global best practice systems and data sets to predict water-related natural disasters.

The Livelihoods Connection

Local communities are more likely to protect biodiversity and freshwater resources if doing so is connected to job creation and income generation. Supporting new livelihood strategies also helps people reduce their risk exposure in the face of a changing climate and increased water scarcity. Resilient Waters is building on livelihood strategies put in place by its USAID-funded predecessor, Resilience in the Limpopo River Basin (RESILIM), throughout the basin in locales as diverse as Polokwane, the buffer zones between communities and protected areas, and at the mouth of the Limpopo River in Xai Xai, Mozambique.

Upstream, a Resilient Waters grant is sharpening farmers' skills to practice climate-smart agriculture and use water-wise farming techniques in an effort to boost income generation in areas where more severe droughts are predicted.

Downstream, the Limpopo River empties into the Indian Ocean in Xai Xai, a city of 120,000 people whose income depends upon viable fisheries and whose water supply depends upon available groundwater. All of the inputs upstream impact Xai Xai,

including a heavy concentration of nitrates from poorly managed fecal sludge and reduced water flows from the Massingir Dam to the north. Saltwater intrusion from the sea further disrupts Xai Xai's water supply, and the coastal town is increasingly vulnerable to flooding from more frequent and violent cyclones. The mangroves that once served as a natural buffer between the ocean and the river have been vanishing, eroding the area's identity as a thriving estuary and limiting the ability of these vital coastal forests to provide natural flood protection.

"Mangroves are very productive ecosystems, they are also good spawning grounds for fish and many other things," notes Moleele. "They also buffer the agricultural land from the intrusion of seawater...[and provide] many benefits. But as a result of a history of degradation from unregulated land uses as well as destruction from floods, the integrity of the Xai Xai mangrove ecosystems has been compromised."

Through a grant to a local NGO, Resilient Waters is supporting local communities to restore the mangroves, work that began under RESILIM and which includes a strong livelihoods component. Women's cooperatives are participating in conservation-based income-generation activities associated with the estuary, for example. "We are working to find ways to establish ecotourism activities that will also generate money for the communities so that they remain motivated to conserve the mangroves, because the mangroves play a critical function in that estuary," says Moleele.

The Pandemic Challenge

A new challenge facing the basin emerged in 2020 — COVID-19. Activities previously seen as win-win approaches, such as linking biodiversity conservation with income-generating ecotourism in buffer zones, have ground to a halt.

"In this part of the world, in the Limpopo River Basin, a lot of the rural economies around the protected areas are built upon or reliant upon the ecotourism industry," explains Chitepo. "And as you know, tourism has been very hard hit by the pandemic. So this has a direct effect on the livelihoods that are reliant upon the conservation area."

Resilient Waters is having to adjust to this new normal, but with challenges come opportunities, according to Moleele. "We're not just operating in a vacuum of what the needs are on the ground. And I think now more than ever, we have an opportunity to really ramp up our livelihoods work, especially given the impacts of the pandemic."

Enhancing Transboundary Coordination

While many of the upstream and downstream challenges can be tackled at the local level, engaging national structures, such as water authorities, is critical to addressing water resources management and disaster risk reduction in the basin. Ultimately, the most pressing concerns must be coordinated at the transboundary level, whether such steps involve mapping an aquifer to explore groundwater depletion in each member country or devising robust early warning systems for the basin. To that end, Resilient Waters has embedded two technical experts within the Limpopo Watercourse Commission Secretariat, the structure put in place by the member states to govern the basin.

This level of coordination is “a lot of work,” admits Chitepo. “But the relationships are there, the intention is there, the political will is there, the countries themselves are contributing towards the costs. Obviously, some countries have got more resources than others to be able to contribute towards this functionality, but they work very well in terms of leaving no one country behind in their cooperation.”

Resilient Waters’ work to strengthen institutional connections, build up its partnerships, and address the shocks and stresses of climate change will help mitigate the pressures on the Limpopo River Basin for years to come. As the health of this vital ecosystem improves, so too will the resilience of the humans and natural systems that depend upon it.

By Wendy Putnam



Additional Resources:

- [USAID/Southern Africa](#)
- [Resilient Waters](#)

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