



# Managing for change

Practical Integrated Water Resource  
Management and Climate Solutions  
for the Limpopo



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**RESILIM** : Resilience in the Limpopo River Basin Program

# Managing for change: Practical Integrated Water Resource Management and Climate Solutions for the Limpopo

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## KEY MESSAGES FOR POLICYMAKERS

- **The implications of climate change for the Limpopo River Basin (LRB) system are serious** and must be addressed across the system
- **Changes to how water resources are managed in the LRB are imperative**
- Positioned as a high-impact adaptation strategy, **the LIMCOM Integrated Water Resource Management (IWRM) Plan will be key to building resilience to climate change** and should be explicitly acknowledged as such throughout the LRB system
- Water scarcity, an existing characteristic of the LRB, is growing – **the need to increase basin water flows is greater than ever**
- Actions in one part of the basin have compounding impacts throughout the system, thereby reducing overall LRB resilience – **scale and regional integration is essential** if high impact solutions are to be realized
- With its riparian countries, **LIMCOM is critical, as a basin-level institution, to enable the implementation of resilience-building measures** such as IWRM
- Usefully, **LIMCOM can strengthen its knowledge base and interpretive analysis** to provide critical insights on how the basin is changing, and how to manage that change
- **Empowered, decentralized water management – a core principle of IWRM** – can be achieved through interpretive, critical analysis strategically disseminated to inform increasingly complex decision-making processes in the LRB
- It is **imperative that LIMCOM's IWRM Plan is renewed and revised** to include additional resilience building aspects and responses to climate impacts
- **The tenet of water conservation in high altitude rainfall catchments should be central** to the revised IWRM Plan
- **A coherent, cooperative strategy for reversing land degradation** is needed to improve the LRB's water quality and prepare for the impacts of climate change
- **The role of biodiversity as an indicator of a healthy functioning ecosystem** needs to be formally recognized through policies around its restoration, conservation and preservation, implemented on a transboundary cooperative basis
- **Water pollution, both surface and ground, must be avoided** – the principle of the 'polluter pays' cannot be a license to continue to pollute; simple measures include enforcing existing legislation on water licensing

## Executive Summary

The impacts of climate change on the Limpopo River Basin (LRB) are likely to be a significant driver for changing the basin's landscape. Transformative approaches to managing the LRB's key resource – water – are needed. The resource is scarce, and becoming more so, because of development pressures. The situation is serious; the LRB, in scientific terms, is a closed system, meaning there is no water left to allocate. Integrated Water Resource Management (IWRM) is a climate change adaptation and water resource management approach that is not unknown in the LRB, albeit in policy rather than implementation terms. IWRM is embedded in the Limpopo Watercourse Commission's (LIMCOM) approach to water management, guiding its goals, policies and strategies for disaster risk management, water quality and allocation. It is suggested that the current LIMCOM IWRM plan can be strengthened by more expediently focussing on the challenges on the ground and precise interventions, rather than on idealizing IWRM and its operationalization. While drawing on IWRM principles such as integrated decision-making and respect for resource benefit sharing, the adoption of a more practical approach supports an adaptive framework for river basin management. A 'no-' or 'low-regret' strategy for building resilience in the LRB highlights, for example, the importance of strategies such as conserving high-altitude catchments (to secure critical water flows for all) and investment programs on local priority issues such as restoring degraded land and areas of biodiversity.

## Introduction

The Limpopo River Basin (LRB) and the four riparian countries it supports (Botswana, Mozambique, South Africa and Zimbabwe) are under developmental and environmental pressure. Accelerated demand from socio-economic development and urbanization means more and more water is being drawn from a river basin system long since considered to be closed<sup>[1]</sup>. Pressure on the supply of water makes the LRB particularly vulnerable to the adverse effects of climate change and biodiversity loss, both of which limit the ability of the basin to provide its key ecosystem service – the provision of clean water. Building resilience to climate-related and other shocks in the basin requires natural runoff into the rivers to be maintained and, wherever possible, increased.

The imperative for opening up the water flows to increase availability for allocation and for conserving already allocated water is strong – even without the impacts of climate change. Building resilience to climate change and other stress factors in the LRB will open water flows and conserve an already scarce resource. This imperative is increasing as development related activities accelerate in the LRB. Agriculture, industry, mining and urbanization are among those developments that are placing the most pressure on the LRB's resources now - and are expected to continue into the future. Multi-pronged approaches are needed to build resilience.

The growing demand for water in the face of increasingly limited supplies has seen a change in the way water is managed globally and this is increasing the complexity of water resource

management. Changes in the world view of managing water resources gave rise to the globally accepted approach of Integrated Water Resource Management (IWRM), already integral to the LIMCOM's water resource management plans. It now remains for the LRB to facilitate investment in IWRM as a high impact adaptation strategy across the basin. Regional integration and cooperation are essential to achieving scale and impact, thus building basin-wide resilience.

A basin-wide approach requires the navigation of a complex set of geopolitical, economic, and institutional issues, as well as the competing sovereign interests that underpin national economic growth. As a transboundary system, the LRB faces additional difficulties of information asymmetries and divergent water management capacities. LIMCOM's mandate is to address some of these issues through information sharing and building cooperation between the riparian countries. In this capacity, LIMCOM has developed a framework of IWRM principles for the basin, which considers the shared concerns of all the riparian stakeholders<sup>[2]</sup>.

## Climate change heightens the need for new approaches to water management

Climate change is further stressing existing resource scarcity. Although climate change is typically discussed in future terms, impacts are already being felt, particularly in Africa. The continent is experiencing the effects of increasing temperatures and extreme events.

In the LRB, climate change is likely to cause additional stresses through declining rainfall and increasing frequency and intensity of extreme events<sup>[3]</sup>. Temperatures are rising across the basin, especially in the interior (with high levels of certainty in the projections)<sup>[3]</sup>. Higher temperatures result in declining land productivity and surface water availability. Degraded land is further impacted by droughts and the land is often not able to absorb the shocks of subsequent floods.

There is less certainty about the accuracy of rainfall projections. The climate model ensembles provide different views of projected rainfalls, with some indicating little change from present circumstances, and others projecting significant declines<sup>[4]</sup>.

These differing views notwithstanding, the climate changes in the LRB will have the cumulative effect of decreasing water quality and availability. The water scarce LRB system, with its current management and institutional framework, is far from able to absorb these impacts. Rapid biophysical impacts, which the natural ecological cycles of the LRB cannot keep pace with, are occurring. It is imperative that institutional transformations founded on adaptive management frameworks occur in order to change the way resources are managed in the basin.

## The case for IWRM

Effective management for long-term water security, including the conservation of available or allocated resources, necessitates an equitable balancing of interests of many different water users. This is the fundamental concept behind Integrated Water Resources Management (IWRM). IWRM is guided by a set of principles and processes which aim to improve

the management of water to increase economic and social efficiency while protecting the environment<sup>[4]</sup>. Protecting the environment (biodiversity) in itself leads to a greater provision of (cleaner) water. Operationally, IWRM involves applying knowledge from different disciplines, as well as insights from diverse stakeholders, to implement efficient, equitable and sustainable solutions to water management problems that are invariably complex. IWRM is globally acclaimed and endorsed by many countries because of its integrative, decentralized approach and consultative principles. The approach has, however, delivered only limited levels of success and impact in developing countries<sup>[5]</sup>.

In South Africa, despite considerable financial resources, implementation of full IWRM practices remains elusive. Nevertheless, there is a strong case for the positive impact of the IWRM paradigm when based on the gradual adaptation of existing management activities to tackle real problems<sup>[6]</sup>.

The integrated management of water is not easy to execute due to the varying responsibilities and controls over different parts of the system and management processes<sup>[3]</sup>. Nonetheless, the imperative for successful implementation of IWRM is stronger than ever in regions such as the LRB given the existing and growing scarcity of water, the multiple stresses on the system, and the complexity of governance in a transboundary river basin. Achieving equity in balancing the interests of the many and diverse water users that operate at multiple levels may be better achieved where decentralized approaches are involved. The value in this approach is that it facilitates multiple and varied adaptive measures across a system that include political and livelihood economies and an integration of important system components such as biodiversity and climate change into management objectives.

IWRM approaches<sup>[4]</sup> generally identify the following main challenges of water management:

- Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment;
- Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels;
- Women play a central part in the provision, management, and safeguarding of water;
- Water has an economic value in all its competing uses, and should be recognized as an economic good.

## IWRM in the Limpopo River Basin

LIMCOM, ratified in 2011, was formally established to facilitate improved transboundary management of the Limpopo River in 2012. The institution developed an IWRM Plan that recognizes the differentiated contexts of its riparian countries. The IWRM framework that LIMCOM has adopted focuses on the important strategic areas of Water Governance, Water Management and Water Resources Development<sup>[2]</sup>. Accepting that decision making in the basin, particularly around water allocations and use, will remain a political (and essentially sovereign)

process within each of the four riparian countries, LIMCOM has identified disaster management, water quality and water allocation as strategic objectives that require priority cross-cutting interventions.

### **Institutional, physical and socio-economic diversity means that management approaches are not universal in the LRB**

Four countries with diverse land-use practices and different, sometimes competing, socio-economic development policies and pathways share the LRB's water resource. Growing water scarcity, compounded by increasingly polluted water, and varied function and scale of water usage across the countries, necessitates collective management that concentrates on protecting river flows and prioritizes equitable distribution amongst users.

One challenge is that platforms for stakeholder participation are varied in form, function and strength in each of the riparian countries. Neither institutional mandates nor membership and structures are aligned, posing constraints for basin-wide stakeholder participation.

Legislative frameworks also vary between countries, with some possessing more advanced water reforms than others. Specifically, LRB countries have implemented varying degrees of decentralized water management, although Botswana has the most centralized institutional framework for water management.

The systems-based Risk and Vulnerability Assessment carried out by RESILIM in 2014<sup>[3]</sup> highlighted water scarcity as being one of the key drivers of spatially differentiated vulnerability in the basin - as is land degradation. Land degradation is wide spread and happens at local levels, often within communities, villages and towns which are over utilizing resources. It follows that reversing land degradation and enforcing related policy would be most effective if managed at similar local levels with responsibility and accountability

being vested with local authorities and community leadership structures. Livelihood diversification and job creation are an important aspect of such work. The decentralized approaches embedded in IWRM are, therefore, important to reversing serious land degradation, as well as improving water quality, which is currently poor in many parts of the basin. Poor water quality is particularly apparent around the upper reaches of the Limpopo River in South Africa, Botswana, and Zimbabwe. Mining impacts, such as acid mine drainage, effluent from poorly functioning wastewater treatment plants and agricultural runoff are the primary concerns to water quality. The response likely to have the greatest mitigating effect is an integrated 'bottom-up' approach based on principles of objectivity, fairness, and ground level influences (top-down responses have been shown to be less effective). An integrated and bottom-up approach is illustrated in Box 1.

### **Expanding LIMCOM's IWRM Plan for resilience**

LIMCOM's current IWRM Plan is set to expire in 2015<sup>[2]</sup>. Its strategic focus areas continue to be relevant and should continue into the new IWRM Plan. However, additional objectives will not only enable sustainability of the basin's resources, but will build resilience in the face of additional stress factors such as climate change.

As a central tenet, a critical, additional component is the conservation of the highly productive runoff-producing areas. Increasing and sustaining water flows within the basin can be greatly assisted by the formal protection of high-altitude catchments<sup>[3]</sup>, concentrating on priority water catchments throughout the basin. The conservation of these strategic water catchment areas (which are also biodiversity-rich areas) will preserve areas with high runoff-producing potential while having the benefits of protecting important biodiversity and maintaining high water quality runoff. In conserving these catchments,

#### **BOX 1: Waste Discharge Charge System as an example of an integrated approach**

The soon-to-be implemented Waste Discharge Charge System (WDCCS) in South Africa is an example of decentralized actions in the face of changing environmental quality. Disaggregated water catchment areas will be able to allocate the costs of water quality improvements in severely polluted catchments to the polluters. While these charges are to some extent centralized in that they are ratified by national legislation, they represent decentralized actions. They are not charged to every polluter in South Africa, but rather only in those catchments that do not meet water quality requirements. The cost of abating the pollution in each catchment (to some agreed upon level) will be distributed to polluters according to the quantity of pollution they produce, within the local context. These charges will be broken up into a discharge levy (aimed at recovering the cost of abatement) and an incentive

charge, which aims to change the production method of polluters in the catchment over a longer period of time.

#### **Comments to this case study**

The 'polluter pays' principle is useful in apportioning responsibility. However, caution should be exercised in the design and enforcement of a policy of this nature. Ideally, policy should not create a situation where polluters simply pay, and carry on polluting - potentially worsening the situation while the polluters carry on polluting. A new level of pollution avoidance should be the benchmark and universal application the ultimate objective. A critical response measure is the enforcement of existing legislation, for example enforcing the law that industry cannot operate without a water licence.

combining land restoration with the provision of employment is important. In developing countries, where public budgets are stretched between social needs, biodiversity conservation will be a more viable action if it can provide jobs and meet sustainable social-economic development goals.

The focus on water quality in the current IWRM Plan must be maintained, if not extended, to include a strategic short-, medium- and long-term approach to land degradation and climate change within the basin. Numerous small-scale studies exist, detailing land degradation in parts of the basin, but this has not been done for the basin as a whole. (These studies should be integrated into a cross-basin assessment that also completes gaps, and provides critical analysis in order to depict an overall 'picture' of land degradation, now and for the future, in the LRB. Analytical aspects could include distribution of degraded land, threatened areas, severity of degradation, relationship to population pressure and links to climate change.) It is already evident that land degradation is widespread in the LRB, and affects water availability and quality, as well as causing increased erosion and sedimentation along rivers and behind dams, reducing critical water storage capacity. Restoring lost biodiversity such as grasses and sedges (and other species) will make a substantial contribution to meeting water quality objectives.

The implications of climate change for the LRB are serious. This must be mirrored in the new IWRM framework. The current LIMCOM IWRM Plan refers its climate change outlook to the SADC Climate Change Adaptation Strategy for the water sector, which is not specific on what climate changes are expected because of the uncertainty in the models<sup>[7]</sup>.

Uncertainty in the model projections notwithstanding, it is evident that resilience building is an absolute necessity in the LRB and that adaptation strategies need be developed that are relevant to either climatic outcome. These are usually options that are also required for sustainable development reasons, hence investments

that meet multiple needs. Termed 'no-', or 'low-regret' investments, these are the most sensible policy options.

### **What LIMCOM can and cannot do**

Decentralized water management is a core principle of IWRM. LIMCOM can play a useful role in entrenching this principle by developing and sharing water-related information that has been improved through valuable interpretation and analysis. Enhanced and accessible information will enable LIMCOM to ensure that the effects and pace of change expected in the LRB is communicated to as wide an audience as possible and that the different stakeholders are applying similar information. Critically, comprehensive, accurate, and consistent information will promote regional cooperation as decision makers apply this in planning, negotiations and agreements.

LIMCOM is not mandated to develop the river basin – sustainably or otherwise; it is mandated to provide the interpretive information needed to inform a responsive and participatory management system that addresses local challenges. This will establish the conditions under which stakeholders can manage water in a decentralized system where locally relevant solutions can be implemented. Because local government officials are closer to water resource challenges and climate risks, they are best positioned to accurately assess needs, implement decisions, and enforce compliance. Since actions in one part of the LRB affect resilience in another, collective action toward decentralization will maximise the potential of this approach.

LIMCOM is positioned to promote an expanded IWRM Plan for resilience building in LRB riparian states. Drawing on its mandate and institutional status, it can elaborate on the benefits and outline practical strategies for implementation that are feasible because they build on existing policy and legislation within each country.

### **BOX 2: A knowledge base to build on**

LIMCOM has focused its IWRM efforts to date on information sharing – an appropriate and important role for a River Basin Organization (RBO). Significant basin-wide studies include the Scoping Study (2010) and the Limpopo River Awareness Kit (Limpoporak)<sup>[7,8]</sup>. Recently, the baseline Monograph Study, undertaken by Aurecon has been completed, but is not yet available publicly<sup>[9]</sup>. This study contains useful and detailed accounts of water quality, water flows, ecosystem health, climate changes and impacts, as well as important indicators of stress and vulnerability. Interpretive analysis will make its content accessible to decision-makers – a critical, value-add role for LIMCOM. The RESILIM program has conducted a basin wide Risk and Vulnerability Assessment<sup>[3]</sup> that, based on a systems analysis, provides an interpretation of stresses in the basin. This report, too, remains to be widely disseminated.

Given what is known about the challenges facing the LRB, specific information is required that both builds on LIMCOM's existing knowledge base and enables decision making in an increasingly complex system. Needs identified include the interpretation of:

- Water allocations between the riparian countries;
- Development plans throughout the LRB including explicit analysis of the required trade-offs between different water usage alternatives;
- Pollution levels and policy solutions;
- Land degradation levels and policy suggestions;
- Impacts of climate change and policy requirements;
- The importance of biodiversity in addressing all the above.

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Resilience in the Limpopo River Basin Program (RESILIM): Strengthening the overall resiliency of the Limpopo River Basin ecosystems and the people dependent upon them is necessary for sustainable development in the region. There is a need to bolster participatory processes built on sound science that effectively incorporate ecological, social and economic aspects of water resource management in the face of climatic change. In addition, individual and institutional capacities must be enhanced to be able to anticipate and respond to changes in ways that ensure equitable and lasting development.

**The Resilience in the Limpopo Basin Program (RESILIM)** provides the United States Agency for International Development (USAID) the opportunity to collaborate with the riparian countries of the basin to improve management of the basin's water resources— surface and ground—to meet the economic, biodiversity, and social needs of each country, and in parallel support the achievement of the development goals of the Limpopo Watercourse Commission (LIMCOM) and Southern African Development Community (SADC). RESILIM's goal is to improve trans-boundary management of the Limpopo River Basin resulting in enhanced resiliency of people and ecosystems. The strategic objective is to open water flows in the basin, given its current status of a "closed" basin, meaning it has no more resource to allocate.

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