



Strengthening transboundary groundwater management in the Shire Aquifer System of Malawi and Mozambique through the Groundwater for aDvancing Resilience (G4DR) in Africa project

Key messages

- **A vital resource under threat:** The Shire Aquifer is a vital transboundary resource that underpins water security and livelihoods in Malawi and Mozambique in the Shire River Basin.
- **Increasing threats to groundwater:** Groundwater in the basin faces growing threats due to governance challenges, overextraction in some areas, agricultural expansion, and densification or urbanization.
- **The G4DR project as a strategic opportunity:** The G4DR project offers a strategic opportunity to transform groundwater governance in the region, with the aim of fostering sustainable management of this shared resource.
- **Need for coordinated action:** A coordinated, transboundary approach is essential to secure long-term groundwater resilience. This requires strong political will, increased capacity amongst officials, and commitment from both countries.

Introduction

The Shire Aquifer System serves as an important resource for many communities that depend on it. This brief delves into the escalating pressures on the aquifer, highlights the need for coordinated action, and analyzes the opportunity for the Groundwater for aDvancing Resilience (G4DR) in Africa project to transform groundwater governance and foster sustainable management of this shared resource.

The Shire Aquifer System (Figure 1), shared by Malawi and Mozambique, is a vital yet vulnerable transboundary groundwater resource. It supports thousands of people through domestic supply, irrigation, and ecosystem sustenance. However, its long-term viability is threatened by several factors:

- **Unregulated abstraction:** Excessive groundwater extraction continues to be a challenge without coordinated management, putting considerable pressure on the aquifer (Monjerezi and Ngongondo 2012).
- **Pollution:** Agricultural runoff and industrial discharges degrade water quality, with increasing salinity noted in the Lower Shire River Valley (Kelly et al. 2019).
- **Fragmented governance:** Limited mechanisms for coordinated management, monitoring, or data sharing hinder effective groundwater management (IWMI and SADC-GMI 2019).
- **Climate change:** Reduced surface water availability increases dependence on groundwater (Fraser et al. 2018).



Measuring water levels and quality parameters, Mangassanja community, Milange District, Mozambique (photo: Claudido Pacacheque).

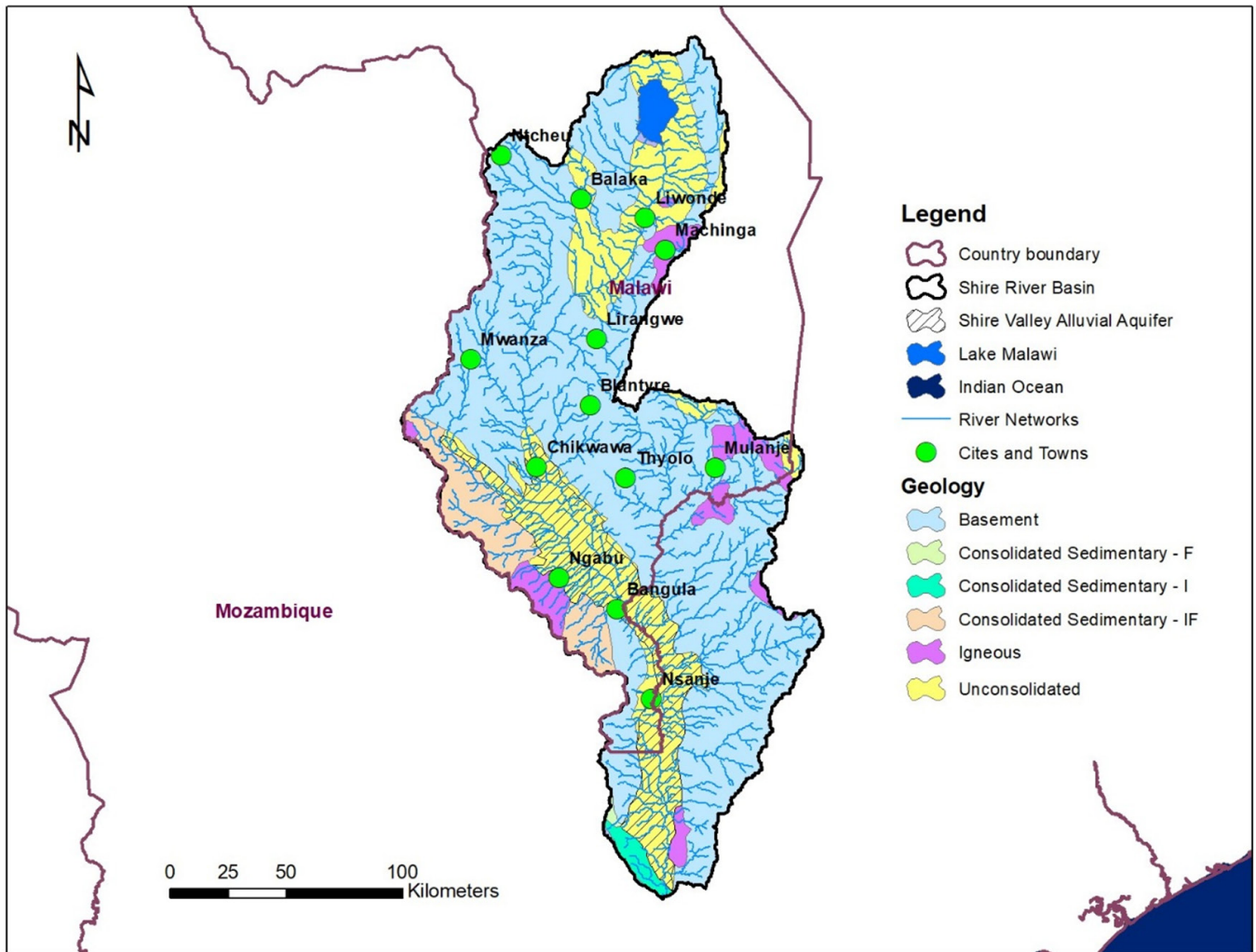


Figure 1. Map of the Shire Basin Aquifer System.

Source: Girma Ebrahim

Why this matters: A critical crossroads

Groundwater is a lifeline for countless communities across Malawi and Mozambique, with around 80% of rural populations relying on it—especially during dry periods (Nijsten et al. 2018). This shows the extensive dependence on groundwater in both countries, extending beyond the Shire Aquifer System. Despite this vital role of groundwater, falling water levels, rising salinity, and an overall decline in water quality are increasingly affecting the daily lives of communities, signaling the urgent need for improved governance and management.

The severity of the situation is further underscored by the state of water infrastructure in the basin. As shown in Figure 2, the functionality of boreholes in the Shire Aquifer System varies significantly between the two countries, posing challenges to reliable water access and monitoring. While specific functionality data for Mozambique remain limited, a study in Malawi revealed that approximately 26% of hand pump boreholes (HPBs) in

rural areas are non-functional—meaning that one in four water sources is unreliable or completely inaccessible to communities (UPGro n.d.). This appears to be part of a broader trend across Southern Africa (MacAllister et al. 2022). Even among the functional boreholes, very few meet the design yield or the water quality standards of the World Health Organization (WHO), posing serious health risks due to questionable water quality that is often worsened by debris or foreign objects entering through damaged or poorly maintained infrastructure.

This situation underlines the critical need for infrastructure rehabilitation and improved management across the entire transboundary aquifer system. Vandalism, inadequate maintenance, and limited institutional capacity further exacerbate these pressures on a poorly understood resource (SADC-GMI 2024). Addressing these challenges is important to ensuring reliable water access for the communities that depend on the Shire Aquifer System for their daily needs and livelihoods.

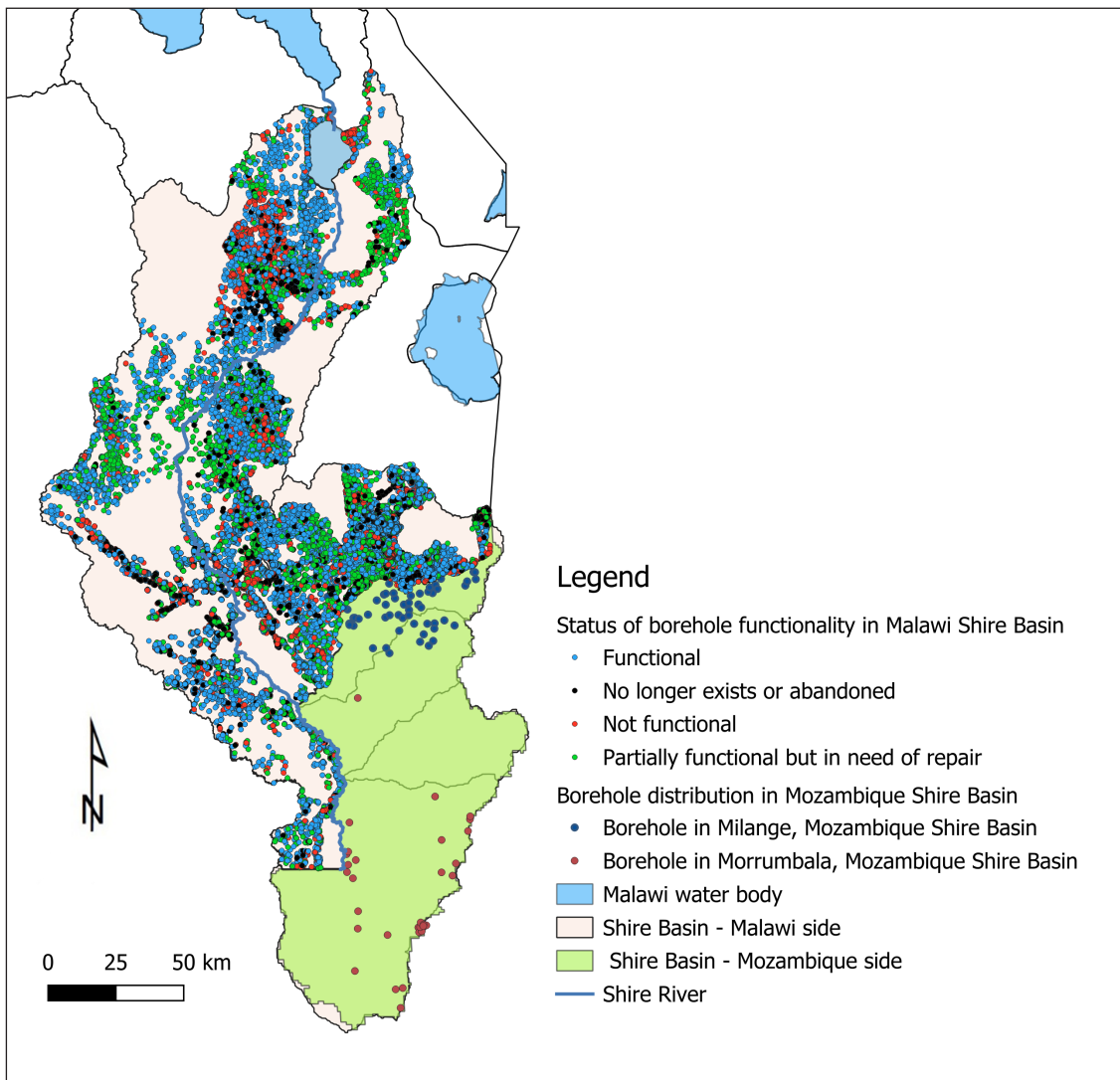


Figure 2. Status of borehole functionality in the Shire Basin, Malawi and Mozambique.

Source: Steve Kuwenda

Governance and policies in the Shire landscape

Both countries have established water governance frameworks, but some gaps exist in addressing transboundary groundwater management. Gaps remain in addressing transboundary groundwater governance—particularly in terms of monitoring and joint planning. **Malawi’s Water Resources Act** (Government of Malawi 2013) establishes user rights and monitoring structures but lacks transboundary provisions, primarily focusing on surface water and national-level groundwater management. The **Malawi National Water Policy** (Government of Malawi 2023) then integrates transboundary water management.

Mozambique’s Water Law (Government of Mozambique 1991) defines groundwater as a public resource but has limited integration with regional cooperation mechanisms. **Mozambique National Strategy for Water Resources Management** (Mozambique 2007), addresses all natural

aspects of water resource systems, including surface water and groundwater, water quality, pollution and protection of ecosystems, water uses in all sectors of the national economy, legal and institutional frameworks, institutional capacity building, and issues related to national development and regional integration.

Despite this progress, there are still some policy gaps that limit effective and coordinated transboundary groundwater management in the Shire River Basin. These gaps are particularly evident when comparing national approaches to groundwater monitoring, legal enforcement, pollution control, climate resilience, and transboundary cooperation.

Policy gaps: A closer look

Table 1 provides a comparative overview of key national policy instruments and highlights areas where bilateral or regional integration remains limited.

Table 1. Policies and legislation that currently exist in the Shire landscape.

| Policy area | Malawi | Mozambique | Transboundary gap |
|--|--|--|--|
| Groundwater monitoring | Limited (Malawi Water Resources Act 2013) | Limited (Mozambique Water Law 1991) | No transboundary data-sharing framework |
| Legal enforcement | Enforcement of permits and regulations remains weak; however, the polluter pays principle is used to control pollution (Malawi Water Resources Act 2013) | Limited legal framework for enforcement (Mozambique Water Law 1991) | No penalties for over-abstraction |
| Pollution control | Limited measures to manage industrial and agricultural pollution (Malawi Environmental Management Act 2016) | Moderate control through national environmental laws (Mozambique Environmental Law 1997) | No harmonized regulations or joint pollution monitoring |
| Transboundary cooperation | Limited engagement in terms of groundwater (Malawi Water Resources Act 2013) | No specific provisions for groundwater cooperation (Mozambique Water Law 1991) | Limited funds delay the establishment of an institutional mechanism for joint groundwater management (SADC-GMI 2019) |
| Climate resilience and recharge | Despite the absence of a dedicated groundwater recharge policy in the Malawi National Climate Change Policy (2016), the National Water Policy (2023) now incorporates managed aquifer recharge as an important water resource management strategy. | Limited groundwater adaptation strategies (National Climate Change Adaptation and Mitigation Strategy [Government of Mozambique 2012]) | Lack of coordinated efforts in climate-resilient groundwater management |



Measuring water onsite quality at an artesian well in Mangochi District, Malawi (photo: Steve Kumwenda).

Existing cooperative groundwater governance structures

While national legislation forms the foundation, several structures offer regional opportunities to advance transboundary groundwater management in the landscape:

- The **Southern African Development Community (SADC) Water Protocol** acknowledges the importance of shared aquifers but lacks aquifer-specific implementation strategies.
- The **Zambezi Watercourse Commission (ZAMCOM)** offers a basin-wide platform for transboundary water governance. However, the current operational focus is on surface water; dedicated structures or capacity to manage shared groundwater systems, such as the Shire Aquifer, are limited.
- The **Joint Permanent Commission of Cooperation (JPCC)** is a broad bilateral framework for collaboration between Malawi and Mozambique on various areas of mutual interest. While the JPCC itself does not directly manage water resources, the *Agreement on the Establishment of the Joint Water Commission* (signed in 2003) operates under this umbrella, providing a mechanism for cooperation on shared waters. This agreement's reference to "water resources of common interest" offers a potential avenue for formalizing groundwater-specific dialogue within the established bilateral structure. Intermittent meetings of the JPCC, most recently in Malawi in 2023, could provide a platform to elevate the importance of groundwater management within the existing cooperative framework.

G4DR: A transformational step for groundwater resilience

The Groundwater for aDvancing Resilience (G4DR) in Africa project is a strategic regional initiative designed to improve groundwater governance and monitoring across Africa. Through research, policy support, and capacity building, it seeks to enhance climate resilience at a Pan-African level—with the Shire Aquifer System serving as one of its key case studies.

Planned impacts of G4DR in the Shire Aquifer System

In the Shire Aquifer System, the G4DR project plans to enhance the overall groundwater management (including monitoring) by:

- Developing a shared groundwater monitoring network between Malawi and Mozambique;
- Establishing a (regional) data-sharing platform;
- Conducting large-scale water quality assessments; and
- Strengthening institutional governance to ensure sustainability beyond the project period.

Enhancing cooperation on groundwater management for resilience in the Shire Aquifer System

With the G4DR project, Malawi and Mozambique now have a timely opportunity to:

- Establish a Joint Groundwater Management Framework under JPCC;
- Launch a bilateral data-sharing agreement for groundwater monitoring;
- Co-develop shared abstraction guidelines and identify recharge zones; and
- Strengthen technical capacity through training and human resource development programs.

Call to action

Ensuring sustainable groundwater governance in the Shire Aquifer System requires a concerted effort. Each stakeholder has a vital role to play:

Governments of Malawi and Mozambique

National governments must lead the way by transforming policy intent into institutional action, starting with activating the transboundary groundwater dialogue/platform, strengthening coordination within the JPCC, investing in monitoring systems, and integrating groundwater considerations into basin and sectoral planning.

Development partners and donors

Support infrastructure for data collection and sharing, fund applied research on groundwater recharge and quality, and facilitate technical cooperation and institutional peer learning.

Local stakeholders and civil society

Encourage community-led monitoring and promote water-efficient practices in agriculture and domestic use.

Concluding note

The G4DR project's work in the Shire Aquifer System goes beyond groundwater—it is about enabling sustainable growth and resilience in Southern Africa. The formalization of cooperation, coupled with sustained investments in knowledge systems and a clear alignment with national and regional strategies, represents a critical turning point. By seizing this opportunity, the Shire Aquifer System can evolve into a compelling model for transformational development through effective transboundary groundwater governance, ensuring water security for future generations and fostering a more stable and prosperous shared future.



Groundwater data collection at Namwera observation boreholes in Mangochi District, Malawi (photo: Makenze Banda).

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Project

The Groundwater for aDvancing Resilience (G4DR) in Africa project aims to support African countries in using groundwater more sustainably to improve water security and climate resilience. Funded by the Global Environment Facility (GEF) and implemented by the Food and Agriculture Organization of the United Nations (FAO), the project is executed by the International Water Management Institute (IWMI) in partnership with key partners, namely, African Ministers' Council on Water (AMCOW), International Institute for Applied Systems Analysis (IIASA), Southern African Development Community – Groundwater Management Institute (SADC-GMI), and the national water ministries in Benin, Malawi, Mozambique, Togo, and Uganda.

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