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Shared aquifers as a source of water security for the riparian states

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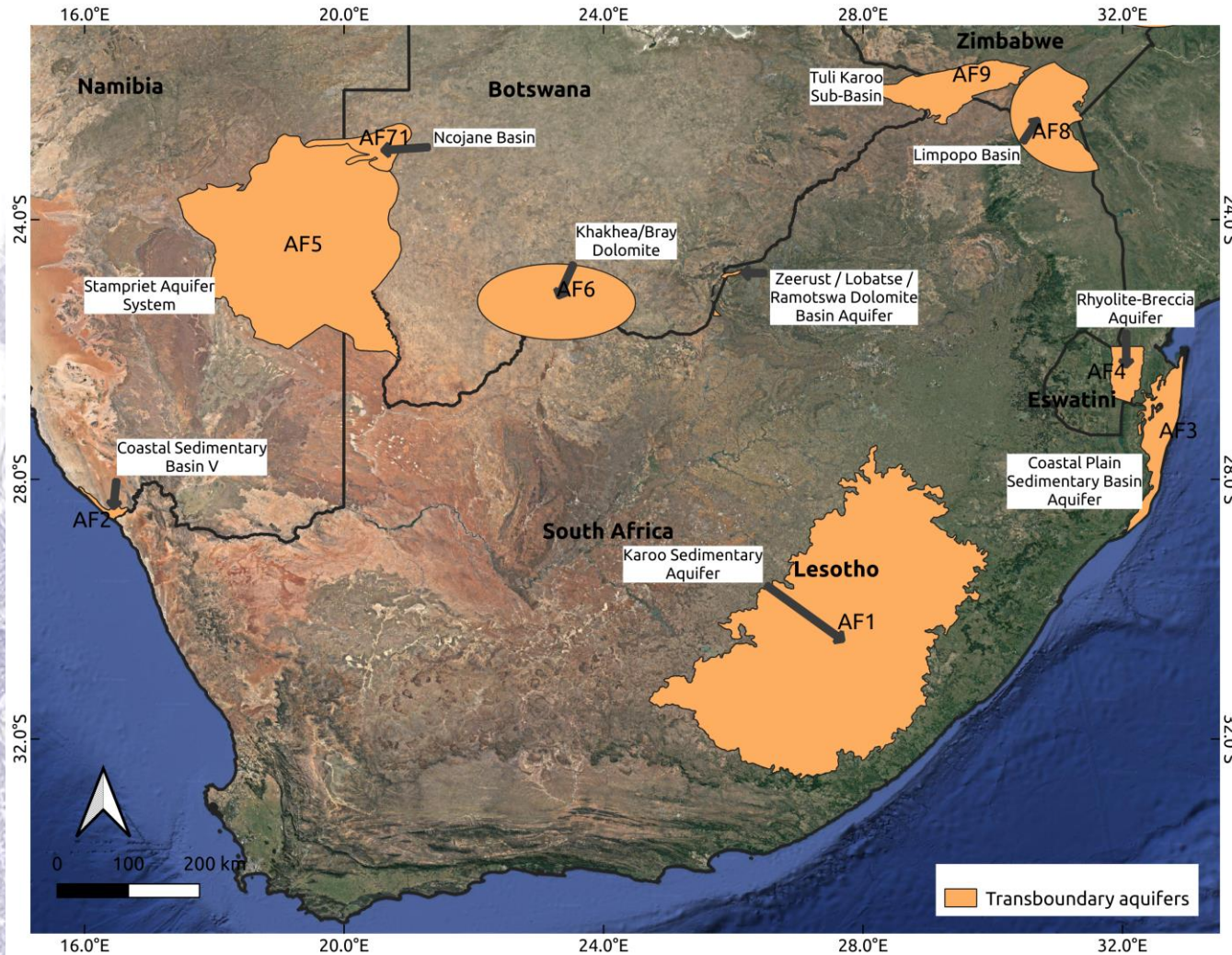
Co-chair International Association of Hydrogeologist
Transboundary Aquifer Commission



Transboundary Aquifers (TBA)

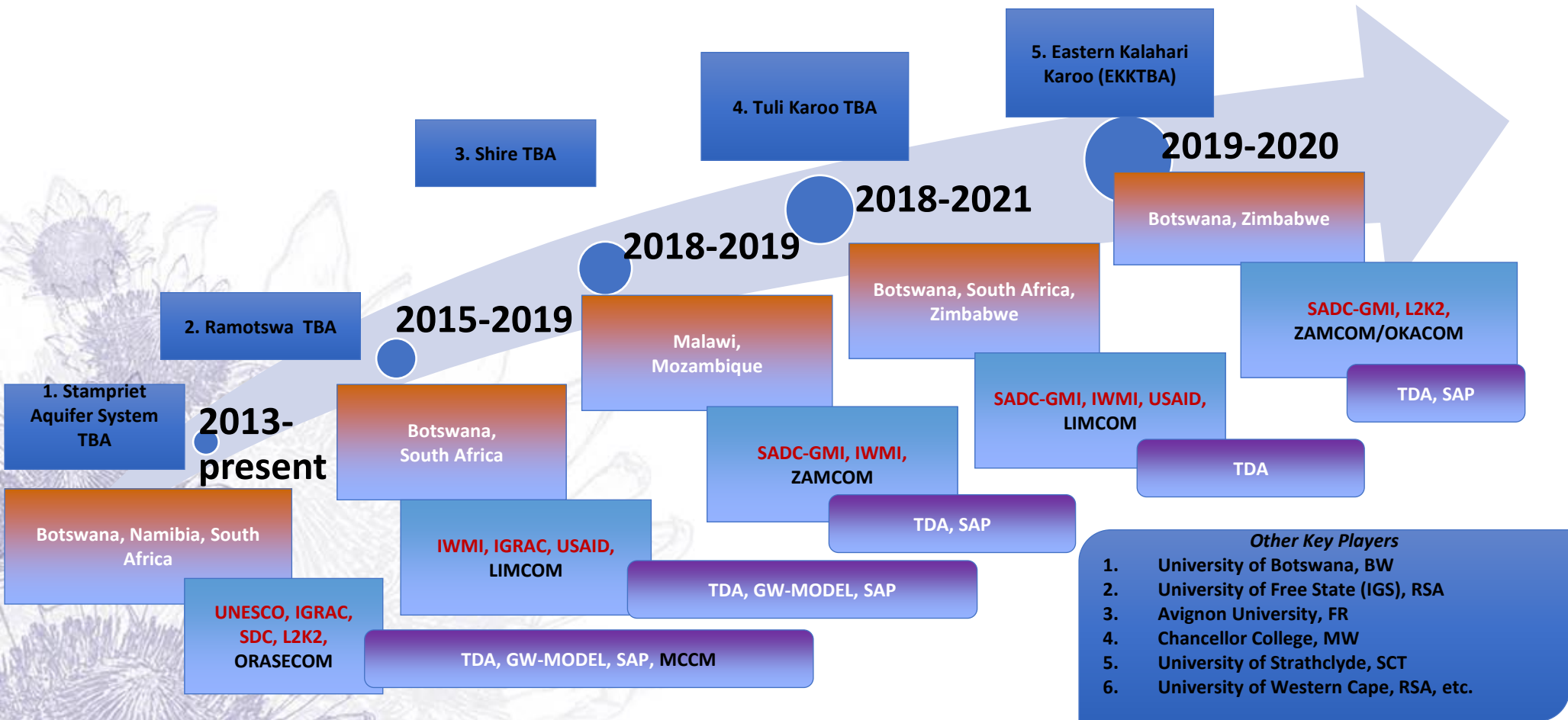


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- Aquifer or aquifer system of which parts are situated in different states
- This sole condition provides additional complexities in assessment and management

Timeline of investigations (in SADC)



Piet Kenabatho, 2021

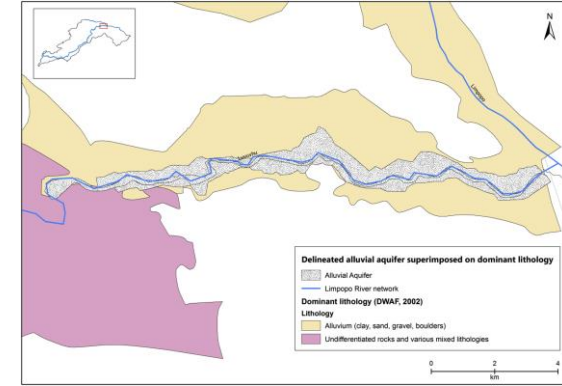
Alluvial aquifers



Garden irrigated from alluvial groundwater, Shashani River, Zimbabwe (Photograph courtesy Richard Owen)



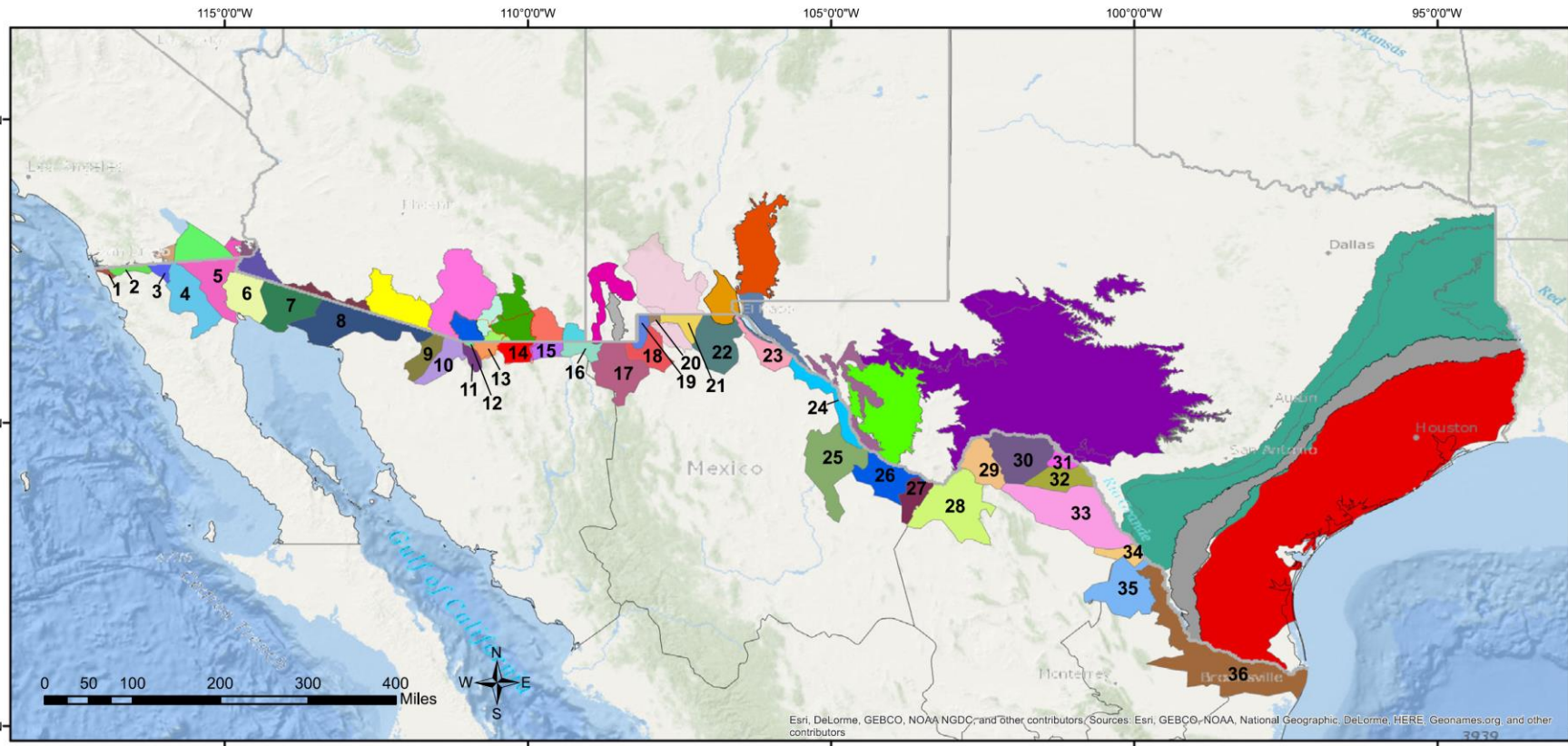
Riverbed well Molototsi sand river in October 2016 during a drought (Walker et al. 2018)



The delineated alluvial deposits are overlain on top of the Messina 2127 1:500 000 hydrogeological map (Mvandaba et al. 2018)



Plan of the Molototsi sand river site showing borehole information, testing and sampling locations (SI = stable isotope, FHP = falling head permeameter) and the geophysical survey lines (VES = vertical electrical sounding) along the Molototsi sand river (Walker et al. 2018)



Rosario Sanchez, Victoria Lopez, Gabriel Eckstein, Identifying and characterizing transboundary aquifers along the Mexico–US border: An initial assessment, *Journal of Hydrology*, Volume 535, 2016, Pages 101-119, ISSN 0022-1694, <https://doi.org/10.1016/j.jhydrol.2016.01.070>.
<https://www.sciencedirect.com/science/article/pii/S0022169416300105>

Why do we care...

- **Dependence on groundwater in transborder areas**
 - Vulnerable communities (women, youth, internally displaced people and refugees)
 - Forgotten communities
 - Water security
 - Water shocks and stressors (drought, flooding, disease, water shortages, food shortages, pests, state collapse or crisis)



Limpopo dry riverbed at a border crossing into South Africa from Botswana.

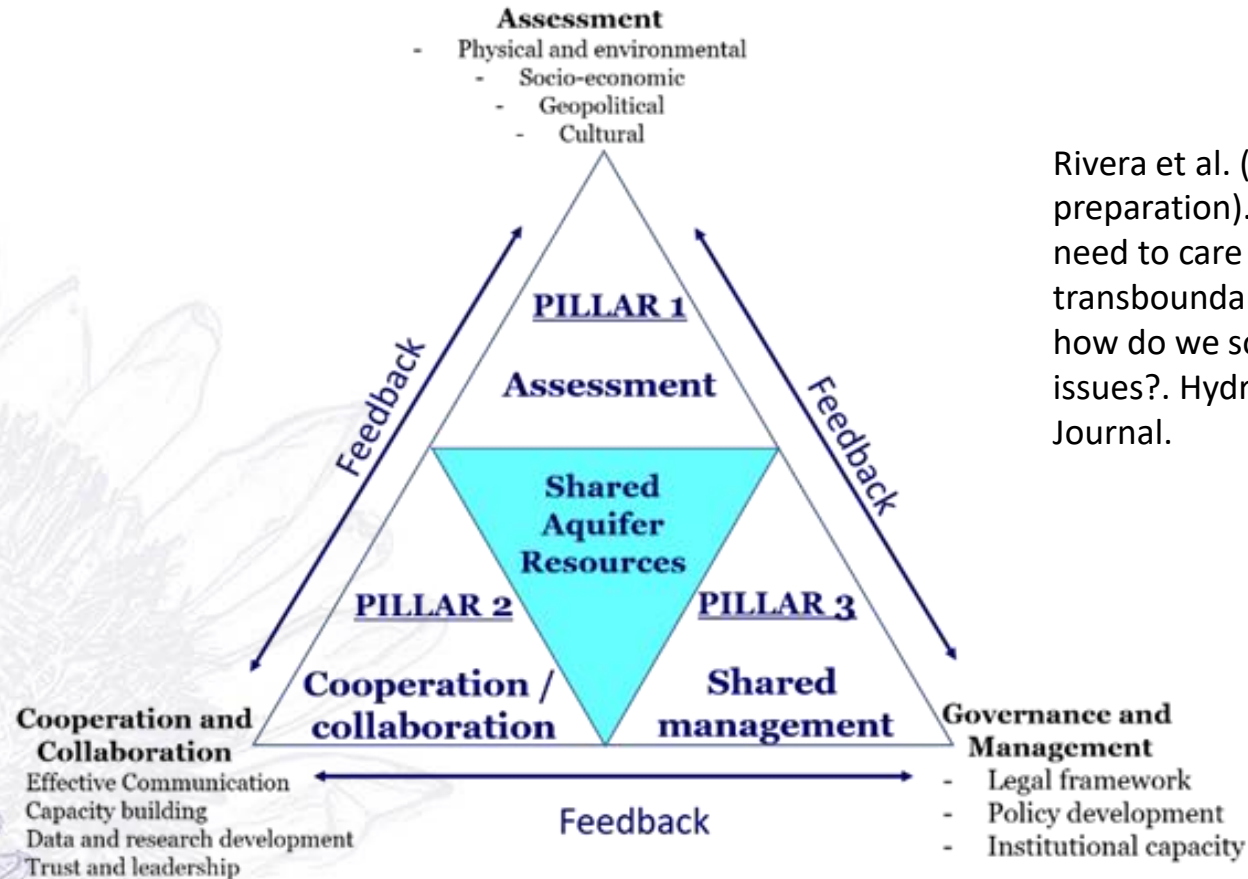


A woman in Botswana carrying water to her wheelbarrow – Ramotswa TBA (Photo credit: Hawkins, Stephanie. 2017)

Three-pillar framework for effective TBA management

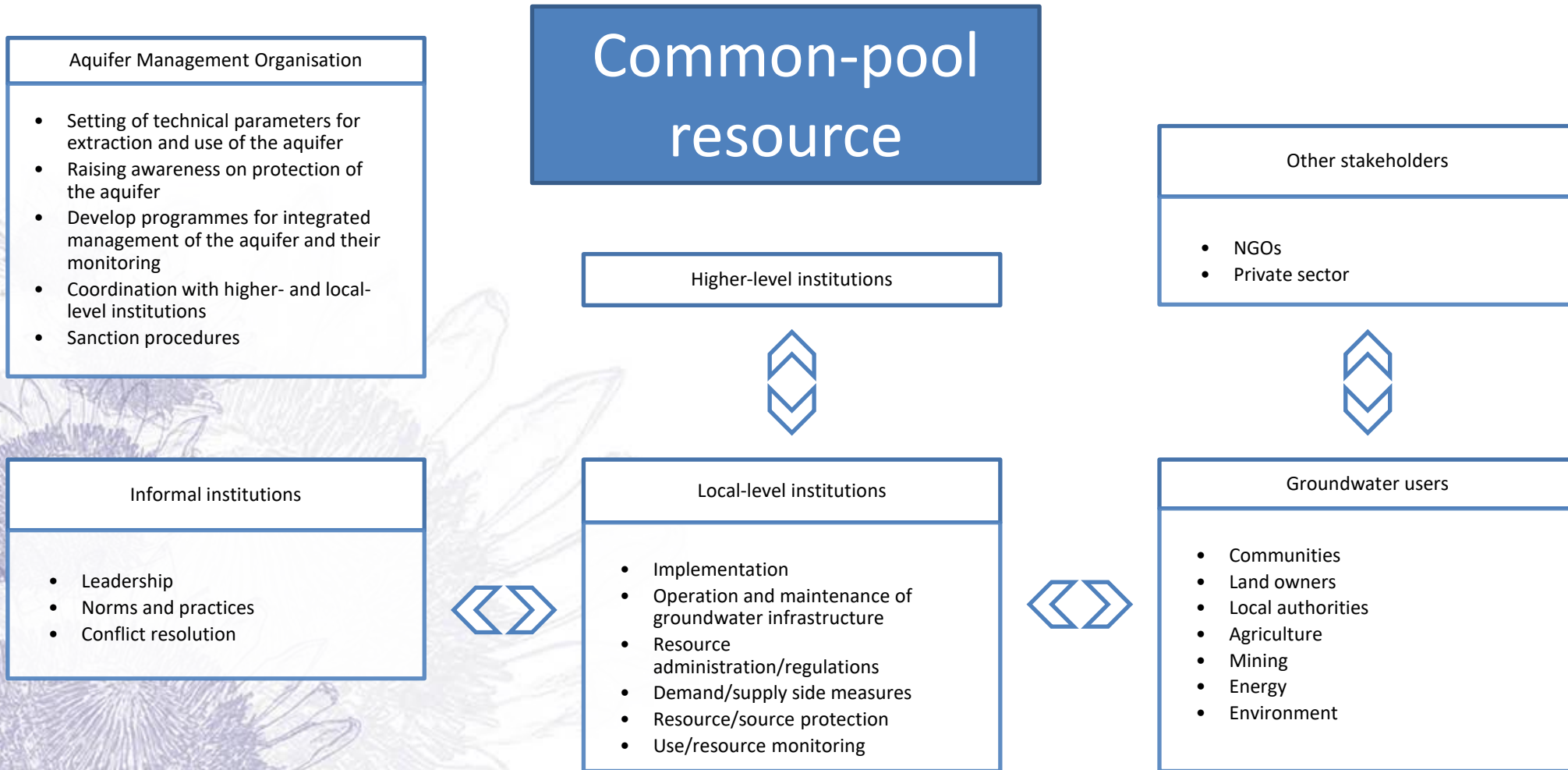


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Rivera et al. (in preparation). Why do we need to care about transboundary aquifers and how do we solve their issues?. Hydrogeology Journal.

Solving issues – Local level governance



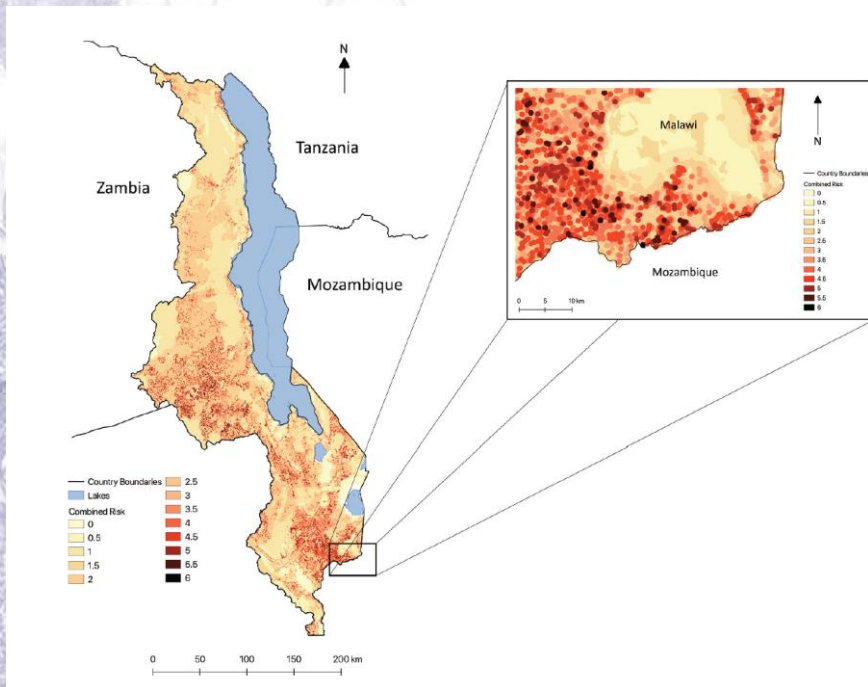
Solving issues – Understanding local context matter



- **Groundwater management analysis in the borderlands of the Horn of Africa**
- **Main findings from the study**
 - Governments have very limited knowledge of groundwater resources in the borderlands and transboundary aquifers which pose a problem of planning and developing water resources to meet the population water demands in the borderlands
 - Informal institutions and clan or ethnic affiliations dictate access to natural resources such as groundwater and conflict resolution in borderland areas
 - Transhumance is the primary coping mechanism to drought – groundwater development should be carefully planned in terms of risk of degradation, loss of ecosystem resilience and access to resources (especially women, youth and IDPs)
 - Multi dimensional strategies including integrated planning for groundwater resources development and pastoral institution-building are required to increase resilience for both groundwater resources and communities

Solving issues – priority areas

- Data scarcity, financing and capacity issues - more detailed assessment at a smaller scale



WATER INTERNATIONAL
<https://doi.org/10.1080/02508060.2020.1832747>

 **Routledge**
Taylor & Francis Group

RESEARCH ARTICLE

 OPEN ACCESS  Check for updates

A methodology to identify vulnerable transboundary aquifer hotspots for multi-scale groundwater management

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^aDepartment of Civil and Environmental Engineering, University of Strathclyde, Glasgow, UK; ^bMinistry of Agriculture, Irrigation and Water Development, Government of Malawi, Lilongwe, Malawi

Solving issues – Participation in International cooperation

- **AMCOW Pan-African Groundwater Program (APAGroP)**



The APAGroP Vision

Through improved groundwater policy and practice, groundwater is used sustainably and equitably, increasing water and food security and resilience, and supporting improved lives and livelihoods in Africa.

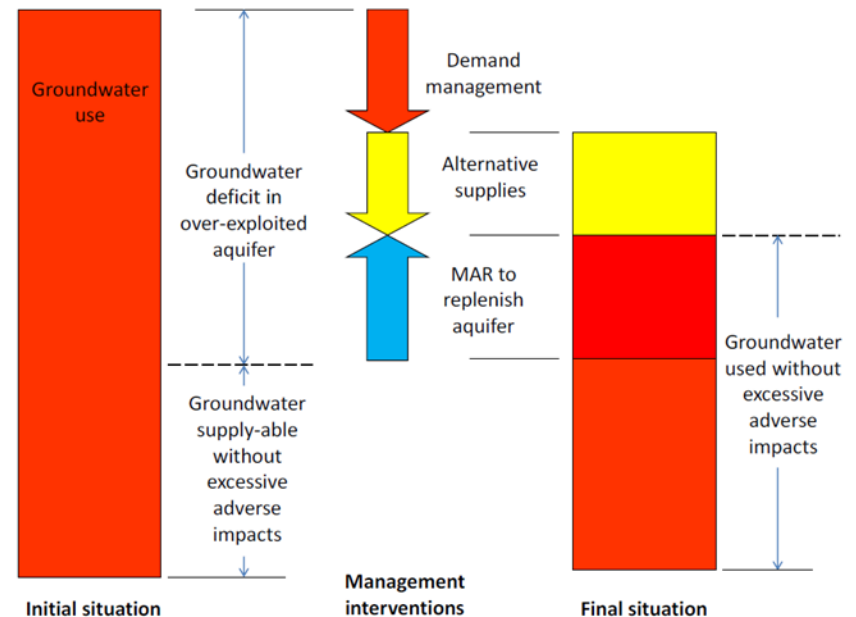


Solving issues – building groundwater resilience



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- Resilience system analysis is increasingly applied to water governance to understand socio-ecological systems ability to recover from imposed shocks
- Interventions to support groundwater resilience
 - Conjunctive management
 - Managed aquifer recharge
 - Groundwater reuse and recycling



Solving issues – innovative financing mechanisms

Typical mechanisms for funding O&M of groundwater schemes

- Recovered from users
 - Ad-hoc basis or as a regularised fee
 - Cross-subsidies
- Community Based Maintenance System - Malawi



USER-BASED FUNDING

- Government funds O&M
- Users might pay for spare parts, but ultimately, no fees are charged
- Kebele Water Technicians – Ethiopia



GOVERNMENT FUNDING

- Major source of funding in SADC
- Some donors cover O&M costs
- Wahis Mai REST programme – Ethiopia



DONOR FUNDING

- Partnerships between government, NGOs, SPs, NPOs and community organisations
- Public Private Partnership - South Sudan



BLENDED FUNDING

Solving issues – institutional capacity development



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- Adaptive institutional capacities are needed at subnational, national and transboundary levels to address the TBA challenges
- An occupationally-directed capacity-building model to support groundwater resilience technical support in South Africa



Key considerations

- A multidisciplinary approach
- Funding model
- Monitoring, assessment and, ultimately, management
- Role and value of TBA
- Cooperation and collaboration

Rivera et al. (in preparation). Why do we need to care about transboundary aquifers and how do we solve their issues? Hydrogeology Journal.



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