

**Transboundary Aquifers: Challenges and New Directions:
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Transboundary Groundwaters: Experiences of Conflict Management and
Regional Cooperation in East Africa**

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ABSTRACT

Tanzania shares its borders with eight countries namely; Kenya and Uganda to the north, the Democratic Republic of Congo (DRC), Rwanda and Burundi to the west and northwest respectively and Zambia, Malawi and Mozambique to the south. Transboundary groundwater commonly implies a body of groundwater intersected by a political border with the attendant potential threat of dispute over a shared resource. A preconceived concern is that a Transboundary groundwater resource that is not managed in a cooperative and holistic way by one state may be over-exploited to the detriment of another state. Transboundary groundwater as a discourse has become prominent in recent years, and is increasingly linked to Transboundary surface water resources. Transboundary water resource management seeks to avoid disputes that might arise from uncontrolled development of such resources. The approaches that promote prudent assessment and management of Transboundary surface waters also inform the management of Transboundary groundwater. Conflict is a form of competitive behaviour between people or groups. It occurs when two or more people compete over perceived or actual incompatible goals or limited resources. The general lack of technical cooperation, data sharing, training and research between the riparian states on hydrogeology hampers a mutual understanding of Transboundary groundwater resources. There are however initiatives in the Southern Africa Development Community (SADC) under the water mapping project. Similarly Tanzania is signatory to various Treaties and protocols that address water issues both surface and underground. Countries should cooperate on basis of sovereign equality, territorial integrity, and mutual benefits. This calls for bilateral and multilateral financial institutions to reinforce their long term support to countries and regional organisations in the development of groundwater for their national economic development, including providing the necessary funds for resource exploration, evaluation and sound data collection to fill in data gaps leading to knowledge based sound management practices. In the political arena, support by African Ministers' Council on Water (AMCOW), African Union (AU) and their constituent bodies are needed. This paper addresses potential conflicts and cooperation potential as well as conflict management strategies that will result in peaceful transformation.

Key words: Conflict Management, Knowledge Base, Transboundary groundwater, Regional Cooperation

1. INTRODUCTION

Tanzania is endowed with relatively abundant freshwater sources; rivers, springs, lakes, wetlands, and aquifers. Water has become of strategic importance to the economies of the SADC region, forming an input to various sectors, such as agriculture, industry, mining and power generation. In addition, water resources have the potential to be developed in such a way as to contribute to the achievement of food security and poverty eradication objectives. Transboundary problems often contain the seeds for both conflict and cooperation at the same time. Such problems can be perceived as threatening the well-being, security and even the sovereignty of a nation, stimulating hostile and conflict responses. Yet, they may be resolvable through cooperative interdependent action among the states that share the problem. Negotiation used early and preventatively can generate a consensus for integrative solutions. A preconceived concern is that a transboundary groundwater resource that is not managed in a cooperative and holistic way by one state may be over-exploited to the detriment of another state. Alternatively, pollutants might migrate across the border to contaminate a neighbour's aquifer (Puri 2001). Transboundary aquifer system is an aquifer or aquifer system, parts of which are situated in different States. Transboundary aquifers receive limited coverage in international law. Furthermore, the provisions are tailored for a surface water body and do not cover the specific hydro geological characteristics of aquifers (Figure 1).

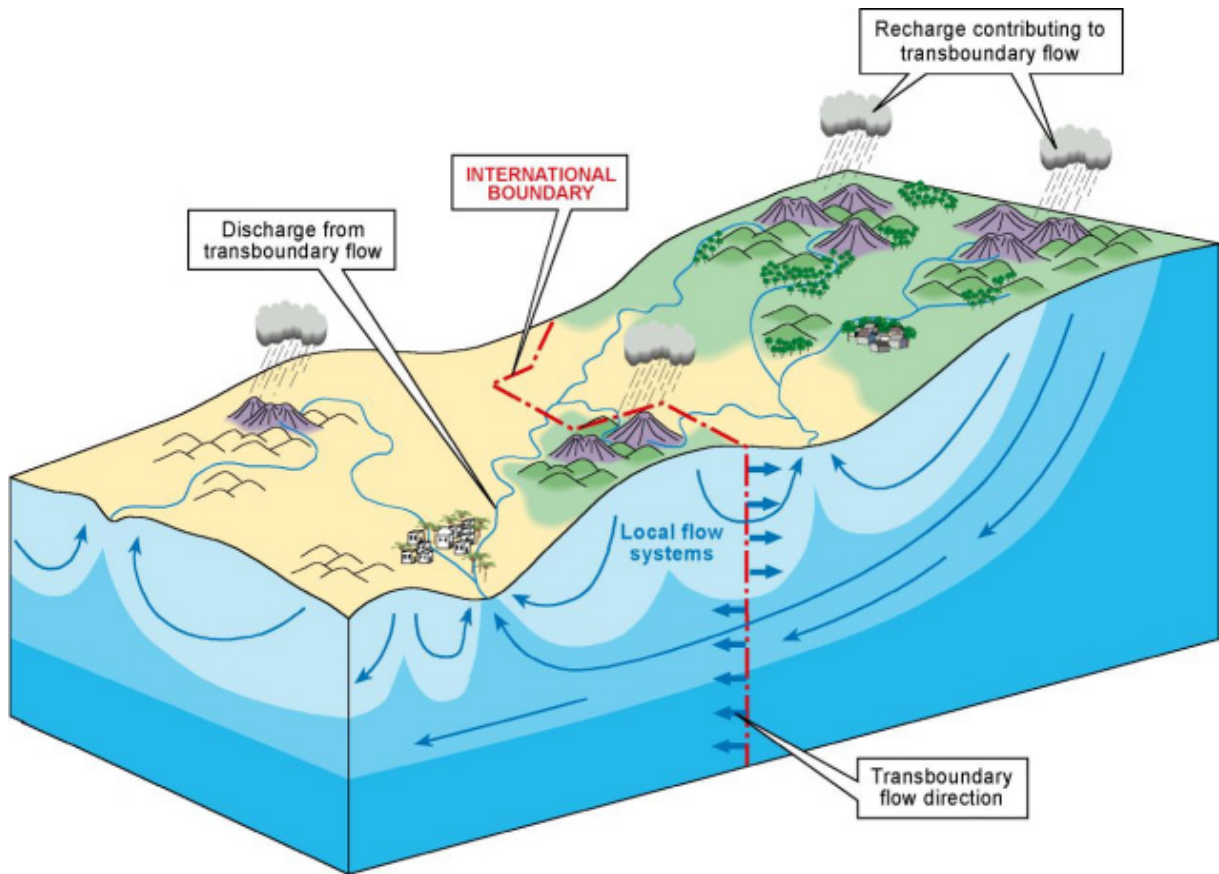


Figure1. 3-d illustration on of a Transboundary aquifer
 PURI et al. 2001, modified, UNESCO ISARM Framework Document

2. TRANSBOUNDARY AQUIFERS IN EAST AFRICA

The geology of Tanzania comprise of, the Precambrian basement complex, Karoo supergroup, Post Karoo sedimentary formations and volcanic and alluvium deposits. Groundwater occurrence in basement complex rocks is largely limited to secondary features such as weathered zones, joints, fractures, faults etc. The transboundary aquifer type in the basement complex is metasediments aquifers that are dominant in west of Tanzania. This type of aquifer is crossing the border to Burundi, Rwanda and partially Northern DRC. Sandstones and conglomerates of Karoo are characterized by groundwater occurrence associated with primary porosity and inter granular flow, which may locally enhanced by secondary porosity created by fracturing. This type of aquifer crosses the border in the southern part of Tanzania to Mozambique. In the coastal sedimentary formations that attain a thickness of more than 200 m, has an aquifer lithology of limestone, sandstones, sand, marls, etc. This type of aquifer crosses to the north with Kenya and to the south with Mozambique. The greatest aquifer potential in Tanzania lies within the volcanic pyroclastic and volcano alluvium deposits found in the slopes of Mount Kilimanjaro. This type of aquifer extends as further as to the Kenyan territory. Last but not least the alluvial deposits that are confined in the deltas have also international significant. The country's boundary deltas of Kagera and Ruvuma that borders Tanzania with Uganda and Mozambique respectively can be included in the subject of Transboundary aquifers.

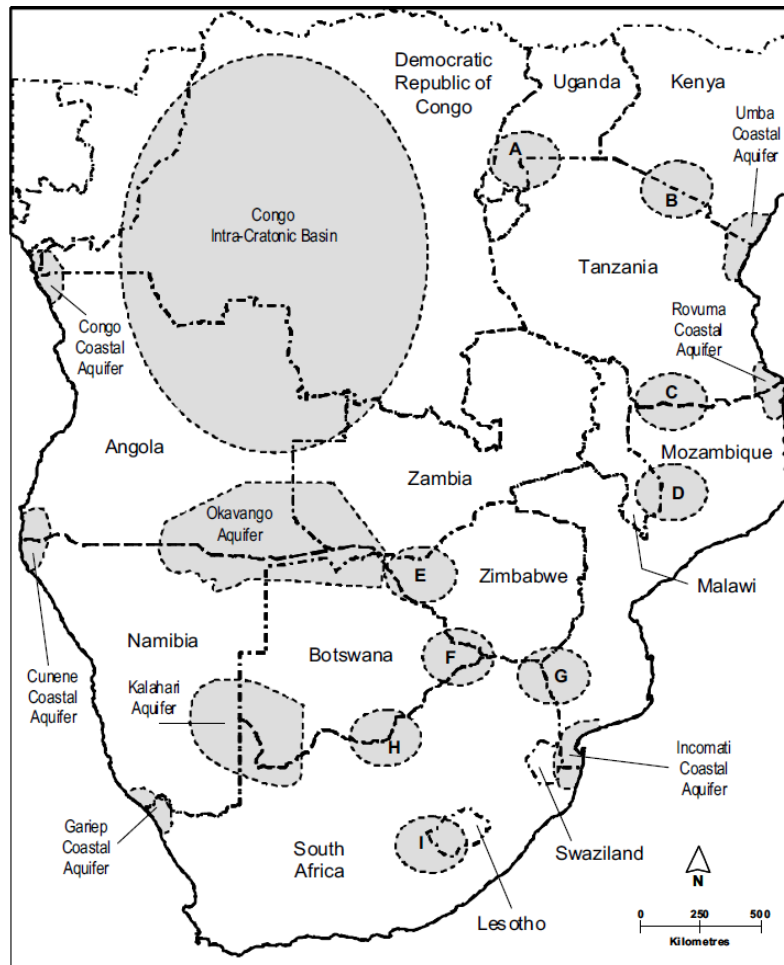


Figure 2: International (shared) aquifer systems: Map drawn from data in UNESCO-ISARM, 2004

Table 1. Transboundary aquifers in Eastern Africa as identified by ISARM

	Aquifer Name	Countries
A	Kagera Aquifer	Tanzania, Uganda
B	Kilimanjaro Aquifer	Tanzania, Kenya
C	Karoo Sandstone Basin	Mozambique, Tanzania
	Rift Aquifers	Kenya, Tanzania, Uganda
	Coastal Sedimentary Basin I	Kenya, Tanzania
	Coastal Sedimentary Basin II	Mozambique, Tanzania

2.1. TRANSBOUNDARY CONFLICT MANAGEMENT

Transboundary aquifer problems often contain the seeds for both conflict and cooperation at the same time. Such problems can be perceived as threatening the well-being, security and even the sovereignty of a nation, stimulating hostile and conflictual responses. Yet, they may be resolvable through cooperative interdependent action among the states that share the problem. Negotiation used early and preventatively can generate a consensus for integrative solutions.

2.2. TRANSBOUNDARY WATER COOPERATION

The main aim of transboundary water cooperation, apart from crisis and conflict prevention, is poverty reduction and resource protection. To reduce poverty, transboundary water cooperation is aimed at making more efficient and productive use of the shared water resources in a given basin. This also means designing water management in such a way that it is economically and socially sustainable, reducing the risks and costs of water use for the population, and improving the access of poor people to water resources with a view to resource protection, transboundary water cooperation is concerned with the sustainable protection of water resources and their surrounding ecosystems, including the protection of biodiversity and ecological integrity, as well as the viability of ecosystems. With regard to crisis and conflict prevention, transboundary water cooperation is aimed at reducing the structural causes of conflicts concerning distribution and use, preventing crises effectively and promoting mechanisms for peaceful conflict settlement. As a rule, however, water is only one of several crisis factors, with contrary territorial, economic and security policy interests frequently playing a central background role in disputes over water. Transboundary water cooperation also offers opportunities for further reaching collaboration amongst riparian states. In favourable settings, joint management of water resources can have beneficial impacts in the regional context beyond the confines of the river, lake or groundwater systems. It can encourage greater economic cooperation amongst the riparian states, a development which has already become evident in many transboundary watersheds. There are examples of cooperation initiatives such as the Greater Pangani "Cross-border Dialogue" which aims to develop an integrated management plan and forum / dialogue for Lake Jipe, Lake Chala and Uмба River, Facilitated by Coast Development Authority (Kenya) and Pangani Basin Water office (Tanzania) with support of InWent/GTZ. Also the East African Community Treaty provides for the establishment of cross-border natural resource management mechanisms under Protocol on Environment and Natural Resources Management. There are records of transboundary cooperation on water issues: Lake Victoria Basin Commission, Nile Basin Initiative, establishment of transboundary water use association for Mara River Basin.

3. CHALLENGES FACING TRANSBOUNDARY GROUND WATER MANAGEMENT

Shared water resources among countries require an effective governance framework at local, national and international levels, with sufficient implementation capacity required at all levels. The policy principle for water resources management for the East Africa region recognizes water as an instrument for peace, cooperation and Regional integration. Similarly, the UN resolution on Transboundary aquifers stipulates that Aquifer States shall utilize transboundary aquifers or aquifer systems according to the principle of equitable and reasonable utilization.

a) Limited Data availability: There is available data on surface water resources in the region; however there is limited information for groundwater resources. The government structures overseeing groundwater development face non compliance of groundwater guidelines and the submittal of hydro geological data from entities participating in its development, mapping and projects conducted are lost or no longer available within the government entity. Monitoring networks and data are limited as data collection is not consistent or continued once the initial development has occurred.

b) Lack of Human Resource: Trained technical experts in groundwater are not readily available in sufficient numbers in the entire region. There are few trained individuals at professional and technical level or remain severely under resourced.

c) Legal and Regulatory Limitations: Enactment of Laws in most member countries have been drawn up with regulation of surface water sources in mind, thus groundwater is generally not prominently featured in legislation.

d) Policy Harmonization: Policies between member states regarding groundwater are not always in agreement; thus there is a need for the harmonization of water strategies and policies between riparian

states to facilitate the management of groundwater at a transboundary level for the sustainable economic development the Region.

e) Poor Prioritization of Shared Aquifers: There is little understanding of the transboundary nature of aquifers amongst managers and communities dependent on the aquifers. The international impact of groundwater abstraction/degradation has been in the past neglected against a focus on national water resources planning, because there was no evidence of potential competition across the border.

f) Institutional Limitations: The lines of Responsibility for management of water resources are often fragmented between different authorities and at different levels. In addition at the operational level there are large differences between government policies/regulations/practices and those that actually exist on the ground. This usually being the case as capacity and resources are not available at the local government level to conduct the obligations as mandated by the government.

4. CONCLUSION

Since 2002 the processes and achievements attained in region by SADC such as the SADC Protocol on Shared Water Courses, the SADC Water Policy, the SADC Water Strategy and the SADC Groundwater Management Programme currently ongoing provide a framework for Member States to manage water resources in a more holistic manner. Within this framework, individual Member States and River Basin Organizations' groundwater management performance continues to be hampered by the many challenges mentioned earlier slowing overall progress towards more sustainable use and management of groundwater resources. The challenges combined have major region-wide impacts which impede progress towards social and economic development and harmonization in SADC.

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