

CHALLENGES TO TRANSBOUNDARY AQUIFER MANAGEMENT IN THE SADC REGION

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Abstract

The Southern African Development Community (SADC) within its Regional Strategic Action Plan on Integrated Water Resources Development and Management (1998) developed and adopted a regional Groundwater Management Programme (GMP, 1999) to focus on the exchange of information, research and training, monitoring, mapping, characterisation and management of transboundary groundwater resources. The overall objective of the GMP is to promote the sustainable development of groundwater resources at a regional level, incorporating research, assessment, exploitation and protection, particularly related to drought management and to integrate groundwater issues in the joint management of International River Basins. The GMP consists of 10 priority Projects within a framework of regional co-operation and development. Since 2002, SADC has begun to implement projects within the GMP. This article follows up on a previous presentation at the Internationally Shared Aquifer Resources Management (ISARM) 2002 Workshop in Tripoli and highlights the progress and challenges to transboundary aquifer management in SADC during the execution of its GMP.

1 BACKGROUND

The Southern African Development Community (SADC) is a regional grouping of 15 sovereign states: Angola, Democratic Republic of the Congo, Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. SADC's population is estimated at 240 million people and expected to double in 25 years; this will add additional stresses to undermanaged water resources and major water and environment crisis will occur if decisive actions are not taken towards sustainable and integrated water resources management.

SADC's water resources are vital for sustainable economic and social development of the region. In addition to meeting the basic needs of water supplies for domestic and industrial requirements, sanitation and waste management for about 240 million people, as well as sustaining a rich diversity of natural ecosystems, the region's water resources are critical for increasing food security through better management of rain-fed and irrigated agriculture, aquaculture, and livestock production; and improving access and availability of cheap energy through hydropower. Despite the importance of water for development in the region, at present there is little focus on a strategy for the development and management of the region's water resources, and in particular the management of transboundary watercourse systems. (SADC Regional Water Policy, 2005)

The SADC region is characterised by very arid conditions in the south-centre and south west of the continent, and is subjected to high climatic variability increasing the vulnerability to floods and droughts. Average annual rainfall varies from 4,000 mm in the Northern part of the region to less than 50mm and high evaporation. Rainfall patterns are characterised by seasonal distribution and high variability, resulting in high vulnerability to floods and droughts. The water resource is unevenly distributed in time and space amongst surface and groundwater.

There are 15 major shared rivers and a minimum of 20 major transboundary aquifer systems covered by the 12 continental Member States. The critical importance of water to regional integration and economic development was recognised by the Member States and thus the SADC Water Sector was established in August 1996; currently renamed as the SADC Water Division (SADC WD) as is part of the Infrastructure and Services Directorate based in

Gaborone Botswana. The vision of the Water Division is "to attain the sustainable, integrated planning, development, utilisation and management of water resources that contribute to the attainment of SADC's overall objectives of an integrated regional economy on the basis of balance, equity and mutual benefit for all member States".

2 SADC WATER INSTRUMENTS

To address the issue of water and the transboundary nature of water in the region, the SADC built a framework to address regional management of water in a comprehensive manner. To achieve this several water legal and non legal water instruments were created and are summarized below.

The *SADC Protocol on Shared Watercourses (adopted 1995, revised 2000)* was framed to set the rules for the joint management of regional water resources. The overall objective of this Protocol is to foster closer cooperation for judicious, sustainable and co-ordinated management, protection and utilisation of shared watercourses and advance the SADC agenda of regional integration and poverty alleviation, a watercourse meaning a system of surface and groundwater consisting a unitary whole flowing into a common terminus. The Protocol is the SADC legal instrument under which bilateral and multilateral agreements between Watercourse States may be developed; and fosters the development of cooperation at the River Basin Level and promotes the concept of Integrated Water Resources Management.

To further implementation of the Protocol the *SADC Regional Water Policy (2005)* was developed and provides the framework for sustainable, integrated and coordinated development, utilization, protection and control of national and transboundary water resources regionally. In addition it provides the context and intent for water resources management, representing the aspirations and interests of Member States.

A *Regional Water Strategy (2006)* was finally developed as the framework for implementation of the Policy and Protocol, indicating actions, responsibilities and timeframes. However actions towards realization of the Protocol had been outlined in the *Regional Strategic Action Plan on Integrated Water Resources Development and Management (RSAP, 1998)* which is currently in its second phase, 2005-2010. The RSAP includes seven areas of intervention identified as key issues for the Region: Legal and regulatory framework; Institutional strengthening; Linkages with sustainable development policies; Data collection, management and dissemination; Awareness building, education and training; Stakeholder participation; and Infrastructure Development. Thirty-one priority water resources interventions, programmes or projects were identified to comprise the Plan. One of these is the *Regional Groundwater Management Programme (GMP, 1998)* as groundwater is viewed as critical to the development of the region. The overall intent of the GMP is to create an enabling environment for the joint management of shared aquifers by putting in place a framework and specific tools to enable effective resource management.

To facilitate the Protocol a river basin approach was adopted by the Member States in the planning, development and management of watercourses, particularly in shared watercourses. Currently five River Basin Organizations are in existence; it is through these organizations and others like them that it is envisaged that the intent of the regional water policy will be implemented and result in the Integrated Water Resources Management of all freshwater resources, including aquifers is realized. This approach will consider the integrated use of surface and ground water resources, the reuse of water, proper pollution management and the provision of environmental requirements.

3 GROUNDWATER IN SADC

Groundwater development in SADC is influenced by the general stress on water resources resulting from the high spatial and temporal variability of the resource and precipitation, increasing water demand, economical development and urbanisation, all of which impact on the quantity and quality of available groundwater. Over arching this is the objective of SADC to meet the Millennium Development Goal drinking-water and sanitation target which will place additional stresses on the resources and the growing concern on protection of a precious and fragile ecosystems in the Region.

3.1 *The Importance of Groundwater Resources*

Groundwater resources in SADC play a major role in urban and rural water supplies and thus must be protected and developed in the best sustainable manner. In some areas groundwater is the only reliable source of water resulting in 60 percent of SADC's population and 70 percent of rural population using groundwater as their primary water source. As a result groundwater is likely to be the key resource to improve the water supply coverage and quality in many rural areas and, to a lesser extent, in urban areas. In addition it has proved time and time again to be a reliable source of water to mitigate the effects of drought.

In the Region's shared river basins complex relations between surface and groundwater exist and are not fully understood; the relations result in aquifers contributing to the river base flow. Groundwater use in such aquifers may have adverse impacts across international boundaries on downstream river flows and transboundary aquifers if inadequately managed and over exploited; aquifer development and management should therefore be addressed in the context of international river basin management. A challenge for SADC is that major transboundary aquifers are in general not coincident with the transboundary river basins.

It is realized in the SADC Secretariat that some aspects of exploration, development and management in selected aquifers should be addressed at the Regional level because it would create synergies between countries and optimise scarce human and financial resources. There are mutual benefits to be gained from an improved joint consideration and protection of groundwater, through the exchange of information, harmonisation, shared research, development and management activities. The increasing demands and resulting pressure on transboundary water resources create a need for a better joint understanding and adequate shared management; in turn leading to the potential mitigation and prevention in transboundary water and water related conflicts.

The strategic planning of SADC's groundwater resources has to take into account the international scope of the resource to meet existing and future water demands and thus the management of shared aquifers should be addressed at both the national and regional level.

3.2 *Challenges Facing Groundwater Management in SADC*

Despite the efforts undertaken by the SADC Secretariat, the Member States, and national groundwater managers to strengthen international cooperation on common issues, the Region is facing a number of challenges. In order to convert good will and good principles into the practical management and development of groundwater on the ground and result in the joint management of shared aquifers, the challenges identified in SADC have to be overcome; the more critical are outlined below (not necessarily in order of priority or applicable to all SADC Member States):

- a) ***Lack of Information and Data:*** surface water resources are generally well characterized in the region, however there is a dearth of basic information for groundwater resources. The government structures overseeing groundwater

development face non compliance of groundwater guidelines and the submittal of hydrogeological data from entities participating in its development (drillers, NGOs...); and data, 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) **Limited Capacity:** Trained technical personnel in groundwater are not readily available in adequate numbers in all Member States. Most have minimal trained individuals at professional and technical level or remain severely under resourced. This is exacerbated by a continual migration of qualified staff out of the region and/or out of the public sector into more lucrative private sector, this is exacerbated by low remuneration.
- c) **Legal and Regulatory Limitations:** 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 Consideration Given to Groundwater Resources:** In many areas, groundwater is not considered because it has not been used in the past, or at present its use is limited, the drilling industry is not developed, or groundwater potential is believed to be poor. This results in neglecting the potential of groundwater as a viable alternative to surface water and thus its management and protection are marginalized.
- f) **Poor Reliance on Groundwater Resources from Water Developers and Planners:** Groundwater resource evaluation and prediction of aquifer behaviour are generally not known with a sufficient accuracy and amounts of water that can be reliably abstracted in the future being too vague; thus water planners are not considering groundwater as a long term water supply option, even if it is economically attractive. In addition poor consideration and less importance is placed on groundwater during water resources planning, IWRM and budgeting. Generally SADC Countries well endowed with surface water usually have a lower consideration of groundwater resources than arid countries, who rely mainly on groundwater for their water supply.
- g) **Implementation Mechanisms:** River Basin Organisations and other organizations tasked with the management of transboundary water resources have a key role to play in addressing the identification of transboundary aquifers, developing processes and creating the institutional setting for shared aquifer management; however the aforementioned activities are limited or in their infancy.
- h) **Poor Appreciation 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. However, increased stresses on Regional water resources will require shared aquifer management as a component of long term planning.
- i) **Awareness of Groundwater:** As groundwater is unseen and difficult to quantify in comparison to surface water the general focus and interest has been towards surface water; this includes communities, the political structures and media. As a result there is very little awareness of groundwater and its importance at all levels of society and

government. The lack of awareness and understanding of groundwater, its availability, its vulnerability and its benefits has detrimental effects on the resources expended on its exploration, development, management and protection.

- j) ***Institutional Limitations:*** Responsibility for management of water resources is often fragmented between different authorities and at different scale. 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.

3.3 SADC Responses to the Challenges

To address the challenges facing groundwater management in the Region, SADC is implementing its Groundwater Management Programme (GWP) for the Region to facilitate putting in place a framework and specific tools, which are a prerequisite for the management of shared aquifers, in particular:

- A good knowledge base: Understanding of aquifer characteristics, geometry, limits, amount and location of recharge, direction of groundwater flow, vulnerability, prediction on impact of abstraction;
- A network of institutions, which create interaction between local, national, regional, global levels i.e. Sub-Committees within river basin organisations;
- A network of experts from countries involved, as custodians of the technical knowledge;
- A network of decision makers and NGOs, facilitating or developing dissemination of information, awareness building, public participation in water management issues;
- Tools such as Harmonised Procedures, Code of good practice, Regional Hydrogeological map, models, etc., and;
- Training and capacity building to develop national groundwater management structures, including community participation.

To achieve the aforementioned objectives an initial set of ten priority projects was identified by the SADC WD and Member States.

SADC GMP Priority Projects

- 1) Capacity Building within the Context of Regional Groundwater Management Programme.
- 2) Develop Minimum Common Standards for Groundwater Development in the SADC Region.
- 3) Development of a Regional Groundwater Information System.
- 4) Establishment of a Regional Groundwater Monitoring Network.
- 5) Compilation of a regional Hydrogeological Map and Atlas for the SADC Region.
- 6) Establish a Regional Groundwater Research Institute/ Commission.
- 7) Construct a Website on Internet and publish quarterly News letters.
- 8) Regional Groundwater Resource Assessment of Karoo Aquifers.
- 9) Regional Groundwater Resource Assessment of Precambrian Basement Aquifers.
- 10) Groundwater Resource Assessment of Limpopo/Save Basin

3.4 SADC's Progress to Date on Groundwater

Since the development of the GWP in 1998 the SADC WD has made a concerted effort to address the challenges facing regional groundwater management. This has been accomplished

not only by the implementation of some of the GWP projects but by the incorporation of groundwater throughout its other water resources activities. The activities can be classified as Direct Groundwater Activities, Institutional Strengthening, River Basin Organizations, Groundwater Awareness and Other Activities; each of these will be discussed in more detail below.

3.4.1 Direct Groundwater Activities

- 1) *Regional Situational Analysis (Completed 2001)*: The objectives of the analysis were to review and assess the procedures adopted in SADC Member States for the development, protection and management of groundwater resources for various purposes, review the institutional and legal framework and the funding structure for the implementation of groundwater development and management programmes in Member States. In addition identify the need for, and define a common nomenclature and references facilitating, the exchange of information and the development of activities at regional scale, such as a common numbering system and geographic references for wells, definition, limits and codification of aquifers, legends for hydrogeological maps.
- 2) *Minimum Common Standards for Groundwater Development in the SADC Region” (Completed 2001)*: The Document “A Code of Good Practice and Guidelines for Groundwater Development in the SADC Region” includes 11 sections on: Groundwater Project Implementation, Reconnaissance, Borehole Sighting, Drilling, Borehole Construction and Development, Groundwater Sampling, Pumping Tests, Production Pumping, Borehole Equipping, Hand Dug Wells and Springs, and Reporting. This document initiates harmonisation and improvement of practices and serves as guideline.
- 3) The development of a regional hydrogeological map is ongoing (completion 2010).
- 4) Pilot Testing of groundwater and drought management plans in communities of the Limpopo Basin is ongoing (completion 2010).
- 5) Mapping of groundwater dependant ecosystems in SADC is ongoing (completion 2010).
- 6) Drought vulnerability mapping is ongoing (completion 2010).
- 7) Groundwater valuation on representative activities is ongoing (completion 2010).
- 8) Pilot testing of transboundary aquifer monitoring is ongoing(completion 2010).

3.4.2 Institutional Strengthening

River Basin Organizations

To move towards the management of transboundary Watercourses the SADC Members States are in the process of the creation and establishment of several River Basin Organizations: Limpopo River Basin Commission (LIMCOM), Orange-Senqu River Basin Commission (ORASECOM), Okavango River Basin Commission (OKACOM), the Rovuma Basin Committee, Zambezi River Basin Commission (ZAMCOM). It is envisaged by the Protocol that the RBOs will also facilitate the management of transboundary aquifers defined in the Protocol as Watercourse. Creation of RBO’s for the remaining transboundary river basins will continue into the future.

Regional Groundwater Centre of Excellence

Based on the issues and challenges facing the SADC region, the GMP identified the need for an institution to raise the understanding of groundwater management through knowledge management, capacity building, coordination, information dissemination and awareness raising, financing, action-oriented research, and promotion of best practices. The institution is being established as the SADC Groundwater Management Institute (GMI) and will address

issues of concern and become a centre of excellence in groundwater in the SADC region and internationally. This institution's intended vision is to "ensure the equitable and sustainable use and protection of groundwater, as well as being a centre of excellence in the areas of groundwater drought management and management of groundwater dependant ecosystems in the region". The GMI is scheduled to be operational by the first quarter of 2010.

3.4.3 Groundwater Awareness

One of the largest challenges is the awareness of groundwater and the importance of its management. Awareness of the potential of groundwater as a sustainable water resources and its fragility is limited at all levels, from communities using groundwater as their primary water source, to water managers, parliamentarians and policy makers among others. In order to meet all the challenges the profile of groundwater needs to be raised in all the aforementioned eyes. To accomplish this the SADC Water Division has developed a specific water resources awareness strategy incorporating groundwater which is currently being implemented. In addition a specific focused groundwater awareness campaign targeting the region's decision makers is also being implemented and is intended to be carried on by the GMI. A strategy of the groundwater awareness campaign is to raise the profile of groundwater among water managers, policy makers, parliamentarians, RBOs and the media through:

- a) Production and dissemination of groundwater awareness informational materials using multimedia channels (website, banners, flyers posters etc);
- b) Development of a journalist network to write in-depth news features on topical groundwater issues in the region;
- c) Strategic engagements aimed at sensitizing policy makers, parliamentarians, RBOs on the importance of incorporating groundwater in integrated water resources management plans;
- d) Facilitating television and radio interviews on groundwater issues of concern for the SADC region.

The continuation of awareness will remain a priority of GMI once it is established.

3.4.4 Other Activities

In fulfilling the plan to provide specific tools, which are a prerequisite for the management of transboundary aquifers, SADC is making significant progress. The tools will be made available to Member States and RBOs to facilitate the management process. The tools include:

- a) Development of a groundwater knowledge information meta database
- b) Development of Decision Support Guidelines for:
 - i. Community Groundwater Management
 - ii. Groundwater and Drought Management
 - iii. Mapping and Methodologies for identifying Groundwater Dependiant Ecosystems
 - iv. Groundwater and Drought Vulnerability
 - v. Groundwater valuation.
- c) The WaterNet, a capacity building initiative, has been created and active over the last years focusing on building the regional institutional and human capacity in Integrated Water Resources Management (IWRM) through training, education, research and outreach by harnessing the complementary strengths of member institutions in the region and elsewhere.

- d) The Water Research Fund for Southern Africa (WARFSA) has been active over the last years in the implementation of multi-disciplinary research projects in IWRM in the region aimed at ensuring sustainable development of water resources.

4 THE WAY FORWARD

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.

Even with the progress made by SADC and its Member States on moving towards more effective groundwater management, a greater consideration of groundwater is still required, in order to put into practice the concept of Integrated Water Resources Management at river basin and regional level. A move towards enforcement of agreed procedures, guidelines and standards needs to be further enhanced to develop joint management of shared aquifers, along with the harmonisation of concepts concerning the sustainable use of groundwater, encompassing technical, legal, regulatory, social and financial aspects.

In summary, the SADC Water Division in collaboration with the Member States, stakeholders and RBOs need to continue to develop programmes, guidelines and projects that will bridge the policy, knowledge, awareness and capacity gaps between Member States and work towards reducing the disparities and "Level the Playing Field".

5 REFERENCES

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