Water Resources of the SADC: Demands, Dependencies and Governance Responses

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1 Introduction

Achieving poverty reduction and economic development in Africa based on a sustainable utilisation of the continent's rich natural resources remains an unresolved challenge. Instead, natural resource use in Africa, similar to other parts of the world, is characterised by overexploitation and unsustainable use patterns. Additionally, it is usually the poor who benefit the least from the exploitation of natural resources, yet they are the ones most affected by the negative effects of unsustainable resource use, such as ecosystem degradation or increased vulnerability to extreme events. Progress towards more sustainable resource use can only be made if governance system are being developed that provide for a balance between the need for economic development and the preservation of the environment at large. Whereas this applies to all natural resource governance frameworks, it is particularly true for the management of water resources. Water resources, unlike any other natural resource, are not only important for economic development and ecosystem functioning – water is essential for human life. More so, water is a fluid resource that crosses international boundaries, adding to the complexity of developing an adequate management framework for the resource. Focusing on the Southern African Development Community (SADC) this paper provides a background to the region's water resources as well as current and future water demands in the region and the associated economic, environmental and political challenges. It continues with describing the ongoing developments with respect to the region's water resources management frameworks before concluding with a summary of policy options for achieving sustainable water resources use for economic development and ecosystem functioning.

2 Water resources of the SADC

The SADC comprises the 12 southern African states as well as the islands of Mauritius and Madagascar (see Figure 1). This report will focus on the 12 continental SADC states, providing an overview of their water-related development needs, dependencies and governance responses.

Figure 1: Countries of the SADC (SADC, 2005)

Although there are similarities amongst the countries in terms of climate, hydrological conditions and governance arrangements the region is in fact marked by large differences between these factors. The humid, well watered regions of northern Democratic Republic of Congo (DRC), lying slightly north of the equator are in direct, climatological, contrast to the deserts found along the Namibian coastline. The SADC region encompasses a range of about 35 degrees of latitude from these northernmost areas to Cape Agulhas, its southernmost point. In the northern hemisphere this can be compared with the 32 degrees of latitude which separates Cairo in Egypt from Oslo in Norway – representing extremes in climate and hydrology. In addition, the climate of the SADC region is heavily influenced by the two ocean currents passing on either side. The Agulhas current on the east coast brings warm water from areas to the north of the region, producing a warm and humid climate along that coastline. The cold Benguela current pumps a stream of water from Antarctica into the south-western coast of the region. This produces a cooler, drier climate along that coastline. National average depth of precipitation in the region ranges from a low of 285 mm/yr in Namibia to 1,543 mm/yr in the DRC (FAO, 2006).

In addition to this great variability in climate and water resources between different parts of the SADC region there is also great temporal variability, especially in the southernmost, drier countries. It is typical to have years of drought broken by large-scale floods, with very few years receiving the supposed average rainfall. Year-on-year variation around the long term norm for various parts of the region is as high as

30 – 35 percent (Hirji et al, 2002). This makes planning difficult and has a direct impact on livelihood security for the population of the region.

As economic growth progresses and population numbers increase several of the states in the region are predicted to become "water stressed" by 2025 (see Figure 2). At present the countries with the most developed economies in the region (as measured by GDP per capita) also face the greatest levels of water stress. These include South Africa, Namibia, Botswana and Zimbabwe (SADC, 2006).

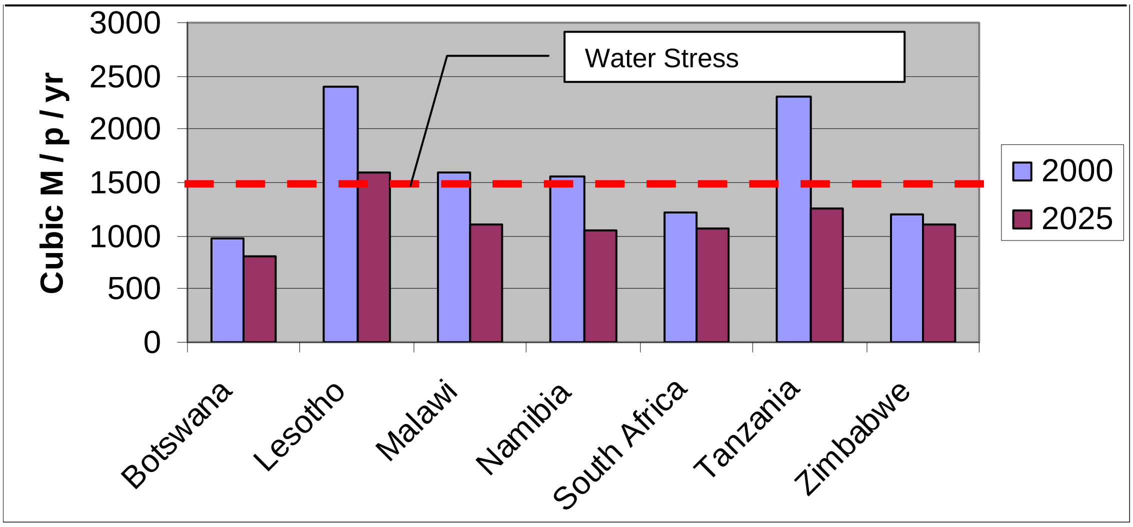

Figure 2: Water Availability in the arid SADC (after Ashton, 2002)

This spatial and temporal variability and uneven distribution in rainfall received by countries in the region has led to the large-scale development of water storage and transfer infrastructure. Indeed, South Africa and Zimbabwe are ranked amongst the top 20 large dam builders in the world by the World Commission on Dams (WCD, 2000). In these countries there are few undeveloped water bodies, with most being used beyond their sustainable supply rate, especially when environmental water requirements are factored in. Providing "new" water for economic and social uses in these countries will involve using current supplies more efficiently through adopting water demand management (WDM) measures. This would involve making substantial investments in agricultural and industrial production processes to make them more water efficient, along with other water use sectors, such as domestic users, switching to "water wise" devices. The alternative to using WDM measures would be to develop more international water transfer schemes in the region, with the drier countries of the south relying more on water from the wetter northern countries in the region. But such schemes come with a range of social, economic, environmental and political implications which could make them complicated.

Two other hydrologically important factors in the region are:

- The high number of transboundary rivers (and the importance of these rivers to national populations). Five of the SADC states have water resources dependency ratios of over 50% - i.e. they rely on water generated outside their borders to supply more than half of their total water resource stock (FAO, 2006). This links the futures of basin states, with impacts on water quantity, quality or flow patterns being transferred downstream;

- High reliance on groundwater – several of them shared (see Figure 3: Major aquifers in Africa). At present very little is known about these aquifers in the region. Most of them are not coincident with the major river basins in the region – instead forming a stock of fossil groundwater. The flow characteristics, recharge rates, permeability and transmissivity of these water bodies is not well understood.

The above two factors both complicate water management in the region as well as linking the developmental futures of neighbouring states. Developments on an upstream section of a river, such as a dam for water supply, irrigation or hydro-power impact the flow downstream. These impacts range from a drop in the quantity of water available downstream to various water quality-related issues. If water is used for intensive agricultural production the return-flow typically has high levels of nutrients associated with fertiliser use as well as pesticides and higher salinity content. These all impact on the ability of downstream eco-systems to operate effectively, with nutrient build-up leading to eutrophication of waterways and a general drop in water quality. A drop in the overall quantity of water flowing downstream, due to consumptive use upstream, will exacerbate the situation, potentially reaching the tipping point beyond which the eco-system no longer manages to absorb and process the nutrients and other pollutants being passed on to it.

The construction of hydro-power dams, although not necessarily directly consuming water, will alter the stream flow characteristics of a river. The natural flow variability will be reduced. In southern Africa many of the riverine and aquatic zone eco-systems depend on this flow variability, with the flood pulse cycle stimulating the growth or germination of various plant species. Thus it is not enough to ensure that the correct minimum amount of water reaches downstream areas, the nature of the flow regime must, as closely as possible, match the natural situation. A blockage in the river, such as a dam, will also tend to trap sediment transport, with the result that the river downstream of the dam will have a greater scouring effect, deepening and straightening the channel. Wetlands and floodplains can also be negatively affected.

The above all impose costs on the downstream user or country, while the benefits are enjoyed upstream. Thus the management of these international transboundary rivers becomes an issue of politics, with negotiations between states needed to address issues around water quality and quantity as well as possible modes of sharing benefits.

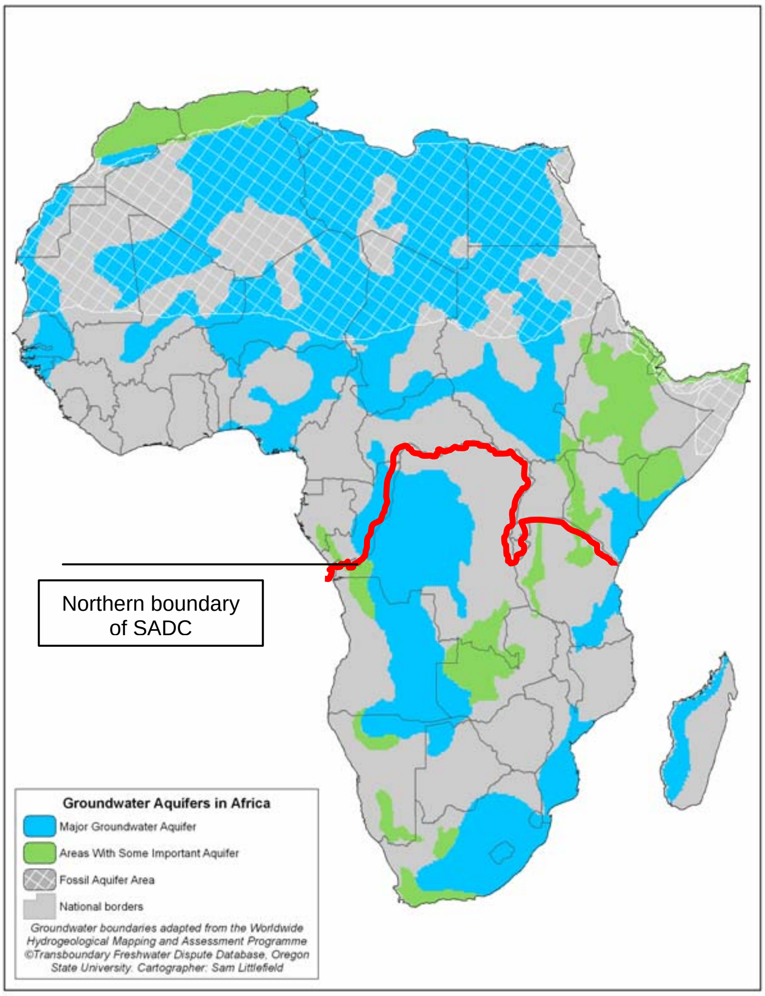

Figure 3: Major aquifers in Africa

Where water bodies are present on the surface, such as lakes, wetlands and rivers, it is relatively straightforward to assess the impact pathways of developments, tracing costs and benefits through the system. The picture is clouded somewhat in the case of groundwater. As can be seen in Figure 3 many of the aquifers cross national boundaries. In addition, their flow characteristics frequently have no resemblance to that of the surface water systems above them (Molapo and Puyoo, 2002). Water can literally be flowing in opposite directions in the two systems – although there is usually a strong bi-way interaction between them.

In several parts of the region groundwater provides the only perennial source of water. However, these aquifers, specifically their transboundary nature, are not well understood and more research needs to be conducted in this field. In the driest parts of the region, groundwater is the primary source of drinking water for the human population and livestock. Groundwater is the main or a complementary source of intensive irrigation in some parts of the SADC region and has a significant role to play in achieving food security through small-scale irrigation. It is estimated that groundwater supplies roughly 27 percent of the water needs of urban communities in the region and 35 percent of the water needs of rural communities, with this figure increasing in times of drought when surface water supplies dwindle (Molapo and Puyoo, 2002).

Industrial, agricultural or domestic water use activities have the potential to pollute groundwater reserves – contaminating them to such a degree that they become unusable for other users. When this happens within one country it proves difficult to determine who should bear the costs for such contamination, but at the international transboundary level it becomes much more complex. More work is needed in determining the characteristics of the aquifers in the region – dimensions, extent, recharge rate, transmissivity etc. This information will be needed in the future to develop and use shared aquifers in an equitable and sustainable way.

An added stressor is that of climate change – compounding the naturally variable climate. The latest stochastic and systems models point to several observable trends associated with an increase in temperature, including:

- An increase in precipitation for the eastern seaboard & interior of the region;
- A decrease in precipitation for the western seaboard and northern interior;
- A shift from winter and toward summer rainfall in the Cape region (IPCC, 2001).

These changes in precipitation timing and delivery will have complex repercussions on the social, environmental and economic water use activities in the region. A shift towards an increase in precipitation, if it is accompanied by an increase in temperature, could lead to diseases such as malaria and river-blindness becoming more widely spread. Again, not enough is currently known about the interactions between the above factors. Both groundwater as well as surface water reserves would be impacted by changes in precipitation, as well as by changes in evaporation. The need for concerted action to mitigate the effects of climate change is highlighted by the Stern review on the economic aspects of climate change, noting that "all countries will be affected. The most vulnerable – the poorest countries and populations – will suffer earliest and most, even though they have contributed least to the causes of climate change" (Stern, 2007).

3 Socio-economic and political challenges – current and future water demands

3.1 Regional trends

Water is 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.

Water resources have been and will continue to be developed and managed in the region to promote agriculture, industry, mining and power generation, thus contributing to regional development. Increasingly it is being recognized that water needs to be secured to sustain biodiversity and natural ecosystems, including wetlands, which are the basis for rural livelihoods and for tourism (SADC, 2005). At present agriculture is by far the largest consumer of water in the region, using between 70 and 80 percent of available resources. Botswana and South Africa devote the lowest percentage of their water-use to agriculture – less than 60 percent, indicating that as the economies of the other countries in the region become increasingly diversified (reliant on industry, mining, tourism etc) agricultural water use will be placed in competition with other sectors of the economy (see Figure 4). Some countries, such as Lesotho, show higher rates of domestic and industrial water use (as a percentage of total withdrawals). This is generally reflective of the fact that investment in irrigated agriculture has been low, with the bulk of the population engaged in small-scale or subsistence farming mainly reliant on rainfall.

The staple foods in the region include various cereals – maize, sorghum, millet and wheat, accounting for just over 60% of regional calorific intake (FAO, 2006). These products are water intensive in their production; in relation to the economic return they generate (Earle, 2001). For instance, wheat requires just over 1,000 cubic metres of water for every tonne produced, with maize being slightly more efficient by consuming 800 cubic metres per tonne (Ibid). The current price (February, 2007) for wheat on the Johannesburg Stock Exchange is about R1, 500 or US$210 (IOL, 2007). This translates to a value-added of less than US$0.20 per cubic metre of water consumed. Considering the range of other costs related to producing irrigated wheat – land rents, electricity, fertiliser, labour etc – it becomes very difficult to also have to pay a market related price for water consumed.

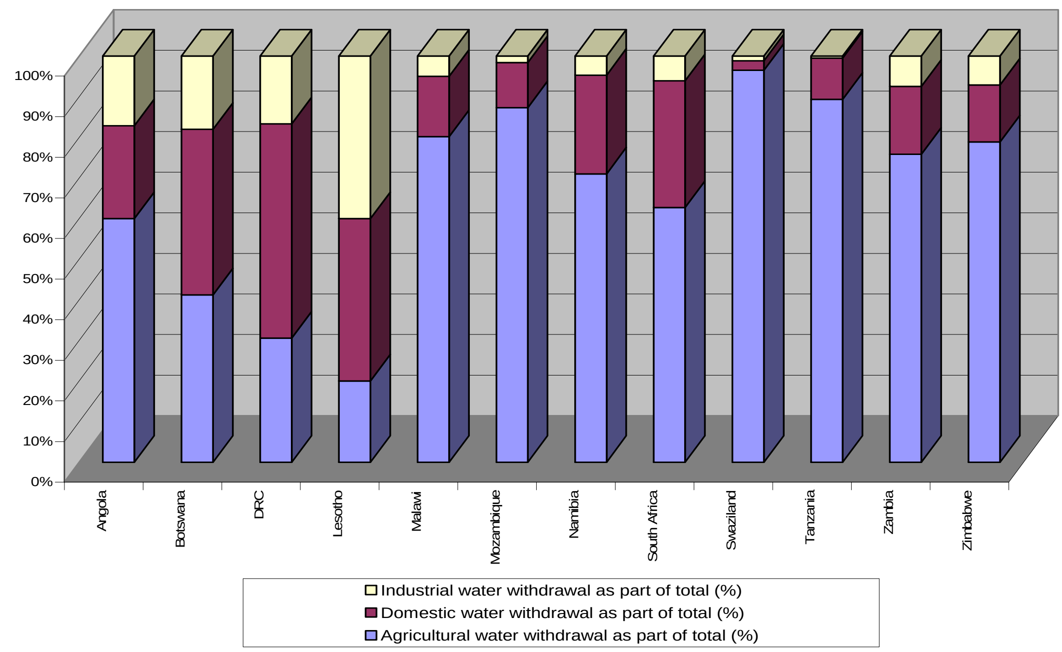

Figure 4: SADC freshwater withdrawals by sector (FAO, 2006)

South Africa, the largest cereal producer in the SADC region, has seen a gradual drop in its output of these crops over the past decade (see Figure 5). This drop in the production of cereal crops has been accompanied by an increase in the imports of such crops. This is in small part attributable to the general opening up of the South African economy from the 1990s onwards, but is more strongly related to the gradual shift towards charging market-related prices for water consumed in the agricultural sector in that country.

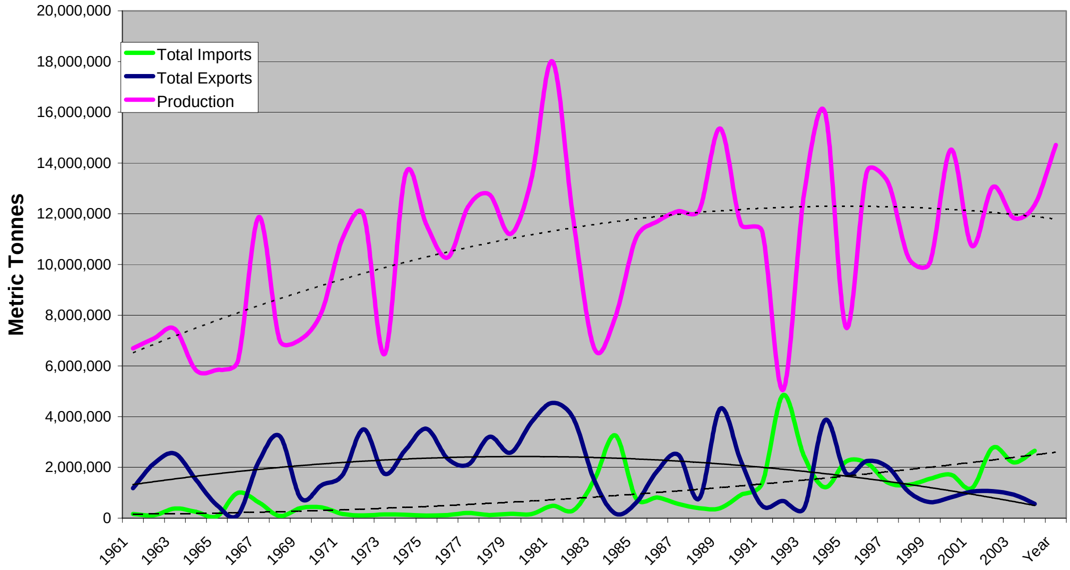

Figure 5: South Africa cereal trade and production (1961 – 2005). From FAO, 2006

Over time there has been a drop in the South African share of overall SADC cereal production and trade (see Table 1). As this trend continues South Africa will become increasingly reliant on imports of staple cereal products. This is complemented by an increase in the production of cereals in countries such as Tanzania, Mozambique, DRC, Zambia and Angola (see Appendix 2: Cereal production of SADC states). For instance Mozambique increased cereal production from 250,000 tonnes in 1992 to 2,000,000 tonnes in 2005 and Angola has experienced a three-fold increase since 1995 (FAO, 2006). Several of these states are emerging from periods of political instability and are now starting to develop their commercial agriculture sectors. Most of them also have large areas well suited to the rainfed production of cereal crops or have large water reserves which can be tapped for irrigation.

Table 1: South African share of SADC cereal production and trade

SADC %	1961 – 1970 mean	1995 – 2004 mean
% of Production	53	47
% of Imports	31	35
% of Exports	77	74

However, agricultural water use in South Africa has not dropped much from earlier levels (DWAF, 2004). Instead, water is being diverted to other agricultural uses which earn more value for every unit of water consumed. These include the production of high quality fruits and vegetables, primarily for export, as well as focussing on the production of processed agricultural products such as olive oil and wine. In doing so the sector has managed to remain competitive in the face of having to pay more for water used.

A continued development of agricultural water use is likely to be impacted by the rapid industrial and urban development several SADC countries are experiencing. Water for mining and industrial processing is increasingly in demand in countries like Botswana, Angola, South Africa and Zambia. To keep pace with this rapid development the electricity production of the region will need to be increased – in the process consuming more water. Water use by the industrial sector is projected to increase by a third by 2020 from 1995 figures – accounting for 20 percent of water used in the region by then (Hirji et al, 2002).

At present the largest industrial water user in South Africa is electricity production – mainly as a coolant in coal-fired power stations in the east of the country. Although the consumptive portion of the total amount of water used is relatively low, much of the return flow is higher in temperature, with a variety of ecological impacts for recipient water systems. It is estimated that less than ten percent of the region's hydro-power potential has been exploited. In the coming years it is likely that hydro-power developments in DRC, Zambia, Mozambique and Angola will increase (SADC, 2005). Again – although not all the water used in hydro-power generation is consumed there are various long term environmental and social repercussions of building hydro-power infrastructure.

Mining currently provides around 40 percent of total foreign exchange earnings in the SADC region and employs roughly two million people (King, 2006). Further development of the region's mineral wealth holds the promise of improved socio-economic development for its population. The region possesses some of the largest deposits of minerals such as gold, platinum group metals, chromites, manganese, uranium and coal in the world (Ibid). The mining of these minerals will require well-developed environmental management strategies, taking into account and mitigating the range of impacts associated with them. Although mining is not necessarily a heavy water consumer there are a range of water quality issues which have to be addressed. In fact, many mines are net water producers, needing to pump water out of working below ground. However, as this water percolates back underground it passes through old workings and underground voids coming into contact with sulphur-bearing pyrite (WRC, 2006). This polluted water can have impact on users far away from the mining area, as water passes underground.

3.2 Local level impacts and responses

Water is a centre point of the interface between humans, the environment and poverty. A healthy and functioning ecosystem provides many of the resources needed by the poor to support their livelihoods (see Table 2). Apart from providing food from crops and livestock the environment also is a source of building materials, heating and cooking fuel and traditional medicines. Eco-systems also perform services such as the cleaning of water, through the absorption and treatment of wastes. When the ecosystem is degraded it is the poor who suffer most, not having recourse to alternatives as a wealthier city dweller may have. Soil erosion, the loss of wetlands and floodplains, poor water quality and reduced flows all impact directly on the communities dependent on eco-system good and services.

Table 2: Linkages between water, environment and poverty (Hirji and Molapo, 2004)

Dimensions of poverty	Examples of water and environmental linkages
Income and Consumption	Access to water for productive use, access to natural resources, sustainable growth
Inequality and Equity	Secure tenure and access to natural resources, water rights and entitlements
Sustainable Livelihoods, Health	Sustainable land and water use practices, water quality, safe drinking water and sanitation, protection against water-borne disease
Security and vulnerability	Improved disaster preparedness and response, water harvesting and conservation
Inclusion and Empowerment	Participation, devolution of ownership, rights and responsibilities to water users, community groups, basin organisations, local governments

Although the more affluent in society, including the commercial farmers and the industrial users of water can to a large degree insulate themselves against the worst impacts of environmental degradation there is still a cost to bear. Manufacturing or processing activities which rely on clean water as an input will need to have more money invested in filtering and cleaning water supplies. The typical approach to resource protection has been to let a water resource get polluted and then to develop ways of cleaning this pollution. This is costly and frequently unsuccessful, with long-term build-up of pollutants difficult to get rid of. More efficient and effective has been the switch to treating pollution at source – thus ensuring that water which is used by an industry or a mine returns that water at an acceptable quality level.

In the region there has been a general recognition of the need to support eco-systems which impact on freshwater. The SADC Regional Water Policy, adopted by all the states of the SADC in 2006, recognises the environment "as a resource base and a legitimate user of water in the region and Member states shall adopt all necessary strategies and actions to ensure that the environment is sustained" (SADC, 2006). Under the policy Member States should "in their mechanisms for allocating water resources among many users, allocate sufficient water to maintain eco-system integrity and biodiversity including estuarine and marine life" (Ibid).

Accordingly most states have or are in the process of implementing laws, policies and strategies which would seek to manage freshwater eco-systems sustainably. To achieve this; a mix of regulatory mechanisms and market-based mechanisms are used. An example of the former is the permit system being implemented in South Africa, whereby all water uses have to be permitted in a specific catchment. An application is considered and rated on the beneficial use it makes of the water – comprised of factors such as environmental sustainability, income and jobs generated and ability to contribute to addressing inequality in the country. Similarly, Zimbabwe has a system of Catchment Councils which allocate water use rights in accordance with environmentally defined water use standards. Such systems increasingly rely on the involvement of the water users themselves in managing water supplies – in accordance with the principle of "subsidiarity" whereby water is managed at the lowest appropriate level. It is difficult and not effective for central governments to make the decisions around water management at a catchment scale, thus some type of more local institution is usually set up to manage the allocation of water-use rights as well as to perform monitoring and compliance aspects.

The other mechanism for promoting sustainable water use is through using market based costs and incentives. This would implement a water use charge on a large scale water user, such as a mine or factory and then charge a commensurate water discharge rate. This rate would depend on the types and levels of pollutants the water user is discharging back into the water resource. These charges are also typically being levied at the local level, with income being used to manage the catchment and improve the state of the environment – along the principle of "polluter pays". These charges then become part of the operating costs of the enterprise concerned and as with any cost there is pressure placed to reduce it. Companies will thus invest in water treatment or water re-use technologies to either reduce the volume of return flow they discharge or to clean it to acceptable standards. A good example of the synergies possible when using market-based mechanisms is provided by the collaborative water purification project between Anglo Coal's Kleinkopje and Greenside collieries and Ingwe's South Witbank Colliery in South Africa. They had to pump out and treat 20,000 cubic metres a day to prevent acid mine drainage into the surrounding groundwater (WRC, 2006). The local municipality of Emalahleni was looking for an additional water supply of roughly that amount. A joint venture called Emalahleni Water Reclamation Project was formed and over several years developed a treatment process which made the water safe for municipal use. The municipality has now been contracted to buy this treated mine water, by so doing mitigating its potential water scarcity and also providing an income stream for the coal companies. Such win-win solutions are needed for sustainable outcomes to be reached.

More of these types of innovative solutions to water quality and quantity problems need to be encouraged in the region. Communities also need to be involved more in the management of water resources on which they depend. The solutions do not lie with any one sector; instead what is needed is a partnership comprising the relevant stakeholders from civil society, the private sector, government, academia and NGOs. All have a role to play in the long term sustainable development of the region's water resources in an equitable way. What is needed are the suitable legislative and governance frameworks to make this a reality. The region has, over the past decade, taken steps towards the development of such frameworks, with the SADC Protocol on Shared Watercourses, the SADC Regional Water Policy and Strategy, the Southern African Vision for Water, Life and the Environment as well as national legislation and policies all being steps in that direction. Section Four provides an overview of these legislative and governance frameworks in the region.

4 Governance frameworks

The water resources governance framework in the SADC has seen significant changes in the past decade, largely influenced by South Africa's changing role in the region. Previously cooperation over shared water resources has happened mostly on a bilateral basis, often with South Africa being one of the two partners (Ashton et. al., 2006), a good example being the agreements relating to the Lesotho Highlands Water Project between Lesotho and South Africa.

Since the mid-nineties cooperation is moving away from bilateral cooperation towards regional and basin-wide cooperation. On the regional level the SADC states concluded the SADC Protocol on Shared Watercourse Systems in 1995. The Protocol has subsequently been revised in order to reflect the principles of the 1997 UN Convention on the Law of the Non-Navigational Uses of International Watercourses[1]. The revised version of the Protocol is now in force as the SADC Protocol on Shared Watercourses (hereinafter SADC Protocol).

The same tendency can be observed at basin level. Where previously only bilateral agreements and organisations had been in place, basin-wide agreements are being concluded and basin organisations established where all basin states are being represented. A good example is the Orange-Senqu River Basin shared between Botswana, Lesotho, Namibia and South Africa. While the bilateral organisations between Lesotho and South Africa (Lesotho Highlands Water Commission, LHWC) and Namibia and South Africa (Permanent Water Commission, PWC) are still in place, they now have to liaise with the basin-wide Orange-Senqu River Commission (ORASECOM) that was established between the four basin states in 2000. All matters relating to the development, utilisation and conservation of the water resources in the river system are now jointly being discussed in ORASECOM, which advises the four riparian governments. Basin-wide Commissions have also been established for other major rivers in the region, e.g. Limpopo, Okavango and Zambezi[2].

This move towards basin-wide cooperation is significant since water resources availability has been and still is high on the national security agenda of most SADC states (Earle & Malzbender, in press). In the past this had the consequence that for example hydrological data, which is important for the sustainable development of a water resource, was classified information. To date hydrological data is openly shared between riparians in the basin-wide Commissions and in many cases countries are even undertaking joint hydrological studies, thus illustrating the drive towards cooperative management of shared water resources.

[1] The UN Convention still lacks the required number of 35 ratifications and is not yet in force – its principles are however accepted as customary international law.

[2] Zambia is the only riparian country that has not yet signed the agreement establishing the Zambezi Commission.

4.1 The SADC policy framework

At regional level the guiding instruments for water resources management are the SADC Regional Water Policy (RWP) and Regional Water Strategy (RWS), whereas the Regional Strategic Action Plan 2 (RSAP 2 – 2005-2010) spells out the concrete projects that are implemented in the region.

Both the RWP and the RWS subscribe to the overarching principle of Integrated Water Resources Management (IWRM). The Global Water Partnership (GWP) defines IWRM as "a process which promotes the coordinated development and management of water, land and related resources in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital eco-systems"GWP, 2005). IWRM thus takes cognisance of the interrelationship between different natural resources and aims at integrating them into a holistic management system (GWP, 2005). As such it is not an end in itself but a means of achieving three key strategic objectives.

- efficiency to make water resources go as far as possible;
- equity, in the allocation of water across different social and economic groups;
- environmental sustainability, to protect the water resources base and associated eco-systems.

(GWP, 2005)

Consequently the concept of IWRM does not provide a blueprint for sustainable resource governance. Instead it implies that sustainable resource governance requires a governance framework conducive to achieving the above objectives. Key elements of such a framework would, among others, be open and transparent institutions, inclusive and participative decision-making, equitable access to the resource and coherent and integrated policies (GWP, 2005).

The relevant SADC policy instruments, RWP and RWS, contain these elements. The RWP aims at achieving a sustainable balance between the development of the region's water resources for economic growth (Policy 1.1.1) and food security (Policy 4.3.1) and at the same time preserving the integrity of ecosystems by recognising the environment as a legitimate user of water (Policy 5.1.1) (SADC, 2006). The RWP further recognises the importance of regional cooperation over water resources and the need to manage water resources in an integrated manner. The policy highlights the need for regional integration (Policy 3.1) as well cooperation between all affected (water use) sectors (Policy 3.3).

The principle of equitable access to water is highlighted both directly and indirectly in the RWP. Policy 3.1 refers to the need for regional economic integration "on the basis of balance, equity and mutual benefit for all Member States" (SADC, 2006). Whereas equity between Member States is thus explicitly recognised in the policy, the concept of equity between different uses permeates the policy as a whole. On the one hand it is recognised that water is an economic good that provides economic benefits (Policy 4.1.1). On the other hand the importance of water as a social good essential to human dignity, poverty reduction and human well-being (Policy 4.1.2) and as an essential requirement for ecosystem integrity (5.1.2) is recognised.

The RWP promotes the establishment and development of transparent institutions and the involvement of stakeholders in water management decision-making. In line with the provisions of the SADC Protocol the policy calls for the establishment of Shared Watercourse Institutions (SWCI) on each shared watercourse (Policy 9.2.2), which shall promote stakeholder participation in decision-making (Policy 9.2.8). In chapter 10 the policy deals exclusively with stakeholder participation and capacity building, stating that water resources management and development at all levels shall be based on a participatory approach (Policy 10.1) and that stakeholders need to be empowered to effectively participate in such decision-making (10.1.2).

This comprehensive policy framework is increasingly being reflected at national level in SADC states. Some countries in the region have already revised their water laws and policies and in this process accounted for the integration of IWRM principles in their national policy and legal framework. Other countries are still in the process of revising the policies and laws and while doing so are guided by the principles enshrined in the SADC RWP. The ongoing harmonisation of policies and laws in and between Member States and with SADC policies are likely to ensure a coherent regional water resources management framework that takes the important principles of IWRM into account throughout the region.

4.2 The legal framework

Whereas the RWP and RWS are non-binding guideline documents (though adhered to by the Member States as they reflect policy statements jointly agreed on by the Member States), the SADC Protocol is the legally binding instrument governing transboundary water resources management in the SADC region.

The SADC Protocol does not regulate the specifics of basin management in the respective basins of the region. Instead it is a framework instrument that contains the accepted key elements of international water law and makes mandatory for transboundary water resources management in the SADC – these elements are, among others, equitable and reasonable utilisation, duty not to cause significant harm and the obligation to give prior notice of planned developments.

The SADC Protocol provides for basin-wide agreements to be concluded between riparian states, in which the management of the respective basin is regulated in more specific terms. To date, the process of concluding comprehensive basin-wide agreements is still in its early stage. The Incomaputo-Agreement[3] is currently the only one in the region that has advanced to a stage where it comprehensively covers basin management issues, ranging from water allocation between states, the development of water quality standards and information sharing requirements.

[3] Tripartite Interim Agreement Between The Republic Of Mozambique And The Republic Of South Africa And The Kingdom Of Swaziland For Co-operation On The Protection And Sustainable Utilisation Of The Water Resources Of The Incomati And Maputo Watercourses

In addition the SADC Protocol establishes the institutional framework – the SADC Water Sector Organs - at the regional level for the implementation of the Protocol. The primary mandate of the SADC Water Sector Organs is to monitor the application of the SADC Protocol and the facilitation of the harmonisation of water law and policies between SADC Member States (Earle & Malzbender, 2007). The SADC Water Sector Organs do not have the mandate to implement and enforce the SADC Protocol in the Member States. This obligation falls on the Member States, whose national laws must ensure that obligations stemming from international agreements such as the SADC Protocol or basin-wide water management agreements are being met.

Whereas the policies and laws at regional level (SADC) and increasingly also at national level in the Member States provide for a coherent water resources governance framework, it is a severe lack of capacity in the region that constrains the effective practical implementation of the described water resources governance framework. Although there are numerous highly qualified water management professionals in the region, there is an overall shortage of human as well as financial resources to fully meet the standards laid out in the regional and national water policies and laws. Capacity gaps can be observed both on the implementation side as well as on the enforcement side. Often the relevant laws are in place, but the responsible institutions do not have the human resource capacity to enforce that for example water quality standards are adhered to. Such capacity constraints affect all countries in the region, albeit to a different degree. The RWP recognises the need for capacity building and promotes capacity building initiatives but this is a long-term process that will require continued efforts in the region.

Another significant gap in the current water resources governance framework in the SADC region is that to date it virtually excludes groundwater resources. As mentioned in Section 2, groundwater resources are an important component of overall water supply, particularly in the drier parts of the region. International water management agreements in the SADC region do not deal with groundwater and the mandate of the existing Shared Watercourse Institutions is limited to the management of surface water resources. In order to address this shortcoming a Groundwater Management Programme for the SADC region has been launched that is aimed at establishing a broader knowledge base of the region's groundwater resources so that these can eventually be meaningfully included in the overall water resources governance framework (Earle & Malzbender, 2007).

5 Challenges and policy options

The challenges related to achieve sustainable water resources governance in the SADC region are well-known. Initiatives are being implemented at regional as well as at Member States level to address them within the confines of the given financial and human resource capacity limitations.

A key policy decision is to strengthen water management institutions at all levels, particularly Shared Watercourse Institutions since they are best placed to develop management solutions for transboundary rivers. Strengthening institutions must not be limited to government institutions or regional bodies – it also includes the strengthening of stakeholder representation and civil society involvement and cooperation between these different sets of institutions. In this regard initiatives are already taking place. ORASECOM is in the process of finalising a stakeholder participation strategy that will guide the interaction between the Commission and stakeholders. This feeds into wider regional or even continental initiatives, such as the recently agreed cooperation between the African Ministers' Council on Water (AMCOW) and African Civil Society Network on Water and Sanitation (ANEW).

A great challenge remains cooperation across water use sectors as well as integrating the governance frameworks for different natural resources. Although the concept of IWRM is based on the understanding that water, land and other natural resources are linked and need to be management in an integrated manner, this proves to be difficult in practice. Countries on the SADC region are in the process of developing national IWRM plans where this issue will be addressed, but the process is still in its early stages and has to be driven further over time. The same applies to cooperation between different water use sectors. As described in Section 2 & 3 different water uses impact on each other and require that cooperation takes place between the different use sectors. Efforts are being made to promote inter-sectoral cooperation but substantial improvements still need to be achieved in this regard.

Arguably the biggest challenge remains the development of water resource management capacity at all levels. This includes building capacity in formal water management institutions (government) as well as within civil society and at community level as water management decision-making needs to take place at all these levels. The SADC Member States are aware of this challenge, as evidenced by its inclusion in the RWP, and remain committed to developing water resources management capacity in the region for ensuring an effectively functioning governance system that ensures the sustainable use of the region's water resources in the long-run.

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7 Appendices

7.1 Appendix 1: Water resources of the SADC

2003-2007	Angola	Botswana	DRC	Lesotho	Malawi	Mozambique	Namibia	South Africa	Swaziland	Tanzania, United Rep of	Zambia	Zimbabwe
Total population (1000 inhab)	14 533	1 801	56 079	1 797	12 572	19 495	2 032	45 323	1 087	38 365	11 043	12 963
Average precipitation in depth (mm/yr)	1 010	416	1 543	788	1 181	1 032	285	495	788	1 071	1 020	657
Groundwater: produced internally (10^9 m3/yr)	58	1.7	421	0.5	2.5	17	2.1	4.8	0.66	30	47	6
Surface water: produced internally (10^9 m3/yr)	145	0.8	899	5.23	16.14	97.3	4.1	43	2.64	80	80.2	11.26
Overlap: surface and groundwater (10^9 m3/yr)	55	0.1	420	0.5	2.5	14	0.04	3	0.66	26	47	5
Water resources: total internal renewable	148	2.4	900	5.23	16.14	100.3	6.16	44.8	2.64	84	80.2	12.26

(10^9 m3/yr)												
Water resources: total internal per capita (m3/inhab/yr)	10 184	1 333	16 049	2 910	1 284	5 145	3 031	988.5	2 429	2 189	7 263	945.8
Water resources: total external (actual) (10^9 m3/yr)	0	9.84	383	-2.208	1.14	116.8	11.56	5.2	1.87	12.27	25	7.74
Water resources: total renewable (actual) (10^9 m3/yr)	148	12.24	1 283	3.022	17.28	217.1	17.72	50	4.51	96.27	105.2	20
Water resources: total renewable per capita (actual) (m3/inhab/yr)	10 184	6 796	22 878	1 682	1 374	11 137	8 718	1 103	4 149	2 509	9 526	1 543
Dependency ratio (%)	0	80.39	29.85	0	6.597	53.8	65.23	10.4	41.46	12.75	23.76	38.7
Water resources: total exploitable (10^9 m3/yr)							0.65	13.91				

Total dam capacity (km3)	4.47			2.82								103

Source:
Aquastat, 2006

7.2 Appendix 2: Cereal production of SADC states