Economic Development and the Water Situation in Southern Africa

Report to Global Water Partnership / Southern Africa Technical Advisory Committee.

Committee on Water, Macroeconomics and Development.

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1. Introduction

This paper aims at exploring the links between macro economics / economic development and the demand/supply balance for water in Southern Africa. "Southern Africa" is defined as the 14 SADC countries[1].

We start by briefly describing the water situation in Southern Africa and then consider the visions that we believe the people of the region may hold. Visions, expressing peoples' image of a better future, set out the ideals which governments and regional organisations must aim for, generally as well as in the water sector.

We then examine three different development scenarios with regard to economic growth and its effect on water demand in each individual country. The exercise serves to indicate to what extent water resources in the region are under pressure. This is followed by recommendations for macro economic management as well as management of water and related sectors. A short section at the end summarises the major conclusions.

Unfortunately, the short time during which the exercise had to be completed and the lack of reliable data means that analysis and conclusions build on a number of assumptions. The projection of water demand is exceedingly simple. Some interesting conclusions emerged from the quantitative work, but the results should be considered highly tentative at this stage.

2. Where are we today?

The socio-economic scene of southern Africa is characterised by the fact that most countries are among the poorest in the world. Poverty is rife with 35% to 75 % of the population below the poverty line. Physical as well as social infrastructure is not well developed and maintained. Economic growth rates are generally low, both because of former and present policy failures, because of the region's role in the global economy as primary producers and because of the occurrence of wars and unrest in the region. There is a need for the region to "catch up" with the rest of the world.

The people in southern Africa are aware of their predicament and have taken action to solve their problems, both within their own countries and collectively through SADC which is probably the most successful regional organisation for broad economic and political co-operation on the African continent.

The spatial and temporal variability of water supply in southern Africa is extreme, see map 1 and 2 annex 4. Annual rainfall in the southern and western parts of the region is very low; from 0-200 mm at the west coast (SA and Namibia). It is slightly better (200-750 mm) in most of the areas below the 15° parallel. Most of Mozambique, Malawi, Zambia, Tanzania and Angola are getting 750 to 1500 mm per annum, which can be considered adequate. The Democratic Republic of Congo

[1] Angola, Botswana, Democratic, Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Seychelles, Swaziland, Tanzania, Zambia, Zimbabwe.

has the highest rainfall with up to 3000mm in the northern half.

Temporal variability is also a problem particularly for Namibia and parts of Angola, South Africa and Botswana where annual variation from mean ranges from 25% to over 40%. Parts of DRC and South Africa experience less variability with 10% to 20% from the mean whereas most of the rest of the region has a variability of 20% to 25%.

This means that rain-fed agriculture is a risky undertaking in the southern and western areas. For these areas, the retention of water is often a problem, as rainfall tends to come in large quantities over a short span of time and requires large and expensive reservoirs. In addition, evaporation is high, as much as 3000mm in parts of Namibia and Botswana. The low population density in these areas makes water transfer economically un-viable and remote populations are left with scarce and low-quality water.

In the north and east, water is available and floods regularly plague countries like Angola and the DRC, TANZANIA and Zambia. Some areas in relatively water rich countries like Tanzania however still have recurring drought problems.

The low incomes in the region means that water transfer and water treatment plants are scarce and the general availability of clean water is far lower than what is desirable. Low water supply tends to have a negative effect on health and on agricultural production which are key conditions for rural development. In this sense nearly all the countries in the region have a "water crisis" today. Improvement for the future is dependent on a "catch up" of to day's deficiencies.

3. A vision

In a low income developing area people's visions of the future will be strongly influenced by their need for improving their material welfare in the short run. People are interested in the welfare of their own families and local community, the education of their children and their chance for living happy and healthy lives. Most of them see how their fate and their chances of being gainfully employed are linked with the performance of the economy of their nation, growth and structural change, modernisation of agriculture and growth of modern industries.

People may be less aware of the long-term environmental consequences of the economic activities of families and societies. They may also have a limited grasp of how the struggle for their own livelihoods influence and in turn are influenced by actions and decisions at the national, regional and international level. The future, seeing a shrinking continent and a shrinking world will bring this closer to home.

The "Water vision" forms part of the picture of a desirable future portrayed by a number of SADC states.

The cornerstone of SADC itself is the vision of a shared future: a future within the regional family.

"Through regional co-operation and integration, the Community aims to provide balanced economic growth and development, political stability and security, for all its member States. The challenge now facing SADC is to build upon its successes to mobilise the region's own resources for sustainable development." [2]

We believe that people, looking 25 years ahead would opt for a water future where:

Accessibility and provision of safe water for drinking and sanitation is ensured. The drudgery of hauling water over long distances would belong to the past. Appropriate pricing policies would ensure that a reasonable consumption of water for a family for drinking and personal hygiene (say 25 litre per day per person) is affordable. The local communities would have a recognised right to be consulted and be involved in making decisions about their own water supplies. Women would have an important role in community affairs and would be empowered to influence water planning and management at higher levels.

Water supplies are adequate to support agricultural production in such a way that sustainability is attained in both agriculture and the water sector.

The availability of ***water*** is not a constraint but ***serves to support industrial (non-agriculture) development objectives.***

The negative effects of droughts and floods are minimised. The most dramatic swings in rainfall subside as global warming is brought under control. Water supply forecasts are reliable and well communicated down to the community level. Appropriate infrastructure exists in particular drought prone and flood prone areas.

The use of water for human purposes ***takes care of and protects the environment and creatures that require water***

Conflicts over water do not develop, neither at the local level, in the region nor internationally.

4. Development Scenarios

Realising the water vision for the region will be a matter of a large number of factors. Important factors are those related to economic performance and economic development. For example, successful development and high growth rates may make capital available for investment in necessary water infrastructure. On the other hand, high economic growth creates higher demand for water and may strain supply.

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[2] *Source: The SADC Handbook - published by the SADC Secretariat*

In southern Africa present levels of economic development and economic prospects for the future are mixed. In terms of GDP per capita, countries range from the poorest in the world to upper middle income countries.

Prospects are equally mixed: in two of the fourteen countries of SADC (Angola and DRC), military confrontations are still the order of the day, two of them (Mozambique and Lesotho) struggle with the aftermath of devastating war or political upheavals. Of the others, Malawi, Tanzania and Zambia are under stringent Structural Adjustment Programmes. South Africa, the economic giant of the region, still struggles with after effects of apartheid and its four smaller neighbours (Botswana, Lesotho, Namibia and Swaziland) are affected by the recent low growth trend of their bigger neighbour.

4.1 High economic growth

Looking 25 years ahead, the sombre starting point has a silver lining: The potential for high growth rates are greater if the basis is low. One does not have to be unduly optimistic to see that the medium term future could unleash the potential for much higher growth rates for many of the countries than over the last 15-20 years.

Our high economic growth scenario assumes that in the medium term, *peace returns to the region.* The process of rebuilding the war damaged countries under peaceful conditions will, by itself spur growth in those countries. Also, the concern with crime and corruption in all countries, but particularly South Africa, will hopefully bear fruit and will lower the barriers for growth of foreign investment and tourism.

It is also more likely now than before that *SADC countries gain access to lucrative parts of the world market.* In the medium term the trade provisions in Lome will continue and the EU-RSA agreement will start to have an effect. Also, it is not unlikely that agricultural products, which are the key exports from most countries in the region, are included in the next WTO round. Last but not least, there is considerable hope that the SADC FTA will be implemented in the early years of the new millennium.

Assuming that *worldwide growth continues*, the above factors will spur growth in a majority of the SADC countries and, *through ripple effects within a free regional market, the entire region will enter a virtuous growth circle.*

This will however not come about without action from the countries themselves. *Firstly*, for poor countries to mobilise investment adequate to underpin higher growth rates, domestic savings will not suffice. Countries will have to seek foreign direct investment (FDI) aggressively. *Secondly, responsible and stable macro and fiscal policies* will have to be implemented in order to create an enabling environment for industrial and agricultural growth and development. Last but not least, good governance will have to prevail, both at the national level and at the local level. Firmly enforced rules and regulations are necessary to form a predictable environment for business. Law and order must prevail.

Under this scenario it is assumed that GDP growth rates, over the next five years will

start rising. In 10 years time they will be at the 6% pa level and will stay at that level for another 15 years.

4.2 Low economic growth

The low growth scenario assumes that political instability and strife continues to flare regularly, in the countries presently plagued by unrest as well as in other countries. This will dampen the inflow of foreign investment. Unfavourable world markets for the region's exports will exacerbate the negative trend caused by low FDI. The SADC free trade area will go ahead, but it will have little effect as long as the main recipients of SADC external exports either grow slowly or are protected.

This scenario will keep growth rates low. Some countries might do better. Typically, however, growth over the next 25 years will be under 2%. Structural change will be very limited.

4.3 Base case (status quo)

The base case is assumed to illustrate a middle between the two extremes. In that case the growth rates will start to converge from the present level towards 3-4% p.a.

The scenario would illustrate a situation where political stability prevailed and world markets were favourable but where the countries in the region did not manage to bring in an adequate amount of foreign investment. The countries may have the right macro policies but they would not result in economic stability to support a long-term high growth trend.

5. Water and Economic development

5.1 Overall regional requirements

The macro scenarios each give rise to different levels of demand for water in the various countries. On the assumption that a million dollars of GDP worth in 2025 will give rise to the same amount of demand for water as at present, the growth in water demand will rise with the same percentage over the period as GDP.

Some overall results of the projections (DRC included) are given in table 1 below. Whereas the present average withdrawals of water resources *worldwide* is 8% (Africa 4% and Europe 7%) the region does not draw more than 3% of available water when DRC is included. Without DRC the number would have been much bigger since the supply from DRC is roughly half of the total water supply in the region.

At the low growth scenario the withdrawal will increase to 5% or little more than the present African average whereas the middle scenario will bring withdrawals up to European levels.

The high growth scenario will require water withdrawals of 10% of supply, i.e. more than three times the size of today and in percentage terms much higher than Europe

7%)

Table 1: Regional Water Balance

	Supply Km^3 ( )DRC	Demand Km^3 per Year						Per cent Withdrawals	
		1998	2005	2010	2015	2020	2025	1998	2025
High Growth	1863 (935)	56.7	63,8	73.9	98.9	132.5	177.3	3%	10%
Base Case	1863 (935)	56.7	63.8	73.9	85.7	104.3	126.9	3%	6.8%
Low growth	1863 (935)	56.7	63.8	70.4	77.7	85.8	94.8	3%	5%

Still, the withdrawals needed are far from those of European countries like France (37%), Germany (46% and Italy (56%). The levels are however not so far from those of some industrialised countries like the UK (12%).

5.2 Water demand and the character of growth

There are a number of factors which cannot easily be incorporated in a simple model. Below we consider at the most significant of them which it will be important to have in mind in drawing conclusions.

5.2.1 Sectoral composition of Growth

In the high growth scenario water demand will tend *not* to increase as fast as overall GDP because the industrial sector, requiring less water than agriculture, will be growing fastest. This is likely to be markedly so in South Africa and Zimbabwe which have an industrial base. For all countries there will be a tendency to modernisation of agriculture over time. Opposite tendencies with regard to water needs will be at work: Dry land commercial farming tends to be less water intensive than peasant farming, while commercial export crops tend to be the most water intensive (except tobacco and cotton).

5.2.2 Urbanisation

All experience from the region tells us that under a rapid growth period *urbanisation* will increase. It is also clear that urban populations require more and costlier water than rural population.

5.2.3 Income growth

An *increase in incomes* will also by necessity increase water consumption, both because a higher level of economic activity requires more water, but also because higher incomes will lead to higher household consumption. Also a rapid growth will

make the income distribution more skewed. This will tend to increase water household demand since the higher the income elasticity of water is above unity.

5.2.4 *Growth of the modern sector*

In itself the *move of people from subsistence to modern activities* will require more water. The consumption of water intensive foods (milk) is likely to increase with the move from subsistence; more water is likely to be used for sanitary purposes and modern sector jobs tend overall to be more water intensive than subsistence sector activities.

5.2.5 *Population*

Population growth has a direct effect on water consumption. Over the time span under consideration, it is highly likely that population growth will slow down dramatically because of HIV/AIDS. If cure or a vaccine for AIDS is found the drop may not be so dramatic, but there are signs that the population transition in the region has already started. Under the higher growth scenario this effect will be stronger. The slower growth will also affect the population age distribution. The average age of the population will increase and perhaps also affect water consumption.

5.2.6 *Spatial factors*

The *spatial distribution* of people and economic activities will also be differently affected under the different growth scenarios. High growth tends to favour concentration, low growth not. Depending on where, in relation to the water sources, concentration takes place, high growth may make it easier or more difficult to supply consumers with the water they demand. A particularly important question is whether people and activities are free to choose their location across national borders in the region. Much water could be saved e.g. is the agricultural activities in South Africa which now consume over half the water for agricultural consumption in the entire southern Africa were to be moved to Zambia where both soils and rainfall are much more suited to arable agriculture.

5.2.7 *The "Catch-Up"*

The above projections takes the situation of today as given and merely asks the question how water demand will be affected at given rates of economic growth. A situation considered undesirable today would therefore be projected into the future. There are particularly two factors that may make it necessary to assume a certain catch up for water demand, in addition to the growth factor mentioned above: (a) the under-coverage of water demand for a large number of people in southern Africa. (b) the fact that dome water resources may already be exploited to a degree that is ecologically unsustainable.

5.3 National characteristics

Looking at the situation of the individual countries, their present characteristics, the future issues and which regional implications these may have will be a major

exercise. The table on page 9, put together from several, often inconsistent, sources gives an indication of the problems as they are seen from the perspective of SADC's constituent countries.

5.4 Conclusions on overall water demand

An important question is whether the degree of withdrawals for the region in 2025 is at a level that we may call ecologically sustainable. Asked in an aggregate way like this, the question is not easy to answer. Much will depend on the individual water sources that are tapped and will be tapped in the future. Our knowledge of the ecological sustainability of using the regions various watercourses are at present at an embryonic stage and much more research is needed to say for sure whether a particular catchment may tolerate 5%, 10%, 15% or higher withdrawal.

Certainly, if it is assumed that withdrawals like in Italy France and Germany are sustainable, the SADC region is well off, but it is doubtful with a region with the skewed spatial and temporal water resources may be compared with Europe.

Still, with the rough projections that we have undertaken some conclusions may be drawn with a fair level of certainty:

- The future problem in the water sector in southern Africa is **not that the amount of water totally available will be inadequate**. Projections show that even without water saving measures it is possible to have a reasonable availability of water in the year 2025.
- The problem is to make water available **where** it is wanted and therefore the **cost** of water.
- This in turn will raise the question of **financing** of water schemes of all sizes, from the ones in the village to inter country transfers.
- Finally, above all, **management** of the water sector, planning and implementation at the local, national and regional levels will become a major challenge.

The rest of this paper addresses the four above questions.

Table 2: Country by country analysis.

	Present Characteristics	Future issues	Regional implications*
Botswana	Adequate supply but geographical distribution necessitates transfer.	Environmental vs other uses. Switch in population location or transfer	Namibia, SA, Angola, Zim and Zambia (Okacom exists)
South Africa	Geographical distribution of supply is not in line with demand. Transfer systems are however in existence	Tugela / Vaal transfer	Botswana
Tanzania	Shinyanga, Dodoma, Singida have deficits. Problems with Rufiji floods	Water -transfer from Lake Victoria	Uganda, Kenya, Sudan Egypt (Commission exist)
Namibia	Geographical distribution of supply not in line with demand. Access Ground water problem Transfer costs high	Kunene and Okavango transfer Desalination possible but water will need subsidy to be affordable.	Botswana, Angola Zambia and Zim Okacom exist
Lesotho	Net exporter, local problems with access	Distribution problem	Africa
Zimbabwe	Geographical distribution South west dry	Water from Zambezi Shangani/Gwaai dam	Zambia, Botswana (Zambezi group exists)
Mozambique	Adequate supplies Water quality in urban areas a problem	Improvement of water management	
Malawi	Rain shadow area Shire	Transfer to shire region	
DRC	Adequate supplies Floods Access Organisation (institutions)	Internal organisation of water management	Tanzania (irrigation in Kigoma, Sumbawanga and Tabora), Zambia (fishing and transport)
Angola	Adequate supplies Access Organisation	Improvement of infrastructure	Botswana, Namibia, Zambia and Zimbabwe
Swaziland	Only one major storage dam and therefore vulnerable to drought. Management and coordination needs to be better	Dependent on SA Development of agric key issue for water consumption	SA (mostly) and Mozambique (Komati)
Mauritius			
Seychelles			
Zambia	Distribution problem (Lusaka)	Can be solved without international transfers (Zambezi)	Angola, Botswana, Zimbabwe, Tanzania, Malawi, Mozambique, Namibia,

* Countries with which agreements will have to be made

6. Water management for a better future

The analysis above has indicated that even under a low growth scenario, the countries of southern Africa will be under various degrees and types of water stress. Overall water shortages are likely to occur under high growth scenarios in the south and west of the region. In lower growth scenarios the problems may be solved through efficient national and local water management. The high growth scenario will lead to problems that can only be solved through regional co-operation. The importance of introduction of well-conceived policies and mechanisms of water management is paramount.

6.1 Policy issues

Water problems cannot be solved only with policies specific to the water sector. Concern for water issues will have to be "built in" to the whole range of policies at both the macro economic and sectoral levels. This means that one will have to create a general awareness of water issues with any policy maker.

6.1.1 Water policy

At present water is largely considered to be a free good. Consumers pay for the construction and maintenance of water supply systems rather than for the water itself. The idea that there are limited quantities of water and that therefore a cost is attached to its' use is uncommon among policy makers, managers and consumers.

With increasing strain on the balance between water supply and demand, nationally and regionally, it is increasingly necessary to consider water as a scarce resource in the sense that each use of water has an opportunity cost. For example: Water used for water intensive industries cannot be used for agricultural purposes. The real cost of industrial use of water is therefore the opportunities lost by using the same amount of water in other sectors. Applying the opportunity cost principle in water planning and distribution not only encourages water saving in existing plants, it also introduces the notion that water may be saved by not producing products that require large quantities of water in areas where water is scarce. It encourages the use of water where it gives the highest social and economic return.

A conceptual reorientation is needed. Policy makers and managers will have to consider opportunity costs rather than attempting to supply cheap water to everyone.

6.1.1.1 Water Pricing

In most countries water allocation and distribution are based on a variety of methods and principles. Administrative water allocation may have advantages, but requires administrative resources that most countries can hardly afford. World-wide, one is now looking to establish water markets that takes care of allocation efficiently and consistently, guided by the price mechanism.

The idea of a price for water is not unknown, particularly at the micro level. Studies have shown that sophisticated water pricing systems are in use and are working at the village level.

Water markets for example based on tradeable water permits do exist. Water is sold by the unit. It is necessary to be aware that there can be considerable costs connected with the establishment of water markets. Market mechanisms require supporting infrastructure and institutions in addition to often-expensive monitoring and enforcement systems. In some cases these costs are so high that it may be more economical to relinquish economically efficient allocation mechanisms.

Water pricing and water markets will sustain economic efficiency but may have negative social consequences. Water pricing policy will have to take into account the fundamental quality of water as a basic need and a public good. Using the principle of *marginal social cost* for pricing of household water consumption means progressive water tariffs where (poor) households that use small quantities of water pay less per unit than (rich) households that use larger quantities for swimming pools, frequent car washes etc.

6.1.2 Macro issues

Many of the macro economic policies that are usually not considered an issue for the water sector in fact have a fundamental effect on the water demand and supply in the country as well as ripple effects in the region. Below some of the more important issues are mentioned.

6.1.2.1 Trade policy

Trade policy deals with the way countries position themselves in world trade through agreements with trade partners, duty concessions, setting the general level of import taxes and exchange rates. Trade policy effects trade flows and therefore also indirectly the flow of *water* across international borders.

A recent example is the free trade agreement between Europe and South Africa. By opening of the EU markets for fruits and vegetables from South Africa it encourages exports of the most water intensive products of South African agriculture which is biggest single user of water in the SADC region.

The global trend of tariff reduction, championed by the WTO, will over time reduce the influence of tariffs on international trade. Domestic tax and subsidy policies will get a relatively greater impact on traders' decisions. This means that domestic water pricing policies will influence the decisions of firms that export or import. For example, a producer facing a low water price will be competitive in water intensive products on the export market. However, if the price of water is low because it is highly subsidised it means that the country subsidises those who buy the exported, water intensive, goods and thus increases the pressure on the supply of water which *in fact* is expensive.

6.1.2.2 Fiscal issues

Presently, most of the governments in the region spend large amounts of money on running and maintaining water purification and distribution facilities. If consumers start to pay the opportunity cost of water and thus cover governments recurrent expenditure on water, it would be possible to move government expenditure towards

capital expenditure for water infrastructure such as water transfer.

Many countries in the region are dependent on donor funds for the water sector. While the donor support for the water sector is most helpful and appropriate, the tendency of some donors to "work around" the public sector is unhelpful in terms of the long-term sustainability of water infrastructure. Governments need to have control over their capital expenditure to be able to plan for sustainable maintenance and management of water infrastructure.

In some countries water pricing is used as an vehicle for financial transfers from central to local governments. An example is where central governments deliver bulk water supplies to municipalities and allow them a mark-up above the cost of local water purification and distribution. The mark up is in fact is a major source of revenue for the local authority budgets. Both central and local governments will then tend to use water pricing for balancing their budget rather than for regulating water consumption. Consumers will thus not be exposed to the actual price of water. While such methods may have practical advantages in management of government finances, it works against the principle of market related water pricing.

As regional trade and investment borders are being eliminated in the SADC region, fiscal policies come to the fore in affecting cross border trade and investment. Fiscal incentives, may, in the same way as noted for water pricing above, inappropriately encourage water intensive industries. The harmonisation of fiscal policies across SADC, already recommended for other reasons, would also have to take water aspect into account. *Within countries*, water pricing and taxation also ought to be sensitive to different water endowment from district to district so that water costs less in the districts where it is most abundant.

6.1.2.3 Monetary policy

Monetary policy normally deals with exchange rate and interest rate policy as well as with inflation.

One important effect of monetary policy on the water sector is the cost and financing of water infrastructure. Much of the water infrastructure in the future, particularly under a high growth scenario where major water transfer schemes may be needed will be extremely big, costly and long-term projects. If the instability of exchange rates, interests and inflation are high, such projects become volatile in terms of their long term economic and financial viability and it becomes difficult to attract finance from foreign or local sources. The water sector will benefit from stability in these key macro economic indicators in the same way as general growth and economic development will benefit.

6.2 Institutional issues

6.2.1 Local water management

There is a growing acceptance that community based water management will improve the sustainability of water supply at the local level. Sustainability of infrastructure requires local responsibility and a sense of ownership. Responsibility

is engendered when people have to grapple with difficult decisions and make choices themselves about how resources should be used. However, community management cannot function if there is a serious lack of appropriately trained personnel at the local level.

Although the principle of community management has been highly praised, it has often been a convenient way for politicians and senior government officers to shift responsibility for the provision of services from themselves to the community level. Nevertheless community management appears to work well in many places. Generally, the less supervision by higher government levels the better it works.

Women manage the households' use of water in a typicaily family. However in the "upstream" activities women usually have very little decision making power. The Africa working Group report says (Abrams, 1997):

...the issue of the engagement and empowering of women in the water sector, both at professional level and at village level, still requires a great deal of attention. When the issue is raised everyone will agree that it is important but if it is not raised little attention will be paid to it.

It is important that higher level authorities see it as their responsibility to empower women in the water sector.

6.2.2 National Water Institutions

At the national level, the growing importance of water demand/supply balance in the future requires improvements of the institutions that implement and monitor national policies and deal with cross-border water issues.

The present situation is one where the expertise in the sector is both scarce, often inefficiently used and given inappropriate incentives. Improvement of the institutional framework could ameliorate the situation without requiring a major expansion in the civil service. Frequent institutional changes should be avoided. Performance based pay principles should be introduced. In many countries staff at present regard conferences and trips abroad as a way of complementing their inadequate salaries.

Also, a less "ad hoc" policy framework and consistency at the political level would help keeping appropriately trained and experienced civil servants in the sector. Most countries do not have clear nation-wide regulations for the water sector. Activities in the sector therefore takes place in an ad hoc manner which is confusing and frustrating both for consumers and administrators.

Another way of reducing governments involvement in day to day water management is *privatisation*. Internationally there are several examples of private water authorities or a mixture of public and private institutions taking care of the supply for large population groups. In southern Africa this mode of operation is relatively untested. Several countries however have privatisation plans and policies that include the water sector.

There is at present little experience with water privatisation in Africa. It is clear from experience elsewhere, however, that privatisation of essentially "public goods"

does require strong and insightful regulatory powers. When water privatisation in Southern Africa gets under way, the countries will benefit much from learning from each other through SADC and specialised organisations such as the International Water Services Organisation, East and Southern African Region (IWSA-ESAR).

6.2.3 Regional water institutions

The increasing water stress levels, particularly under the high growth scenario, will partly have to be resolved through joint use of border rivers and inter country transfers of water. Although treaties between the riparian states cover most border rivers and basins, it is not clear whether these are in all cases working well and will be able to handle the increased pressure of the future.

Disagreements between the driest countries in the north and west, like Botswana and Namibia are to be expected. To meet the requirements of the future it is of paramount importance to start building organisations in southern Africa which are strong enough to handle conflicts that may develop. SADC has done considerable work in this area and support for the organisation's work to strengthen the regional institutions is increasing. (See Box 1 page 15)

SADC ACTIVITIES IN THE Water Sector

(Excerpt from the Sectoral report on water from the Annual conference, Lusaka February 1999)

The terms of reference for the Water Sector outlines the sector's vision as: **to attain the sustainable, integrated planning, development, utilisation and management of water resources that contribute to the attainment of SADC's overall objective of an integrated regional economy on the basis of balance, equity and mutual benefit for all Member States.**

The Water Resources Technical Committee (WRTC) has established four Sub-Committees to assist in its activities. These are the Sub-committee for Hydrogeology, Sub-committee for Hydrology, Sub-committee for Water Quality and Control of Aquatic Weeds, and Sub-committee for Water Supply and Sanitation.

One of the SADC Water Sector's main programmes is the Zambezi River System Action Plan (ZACPLAN). The ongoing project under this programme, ZACPLAN Project 6 (ZACPRO 6), aims at formulating an integrated water resources management plan for the entire basin.
A draft agreement for the establishment of the Zambezi River Basin Commission (ZAMCOM) has been considered.

The SADC Hydrological Cycle Observing Systems project (SADC-HYCOS) is establishing a pilot regional centre for data processing and dissemination at the Department of Water Affairs and Forestry (DWAF) in Pretoria, South Africa.

Eight (8) Member States (Botswana, Lesotho, Malawi, Namibia, South Africa, Swaziland, Zambia and Zimbabwe) have ratified **the Protocol on Shared Watercourse Systems in the SADC Region,** while others are at advanced stages of the ratification process and were expected to ratify the Protocol by September 1998.

The WSCU has been involved in several regional and international events addressing water resources and natural resources management. The Water Sector Coordinating Unit is also co-operating with other regional and international support agencies and centres of excellence to initiate programmes and projects on water resources management and development including ground water management and water resources data exchange.

6.2.4 *Legal institutions*

A market related water distribution system would need a regulatory framework and a *legal* framework which has the competence to handle water matters. The possible entry of the private sector and the use of markets for water allocation will undoubtedly lead to disputes that are new to the legal system and thus pose challenges. For example, the South African white paper on Water Policy foresees as a possibility: "the establishment of a specialised Natural Resources Court to deal with all natural resource and environmental matters".

At the local (village) level when disputes arise there is also need for a framework to deal with water rights. Traditional mechanisms exist and they must be built on and developed in line with overall policies and strategies.

6.2.5 *Water market institutions*

At the village level there are examples already of private entrepreneurs that market water. It will be important to find out how well such institutions are working, whether they should be encouraged and whether there is a need to regulate activities at this level.

6.2.6 *Financial institutions*

The conservative nature of financial institutions has been seen to be a barrier for projects in the water sector. Casual observation indicates that more than one "bankable" water project have been denied finance because financial institutions still basically consider water a free good. If water is not considered as a saleable commodity, it will be difficult for financiers to accept various water projects as economically viable projects that will pay back loans. This will particularly be the case for smaller projects. Large national projects are usually backed by governments or major corporations.

6.3 Environmental issues

The key problem in water demand management is to balance long-term protection of water resources with short- and medium-term demands for using them.

As indicated by our projections a major environmental issue is how to ensure an adequate *water supply for environmental use.* At present, even the more advanced national water policies are not very clear on this point. There is considerable haste to create clarity in this field so that unequivocal rules may be established, nationally and regionally. Otherwise the ecological demand will be the "soft" area that tends to loose out as pressures on supplies increase.

Whereas this paper deals largely with ways of managing demand, it is clear that there are links between supply and demand. There are numerous examples of how certain uses of water may lend themselves to re cycling and hence improving supply. It is clear that more incentives for research into methods of recycling and management of waste and polluted water may have considerable payoffs. Research and new methods will however hardly have considerable effects unless the

incentives for using these methods are right. The introduction of Polluters Pay Principle will ensure that potential polluters are given an incentive to clean up water pollution or other environmental damages or pay a price which is high enough for society to take care of the pollution problem.

6.4 Technology, information and research

6.4.1 Water focused technology

It is arguable that the availability of technology far outstrips our ability to implement it. Before major steps to research new areas are taken, countries and the region as a whole should make sure that they have exhausted opportunities for "tapping" technology advances from international sources. Accessibility and dissemination of useful and locally adapted technologies is the key. It is necessary that the sources of technology are aware of economic social and cultural barriers to introducing new technology. Appropriate technology is a *sine qua non* for sustainable use of technology.

For both major urban areas and rural areas the increasing development of modern agricultural methods and industries cause a threat, not to the *quantity* of water but the *quality* of water. Supporting the use of already known cleaning methods, (mechanical, chemical and biological) should have high priority. Adaptation of technologies and implementation are areas where regional co-operation could save resources and speed up practical use of new methods.

Handling water issues is not only a matter of technology but also of social and economic "mechanisms". There are a large number of questions that will have to be asked, from technical questions on pricing systems for water to social and traditional factors affecting water management. For example: To what extent do people react to market signals in the water market? What other factors than price are there to take into account? Exactly how should a socially and health sensitive water market and pricing system be set up? What are the best methods for dividing water rights between riparian states?

6.4.2 Information Technology

Technological progress has had a pervasive effect on nearly all human endeavours. Production processes are getting faster and more economic, saving costs and raw materials. Enormous advances in information technology enhance the spread of new production technology.

It is widely recognised that IT has had the effect of lowering the wastage of raw materials, among them water, in production. For this process to be effective in the Southern African region it is important not only that technologies are available for use, there will also have to be incentives to apply them. Again it is paramount to accept that water has a price and apply well thought through pricing mechanisms. If water is considered not a free good but appropriately priced, the use of IT to save water in various industrial and agricultural processes may become *the* key to removing water restrictions on development in southern Africa.

7. Conclusions

The above analysis has shown that there are indeed reasons to be concerned about the water future in southern Africa. Some of the countries will meet definite water shortages with only a lower level of growth, and probably serious crises with higher growth. There will be a need for transfer of resources and considerable capital expenditure.

If the people of the SADC region aims at a water future where:

Accessibility and provision of safe water for drinking and sanitation is ensured.

Water supplies are adequate to support agricultural production

The availability of water is not a constraint but serves to support industrial (non-agriculture) development objectives.

The negative effects of droughts and floods are minimised.

The use of water for human purposes takes care of and protects the environment and creatures that require water

Conflicts over water do not develop.

And, they desire, at the same time to keep economic growth rates in the region at a level consistent with the "catch up" that southern Africa needs.

Then people and governments in the region must achieve the following:

- An integrated water policy framework and implementation
- Institutional capacity building for focus in the long run water management
- Better management and more investment at various levels
- Movement towards proper pricing and markets
- Full user involvement and responsibility
- Gender awareness in water policy and management
- Balanced protection of water as pat of the environment.
- Strong regional efforts and co-operation through SADC

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Annex 1: Data sources and definitions.

The projection uses the latest data from the World Bank and World Resources Institute. (1998-99). Annual internal water resources refers to the annual flow of rivers and recharge of groundwater generated from endogenous precipitation, included are also river flows from other countries.

Caution should be used when comparing different countries because these estimates are based on differing sources and dates. These annual averages also disguise large seasonal, interannual, and long term variations. When data for annual river flows from and to other countries are not shown, the internal renewable water resources figure *may* include these flows.

Actual annual renewable water resources available for use is usually less than the sum of internal renewable resources and river flows. This is due to the fact that not all resources can be mobilised for use and that part of the flow coming from upstream countries or leaving from downstream countries might be reserved to those countries by treaty or other agreement. For example, Sudan's actual water resources include the flow of the Nile, *less* the amount that it is committed by treaty to deliver to Egypt at Aswan.

Annual withdrawals as a percentage of water resources refer to total water withdrawals, not counting evaporative losses from storage basins, as a percentage of internal renewable water resources. Water withdrawals also include water from non-renewable groundwater sources, river flows from other countries, and desalination plants in countries where that source is a significant part of all water withdrawals.

Annex 2: Committee on Water, Development and Macroeconomics. The process

The members of the Group were:

Mr. J. Isaksen, Botswana Institute for Development Policy analysis, Gaborone, Botswana. (Chair)

Dr. A. Leiman, University of Cape Town, Cape Town, South Africa

Dr. H. Semboja, Economic and Social Research Foundation, Dar-es-Salaam, Tanzania

Dr. W. Werner, Namibia Economic Policy Research Unit, NEPRU, Windhoek, Namibia.

Mr. Tiro Kayawe, Botswana Institute for Development Policy analysis, Gaborone, Botswana.

Dr. Felix Kani, the Chief Economist of SADC was invited to participate in the work of the committee. Whereas he expressed great interest for the study, he was unfortunately not able to participate directly in the meeting but promised to comment on an early draft.

It was realised at an early stage that little work had been done to quantify water demand and supply for the region and its constituent countries. Data collection and construction of a quantitative projection model were therefore started at an early stage.

After a tentative framework constructed by the chairperson had been distributed to the participants by email, the group met in Gaborone, Botswana 7th and 8th June 1999.

For the meeting, participants brought studies on water and relevant demand supply data for their countries. This was fed into the model. For other countries, the group had to rely on other sources,

Over two days the team discussed a revised framework and agreed the general direction of the paper.

At an early stage in the drafting process a tentative draft was sent to all members and the Chief economist of SADC for their comments.

The paper has benefited from insightful comments from the participants in the meeting of Sub-sectoral specialist working groups, Harare June 21st and 22nd 1999.

Annex 3

EXECUTIVE SUMMARY

(Excerpt from sectoral paper on Water from SADC Conference 10-12 February 1999)

The terms of reference for the Water Sector outlines the sector's vision as: to attain the sustainable, integrated planning, development, utilisation and management of water resources that contribute to the attainment of SADC's overall objective of an integrated regional economy on the basis of balance, equity and mutual benefit for all Member States. The terms of reference also articulate the overall objective, functions and the institutional arrangements for the Water Sector.

According to the terms of reference for the Water Sector, the Water Resources Technical Committee (WRTC) can form Sub-Committees and adhoc expert groups to address specific projects and programme of the Sector. In this regard, and to accommodate activities previously under Southern African Regional Commission for the Conservation and Utilisation of the Soil (SARCCUS), the WRTC has established four Sub-Committees to assist in its activities. These are the Sub-committee for Hydrogeology, Sub-committee for Hydrology, Sub-committee for Water Quality and Control of Aquatic Weeds, and Sub-committee for Water Supply and Sanitation. Member States are expected to nominate representatives to these sub-committees and that these sub-committees should be involved in the development and implementation of the Water Sector activities, such as the ground water programme, and the aquatic weeds project, etc.

The regional water resources situation has been seriously affected by the current El Nino phenomenon, which has resulted in below average rainfall amounts, and in some member States, a state of emergency was declared. The under ground water, in some member States, was adversely affected with some areas experiencing drying-up of boreholes. In order to mitigate the effects of drought, individual Member States have put in place different mechanisms. These constraints continue to exacerbate the water supply shortages to people, in particular the poor majority who mostly depend on underground water as their source of potable water.

The Water Sector has as one of its main programmes the Zambezi River System Action Plan (ZACPLAN). The ongoing project under this programme, ZACPLAN Project 6 (ZACPRO 6), aims at formulating an integrated water resources management plan for the entire basin. Under Phase I of ZACPRO 6, a water resources database has been developed. Data and information on seven sectors (Sector Studies) initiated in March, 1997 at the Zambezi River Authority, in Lusaka, Zambia has now been completed and

were handed over in a workshop held at Ezulwini, Swaziland in August 1998. A workshop funded by Norad was held in Victoria Falls, Zimbabwe, 5-6 March, 1998, to start the process of implementing Phase II of the ZACPRO 6 project. A workshop was also organised and held at the same venue on 12 -13 March, 1998, to consider a draft agreement for the establishment of the Zambez River Basin Commission (ZAMCOM).

The SADC Hydrological Cycle Observing Systems project (SADC-HYCOS) which is being supported by the European Commission (EC) to the tune of ECU 1.964 million is progressing satisfactorily. The project is establishing a pilot regional centre for data processing and dissemination at the Department of Water Affairs and Forestry (DWAF) in Pretoria, South Africa. A memorandum of understanding between the Water Sector and DWAF has been concluded and signed to this effect. The Water Sector together with the EC have concluded a contract for the supply of equipment for the project, and identified and concluded a contract for appropriate technical assistance for the effective implementation of the project. The allocation of stations has been agreed to by the member States with allocation per member- State ranging from 3 stations (minimum) to 6 stations (maximum). All in all 50 stations have been allocated with DCPs. The World Meteorological Organization (WMO) is the supervising agency on behalf of the WSCU.

The Water Sector Co-ordination Unit (WSCU), in collaboration with the SADC Secretariat and financial and technical assistance of UNDP, is preparing for a round table conference which will be in December 1998. To this end WSCU and UNDP-Lesotho identified and engaged a regional water resources expert, and a Water Resource Planner/Economist to assist in drafting the Regional Strategic Action Plan (RSAP) for the management and development of water resources in the SADC Region. The draft RSAP document was reviewed at a stakeholders workshop held in Livingstone, Zambia, 3-4 March. 1998 and was later reviewed by the WRTC at their meeting in Lusaka, Zambia, held on 4-8 May, 1998, together with draft Round Table Conference (RTC) document. A WRTC also convened in Maseru, Lesotho, 18 to 20 May, 98, to further review the RTC document and a summary of the RSAP document.

The Water Sector Co-ordination Unit has also been charged with the responsibility of coordinating the contribution of SADC countries at the World Exposition 2000 (EXPO 2000), organized by the Government of the Federal Republic of Germany, scheduled for June to October 2000, in Hanover, Germany. SADC has chosen a theme WATER for the joint SADC presentation at the EXPO 2000. A theme statement and conceptual framework for the joint presentation have already been made and submitted to the organizers of the EXPO 2000 for consideration.

Eight (8) Member States (Botswana, Lesotho, Malawi, Namibia, South Africa, Swaziland, Zambia and Zimbabwe) have ratified the Protocol on Shared Watercourse Systems in the SADC Region, while others are at advanced stages of the ratification process and were expected to ratify the Protocol by September 1998. Mauritius has already acceded to the Protocol. This means that the Protocol has now entered into force. The Council of Ministers at their meeting in Malawi, September 1997 and in Mozambique, January 1998, instructed the SADC Secretariat and the Water Sector to compile amendments on the Protocol for consideration in their next meeting.

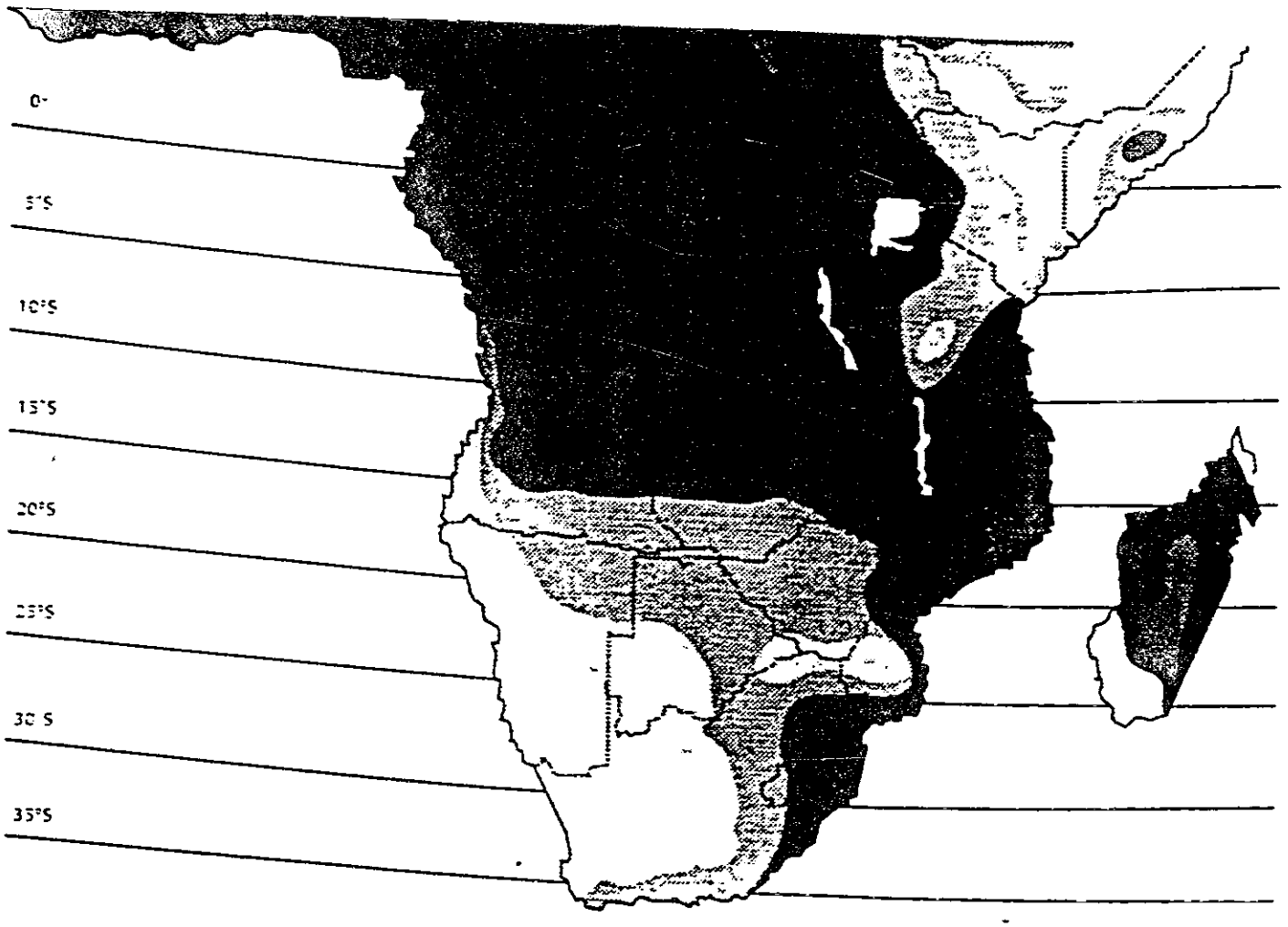
Botswana, Malawi, Mozambique, South Africa, and Zambia submitted proposals for amendments to the Protocol, in addition to those received from Angola and Mozambique previously. A Protocol amendments workshop similar to the one held in Manzini, Swaziland, in April 1997, to address comments on the provisions of the Protocol, was held in Mbabane, Swaziland, on 18 - 21 August 1998. Significant progress was achieved in the negotiations, however, in view of the fact that agreement still has to be reached on some aspects, Council directed the Water Sector Coordinating Unit and the Secretariat to continue with the process of facilitating negotiations on the amendments.

The WSCU has been involved in several regional and international events addressing water resources and natural resources management. The Water Sector Coordinating Unit is also co-operating with other regional and international support agencies and centres of excellence to initiate programmes and projects on water resources management and development including ground water management and water resources data exchange.

Annex 4

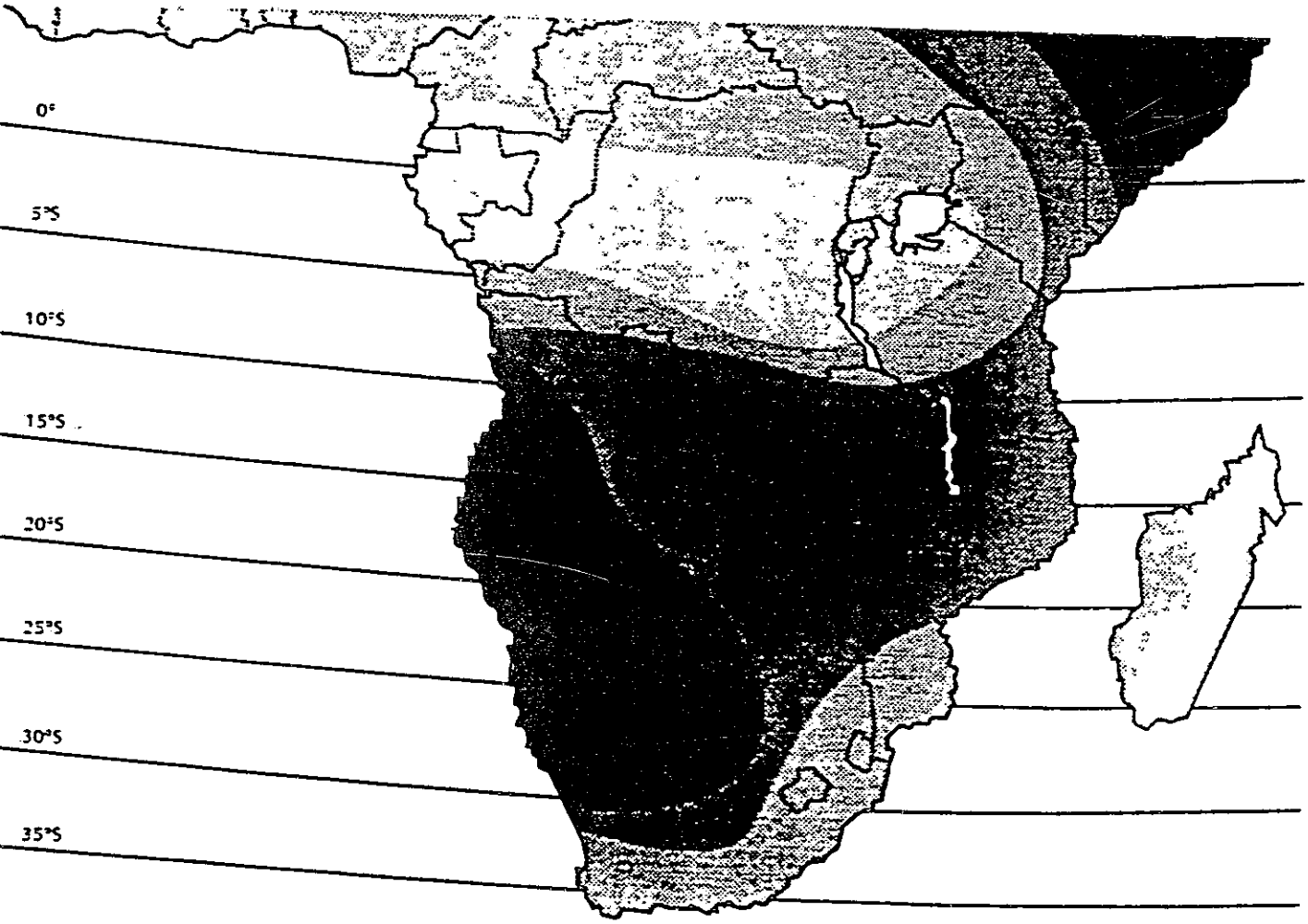
Maps on Rainfall and Rainfall variability

MAP 1: RAINFALL PATTERN IN SOUTHERN AFRICA



Based on: Paul Harrison, *The Greening of Africa*, Paladin, 1987.

MAP 2: VARIABILITY OF MEAN AVERAGE RAINFALL IN SOUTHERN AFRICA



Annual variation from mean

- 10-15%
- 15-20%
- 20-25%
- 25-30%
- 30-40%
- over 40%

Based on: David Grigg, *The Harshlands*, Macmillan, 1970.