CLIMATE CHANGE ADAPTATION IN SADC

A Strategy for the Water Sector

ISBN 978-99912-475-6-4

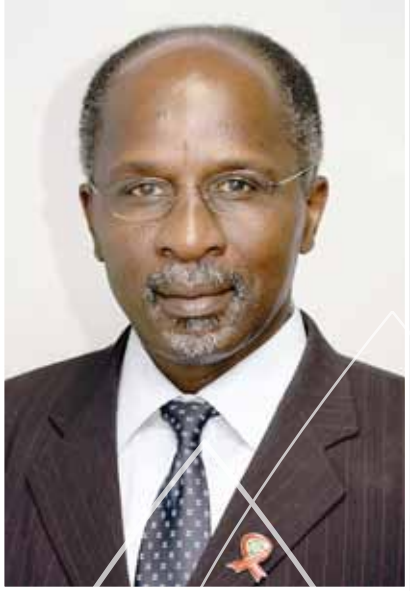
ACKNOWLEDGEMENTS

The *Climate Change Adaptation Strategy in SADC: a Strategy for the Water Sector* was formulated on the basis of an open process of collaborative thinking, decision-making and inputs from stakeholders at all levels. Many thanks go to representatives of Member States and River Basin Organisations who have been very supportive to this process especially through the inputs they provided during the annual meetings of the Water Resources Technical Committee as well as on the occasion of the 2010 and 2011 SADC Multi-stakeholder Dialogues. The extreme valuable input provided by the regional team of Climate Experts, Global Water Partnership Southern Africa (GWP-SA) and the Regional Climate Change programme (RCCP) is greatly appreciated. Further thanks go to our International Cooperating Partners for the guidance they provided through the Water Strategy Reference Group.

Finally, The SADC Secretariat would like to express its sincere appreciation for the financial and technical support provided by the Federal Republic of Germany (BMZ), in delegated cooperation with the UK Department for International Development (DFID) and the Australian Agency for International Development (AusAID) for the development and publication of this document. This partnership is supported by GIZ through the implementation of the Programme on Transboundary Water Management in SADC.

CONTENTS

FOREWORD



The science is beyond dispute and the facts are clear. The climate is changing. Various changes in our biosphere are already occurring all on the extreme side in terms of either magnitude or periodicity. Scientist have already observed a general increase on the earth's average temperature has led to melting of ice caps thus pushing sea level resulting in salt water intrusion in small islands States and coastal areas not to mentioned frequent occurrence of extreme event such as flood and droughts. It is very clear that water is central to climate change impact which then affects other sectors which play vital roles in keeping the human race and supporting ecosystems intact.

These climate calamities are not only disastrous in nature but also cause serious drawbacks in thriving economies and a key culprit for eroding integrity of societies. Though the Southern African region contributes less that 1% of the green house gas emissions it is one of the most affected regions in the world affected. The impacts of climate change are already perceived and are expected to result in increased frequency and severity of droughts, floods in the SADC region. Every year more people are plunged into poverty because of the increased reliability of climate and the resultant extreme event. In some countries, where resources are relentlessly linked to climate, this situation could even lead to conflicts.

It is an unfortunate reality that the cause of Climate Change is purely anthropogenic. This means it's us destroying ourselves. The recognition that we are the cause of this phenomenon is vital step in the right direction. This means it is still us the human race that can reverse this phenomenon by enacting legally binding instruments that obliges all countries to reduce their green house gas emissions and fully comply. I am very happy and proud of all SADC Member States' commitment to support and comply with all international instruments such as the Kyoto Protocol which are aimed at mitigating the causes of Climate Change.

To make a significant impact in reversing the climate change phenomenon it requires that Annex 1 country Parties (developed countries) to comply with their commitments under the UNFCCC and Kyoto Protocol, especially regarding the control of emissions but also on the provision of adequate, predictable, dependable and accessible funding for climate change adaptation.

The priority for Africa is to improve climate resilience to achieve sustainable and equitable development that will ensure poverty alleviation and enhance the standard and quality of life of the people of Southern Africa.

But we cannot meet this challenge alone as individuals. We need to work together, as a region, as a continent and as members of the global community. Climate change knows no boundaries. I hereby invite all SADC Member States and the entire global community to support the implementation of this Strategy.

Dr. Tomáz Augusto Salamão
Executive Secretary
Southern African Development Community

PREFACE

The Southern African Region is one of the most affected regions by Climate Change and Climate Variability in the world. Water resources has been the epicentre of the Climate Change impact which has been characterised by extremely devastating events in the form of floods and droughts leading to food insecurity, poor health conditions (e.g. malaria outbreaks), loss of dependable shelter and even loss of life. The 2000 and 2001 floods are testimony to this calamity.

In the water sector, Climate Change challenges in the region are exacerbated by the very low resilience of the communities in coping with the resultant extreme events. Lack of infrastructure to mitigate the impact of climate change and climate variability is a key factor that undermines the region's ability to cope with periodic disasters. Due to the this monstrous phenomenon, it is becoming uncommon to experience floods and droughts during the same year but if the region had adequate storage infrastructure that wouldn't be a concern since water would be impounded during the flood situation for use during drought times. This would go a long way in contributing towards sustainable food security, energy security, water supply for domestic and industrial use while attenuating flood impact.

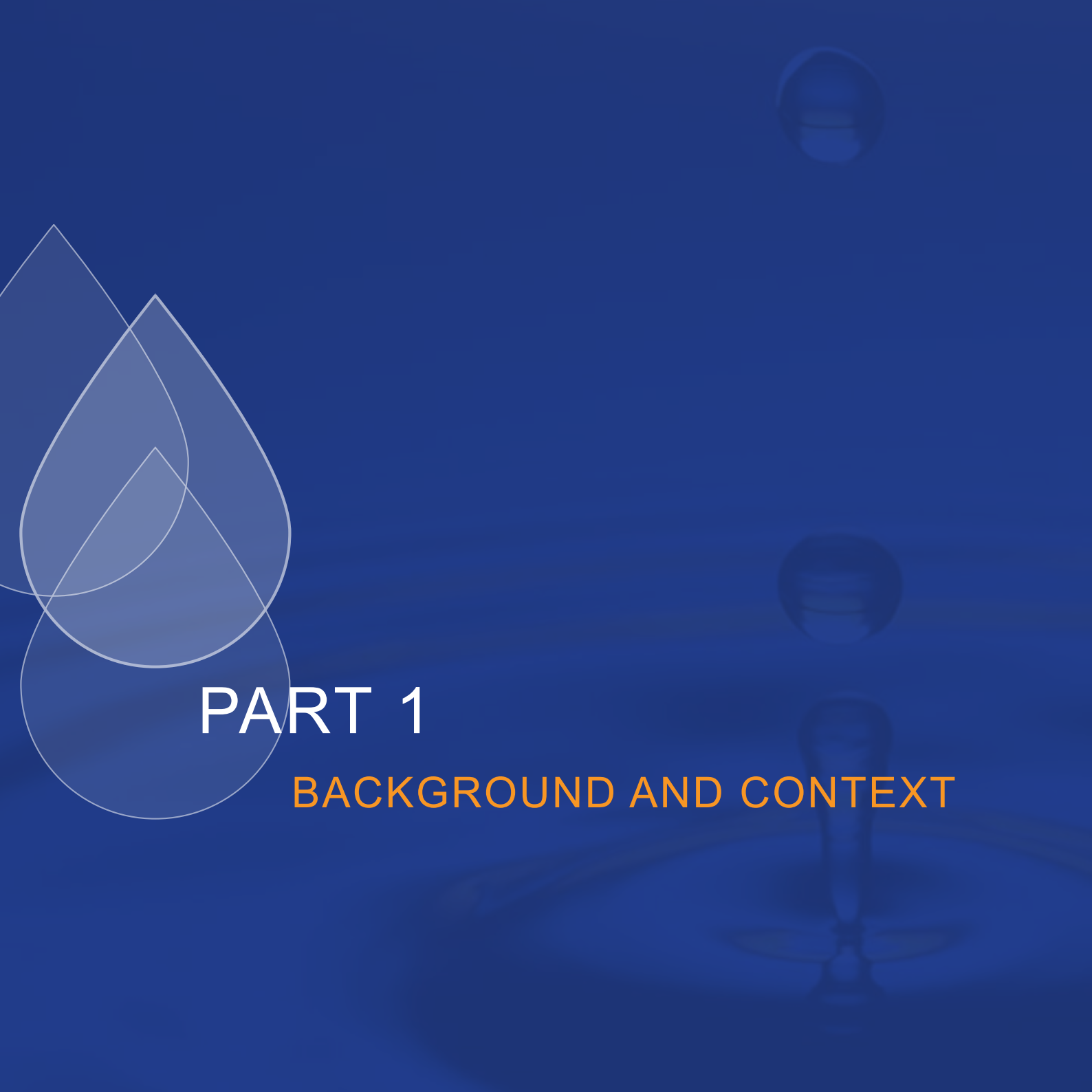
Fortunately, the region is more than ready to tackle the Climate Change challenges in all sectors. As a starting point, the water sector has already crafted the road map in the form of this Climate Change Adaptation Strategy. The enabling environment to undertake the journey of implementing this strategy is conducive in terms of instruments for regional cooperation. Starting from the Treaty, Regional Indicative Development Plan (RISDP), Regional Water Policy, Protocol on Shared Watercourses, River Basin agreements, Regional Water Strategy and the 3rd phase of the Regional Strategy Action Plan (RSAP III) on Integrated Water Resources Development and Management all provides a guiding framework for the smooth implementation of this strategy on Climate Change.

As a region, we are more committed to take the Climate Change Agenda further in partnership and closer collaboration with all concerned Parties and will endeavour to promote the prominence of the of the water agenda under the UNFCCC negotiations as way of paving way for all sectors that are impacted by water resources to inherently benefit from such outcomes.

Eng. João Samuel Caholo
Deputy Executive Secretary – Regional Integration
Southern African Development Community

ABBREVIATIONS AND ACRONYMS

CCA	Climate Change Adaptation
CCAS	Climate Change Adaptation Strategy
GDP	Gross Domestic Product
GCM	Global Circulation model
GHG	Greenhouse Gases
MDG	Millennium Development Goals
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resources Management
M&E	Monitoring and Evaluation
PPP	Public Private Partnership
RSAP	Regional Strategic Action Plan
SADC	Southern African Development Community
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
WSS	Water Supply and Sanitation


PART 1
BACKGROUND AND CONTEXT



1.1 Introduction

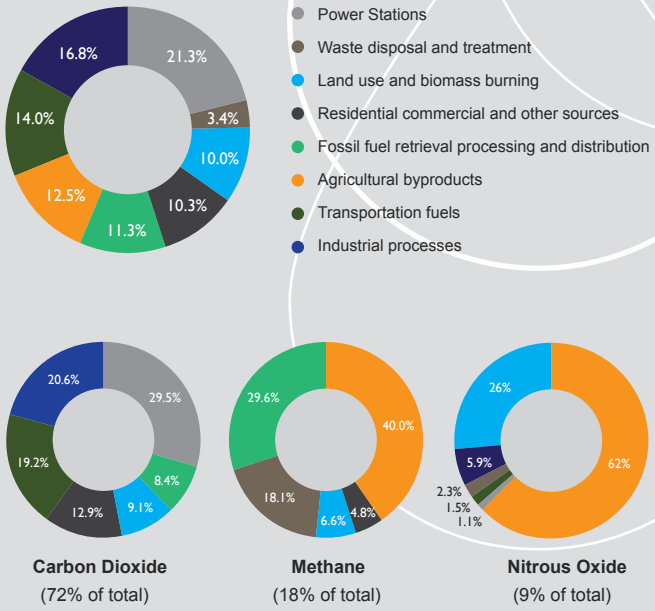
The scientific community is now unanimous, the global climate is changing. Global temperatures are rising and precipitation patterns are changing. The observation of data over the past 100 years clearly shows that the climate is heating up. Between 1906 and 2005 the global mean temperature rose by 0.74 °C. The Earth's average temperature is estimated to rise by 1.4 to 5.8°C between 1990 and 2100.

In all likelihood, these changes are attributable to anthropogenic activities. The global warning of the past 50 years is due primarily to human-induced emissions of greenhouse gases. As illustrated in the figure below, the main source of greenhouse gases emissions is the burning of fossil fuels for power generation, industrial processes and transportation.

Global warming will affect the entire planet. This will pose huge challenges to countries, communities, organizations, enterprises and individuals. Developing countries will suffer the most from the adverse effects of climate change. Some highly vulnerable regions, such as Southern Africa, are already being affected by the impacts of climate change.

Climate change *refers to a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods (UNFCCC).*

Figure 1: Greenhouse gas emissions by sector



Source: Emission Database for Global Atmospheric Research 2000

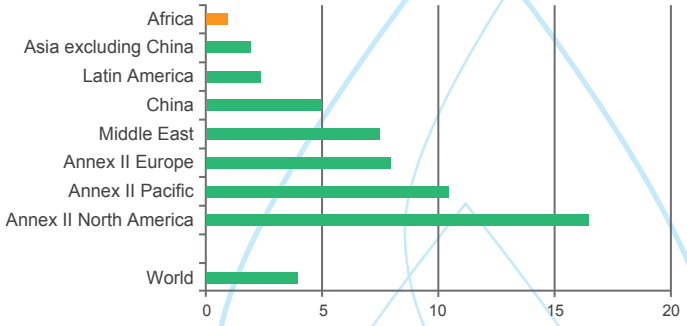
1.1.1 Mitigation and Adaptation

Globally, the priority is to stop global warming and to prevent further climate changes through the implementation of mitigation measures. Mitigation in the context of climate change is defined as a human intervention to reduce the sources or enhance the sinks of greenhouse gases. Examples of mitigation measures include the adoption of more efficient uses of fossil fuels, the conversion to renewable energies such as solar and wind power, and the expansion of forest areas and other sinks to remove greater amounts of carbon dioxide from the atmosphere. If nations worldwide fail to implement such measures mean global temperatures will continue to increase and the adverse impacts of climate change on societies and economies will worsen.

In the meantime, countries have to adapt to climate changes so as to better cope with the effects of global warning. The United Nations defines climate change adaptation as the process of taking actions to help communities and ecosystems cope with changing climate conditions. Adaptation measures include the construction of flood walls to protect property from stronger storms and heavier precipitation, or the planting of agricultural crops more suited to warmer temperatures and drier soil conditions.

In Southern Africa and in Africa in general, adaptation is the main priority when it comes to climate change. Indeed, most African countries only contribute to a very small portion of global emissions of greenhouse gases (figure 2). As such, the reduction of emissions in Africa will only have a marginal effect on global warming. Mitigation measures are also associated with very high opportunity costs. More importantly, most countries in the region are already confronted with the adverse impacts of climate change. In the most vulnerable countries, climate change is not only an additional development challenge slowing economic growth but it also threatens some of the progress made over the last decades. In Southern Africa development and climate change adaptation are intertwined. This is especially true in the water sector.

Figure 2: CO_2 emissions (tons per capita)



Source: International Energy Agency 2010



1.1.2 Water and Climate Change

Water is a key resource for sustaining life and society. No community and economy will prevail without water of sufficient quality and quantity. With a large part of the population lacking access to clean and safe water as well as a high dependence on water-intensive sectors, water is the nexus of Africa's development challenges.

Climate change adds pressure to existing threats on freshwater resources and water management systems. It increases water stress in already dry areas, and undermines water quality in areas flooded either by rain or by sea water. The Intergovernmental Panel on Climate Change (IPCC) is confident that the overall net impact of climate change on water resources and freshwater ecosystems will be negative due to diminished quantity and quality of available water.

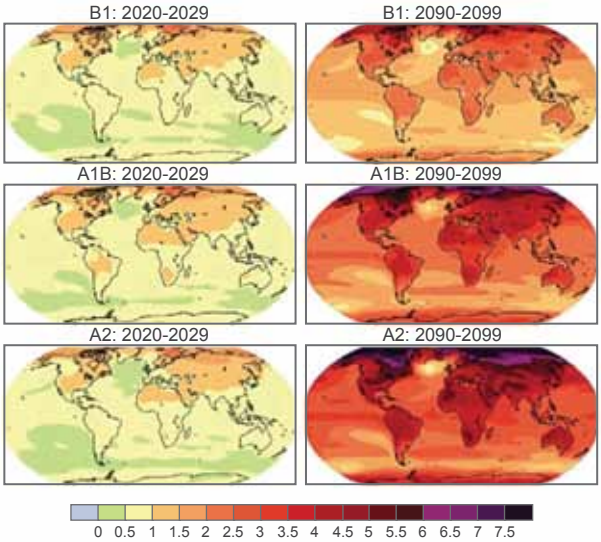
Climate change is already changing the geographic distribution, frequency and intensity of weather-related hazards and threatens to undermine the resilience of poorer countries and their citizens to absorb loss and recover from disaster impacts. Climate change acts as a "threat multiplier" by exacerbating existing vulnerabilities.

Throughout the region water resources management practices should be adapted to become less vulnerable to climate changes. Water management should also be promoted as a tool to improve climate resilience in the region.

1.2 CLIMATE CHANGE IN SADC

The IPCC has identified Southern Africa as being very susceptible to climate change. Generally, the climate changes anticipated for Southern Africa are similar to those being experienced around the world.

Figure 3: Projected global temperature changes relative (multi-model projections)



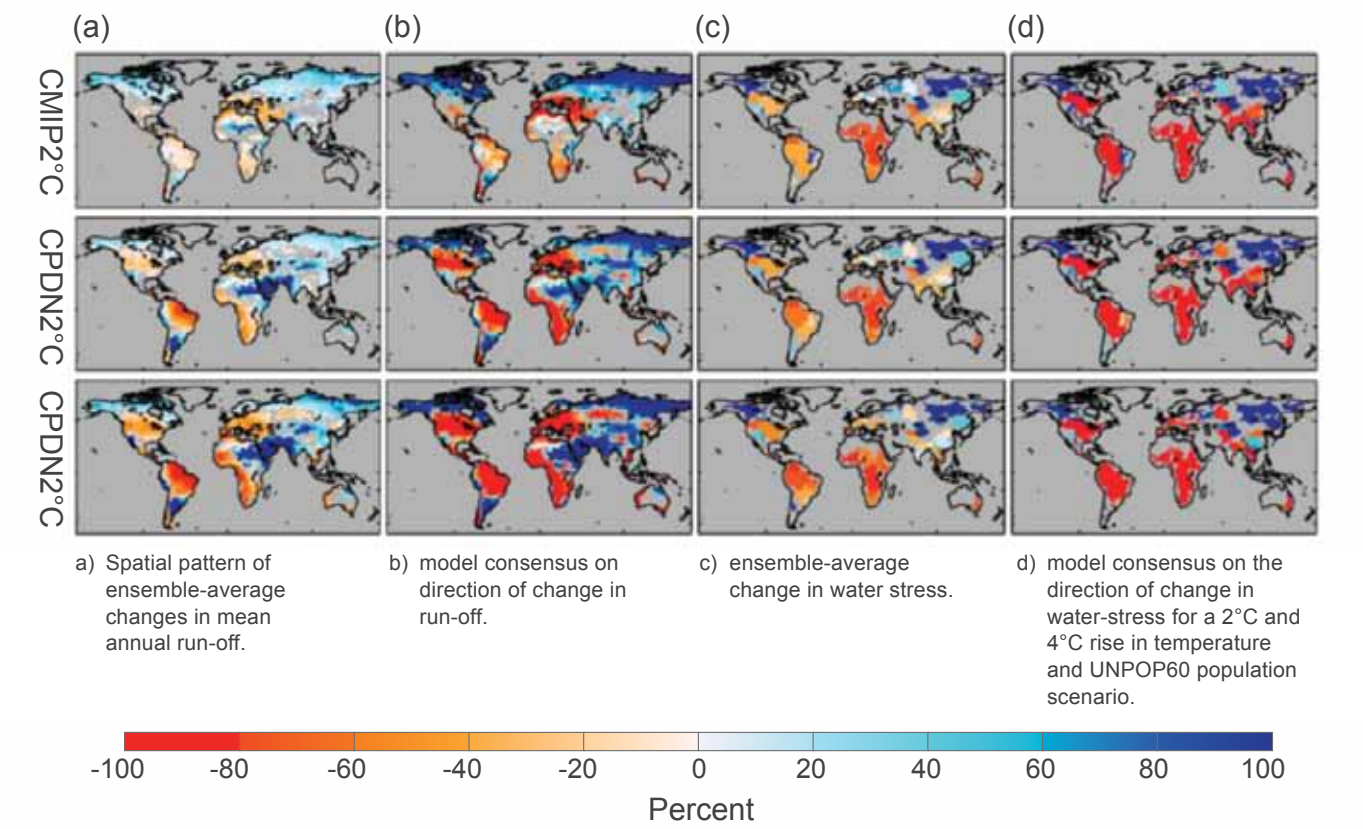
Source: IPCC 2007

1.2.1 Observed and Projected Changes

Over the last decades the region has been experiencing a warming trend. According to the IPCC, temperatures in the region have risen by over 0.5°C over the last 100 years. It is widely accepted, based on future climate modelling findings, that the region's climate will become hotter and drier (figure 3). Climate modellers indicate a further increase of mean temperatures between 2°C and 4.5°C in the next 50 to 100 years. Such temperature rises are expected to be greater in the summer than in winter season.

The region has also experienced a downward trend in rainfall. This has been characterized by below-normal rainfalls and frequent droughts. Although projections of future rainfall are subject to considerable uncertainty, most projections based on global circulation models (GCM) show reduced rainfall for much of the region in winter (figure 4). Beside volumes, precipitation patterns are also expected to change in intensity and frequency, resulting in more extreme events and longer periods between rainfalls.

Figure 4: Future water availability



a) Spatial pattern of ensemble-average changes in mean annual run-off.

b) model consensus on direction of change in run-off.

c) ensemble-average change in water stress.

d) model consensus on the direction of change in water-stress for a 2°C and 4°C rise in temperature and UNPOP60 population scenario.

Source: Fung, Lopez and New 2011

1.2.2 Associated Risks

As average temperatures rise worldwide, the water cycle is being affected through increased evaporation and changing precipitation patterns. More intense and frequent storms, combined with increased run-off, are leading to more frequent flooding. Climate-related floods pose a serious threat to national economies and sustainable development. Southern Africa is one of the five regions in the world exposed to serious risk of flooding in coastal and deltaic area.

At the same time, water scarcity is also intensified through disrupted rainfall patterns, increased evaporation loss and increased water demand in all sectors. Drought-prone areas of Namibia, Botswana, and Zimbabwe are likely to be more vulnerable to climate change than the more humid areas of Tanzania or Zambia (IPCC, 2008). In its Fourth Assessment Report, the IPCC has concluded that there is a 90 per cent probability that the extent of drought-affected areas will increase.

In addition, projected sea level rise is expected to affect low-lying coastal areas with large populations, with associated costs estimated at least 5 to 10 % of gross domestic product (GDP). Sea level rise represents a threat to the region

through saltwater intrusion, coastal erosion and the degradation of groundwater in coastal areas. Sea level rise will be an important challenge especially in the Island States or in Mozambique, where more than 60% of the population lives within 50 km of the coast. These effects will only be felt toward the end of the 21st century.

1.2.3 Socio-Economic Impacts

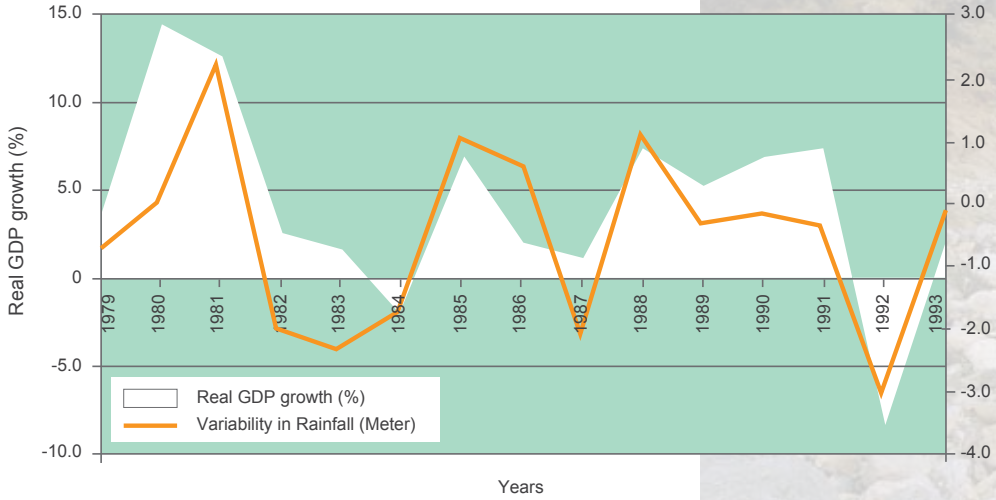
The extreme climatic events that the sub-region has been experiencing are negatively impacting the inhabitants and economies of Southern Africa. Since 2001, consecutive dry spells in some areas of the region led to food shortages. For example, in 2001 and 2002 six countries, namely Lesotho, Malawi, Mozambique, Swaziland, Zambia and Zimbabwe, faced a food deficit of about 1.2 million tones of cereals and non-food requirements. These were estimated to cost USD 611 million.

Changes in the physical environment, due to climate change, are expected to have an adverse effect on agricultural production, including staple crops such as millet and maize. The areas suitable for agriculture, the length of growing seasons, and yield potentials are all expected to decrease. Diminishing fisheries resources in large lakes due to rising water temperatures are also expected to further limit local food supplies. For the region as a whole, net productivity reduction of more than 10 percent are possible in the case of maize and other major crops such as sorghum, millet, sugar cane, and wheat.

Climate change also has an impact on human health. There has been a resurgence of water-related vector-borne diseases in areas where eradication programmes had previously been successful, and emergence of new vector-borne diseases in areas where they were previously unknown. New breeding places for mosquitoes and other disease-transmitting insects may also develop. Some assessments suggest that climate change can lead to an expansion of the areas suitable for malaria transmission, and thus increase risk of the disease.

Climate variability can also have severe macroeconomic consequences. In this regard, droughts and floods are important factors determining economic growth in Southern African countries. For instance, the GDP of Zimbabwe dropped by 3 percent and 8 percent after the 1983 and 1992 droughts, respectively (figure 5). In South Africa, the 1992 drought induced a reduction of the agricultural GDP by about ZAR 1.2 billion and caused a 0.4 to 1.0% loss in economic growth. The same drought cost the Zambian government USD 300 million and translated into a 39% drop in agricultural output and a 2.8% decline in the country's GDP.

Figure 5 Rainfall variability and GDP growth in Zimbabwe



Source: World Bank 2007



1.3 ADAPTATION STRATEGY

Throughout history, the adjustment of natural and human systems to climate change and climate variability has been the rule rather than the exception. Humans have always adapted to changes. It is a matter of survival.

However the unprecedented pace of the current changes and the increasing complexity of our societies and economies suggest that isolated, spontaneous and self-regulated adaptation mechanisms are not sufficient anymore. Climate change adaptation is a dynamic social process determined partly by our ability to act collectively.

Adaptation to climate change *refers to the capacity of natural and human systems to reduce vulnerability against actual or expected climatic stimuli and their effects on society, the economy and the environment (UNFCCC).*

Even if the world succeeds in limiting and reducing greenhouse gases (GHG) emissions, the planet will take at least another 50 years to recover from the GHG already in the atmosphere. Regardless of what we do now to mitigate climate change, we will be faced with the impact of climate change for at least two or three generations. We need therefore to take (collective) measures to adapt and limit the impacts of climate on our societies and economies.

1.3.1 Purpose and Goals

The main goal of the Climate Change Adaptation (CCA) Strategy is to improve climate resilience in Southern Africa through integrated and adapted water resources management at regional, river basin and local levels.

The objective is to promote further the application of integrated water resources management as a priority tool to reduce climate vulnerability and to ensure that water management systems are well adapted to cope with increased climate variability.

In other words the strategy envisages water management as a key building block to develop climate resilience while making sure that this particular block is made of the right material, well adapted to the region and the changing climate.

Indigenous knowledge: *Local communities have been dealing with climate variability for generations and have learned to adapt their lives and livelihoods to the water cycle. New adaptation measures for the water sector must build on such knowledge.*

The Strategy focuses on the implementation of both “no-regret” and “low-regret” measures. The former relate to measures that will prove worthwhile doing even if no (further) climate change will occur, and the latter, to measures that will only require small additional expenditures to cater for the negative effects of climate change.

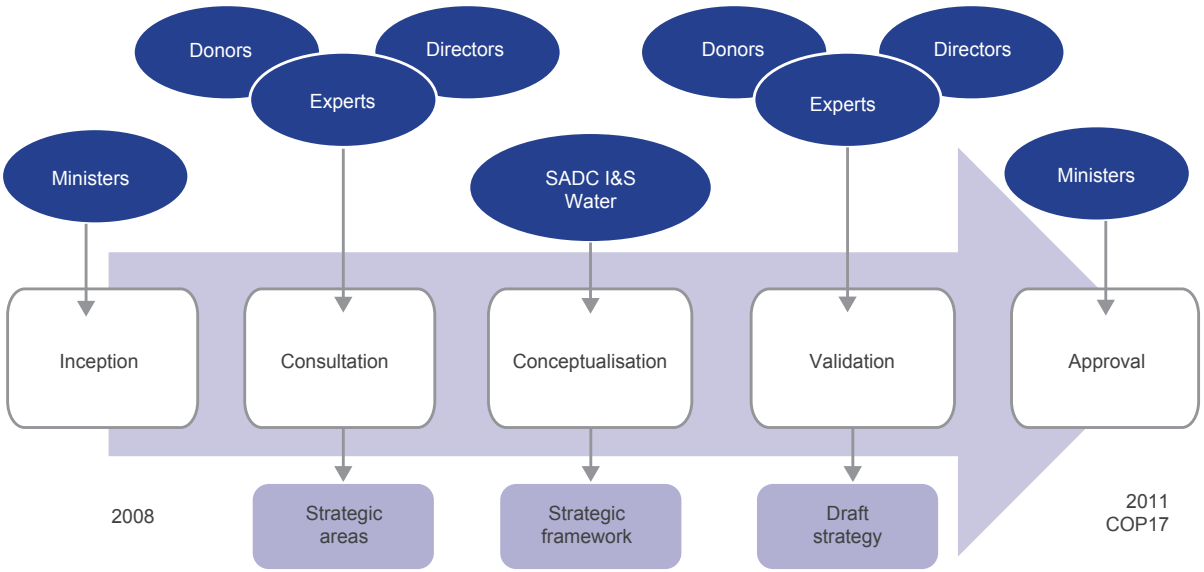


The Strategy presents measures to be taken over the next 20 years. It is recommended that work on adaptation should be started immediately as this would benefit the sectors under present climatic conditions.

1.3.2 Process

The development process of the SADC CCA Strategy was initiated in May 2008 during the second SADC Multi-Stakeholder Dialogue in Maseru, Lesotho. The Strategy formulation process is presented in the figure below, highlighting the different stages, outputs and stakeholders involved in the process. There was considerable iteration within the Strategy formulation process to refine the outputs and align the Strategy with the Regional Strategic Action Plan (RSAP) as a first step to mainstream climate change in the SADC Water Sector.

Figure 6: CCAS formulation process



1.3.3 Strategic Framework

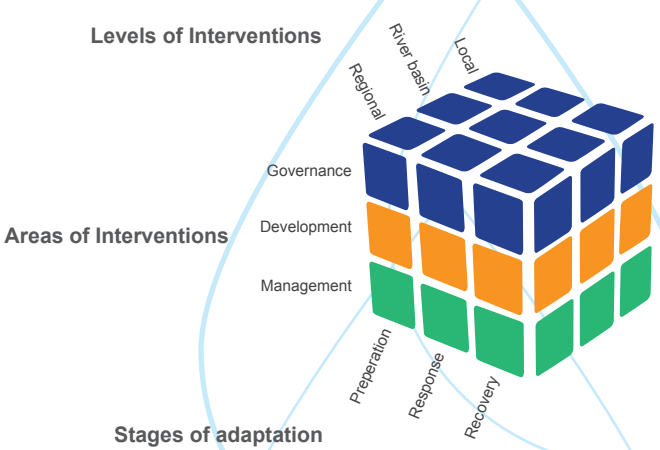
Climate change adaptation in the water sector is multi-faceted. First, global warming and climate change are by nature planetary phenomenon transcending national political boundaries. Climate change adaptation is therefore a transboundary process which requires the adjustment of societies and economies at different levels, from the grass roots up to the river basin and regional levels.

Second, adaptation is not just about prevention. In many cases, regardless of the level of preparation, extreme events such as floods and droughts will continue to occur in Southern Africa. A sound adaptation strategy should therefore provide recommendations on ways to respond to and recover from these extreme events.

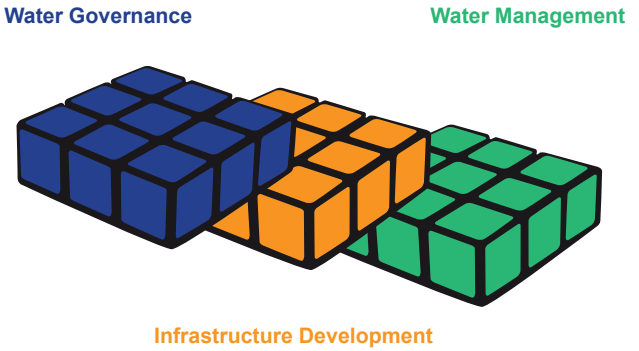
Finally, adaptation in the water sector is not just about water, it is also about the people who use the resource and who are affected by the variations triggered by climate change. Climate change adaptation is therefore as much an issue of water management as it is a matter of water governance. In Southern Africa, given the limited storage capacity, climate change adaptation is also a matter of infrastructure development.

In order to reflect the different dimensions of adaptation, the SADC CCA Strategy promotes the adoption of a comprehensive and multi-dimensional approach to climate change adaptation, in alignment with integrated water resources management (IWRM). The strategy calls for the implementation of adaptation measures at different levels, at different stages of the adaptation process and in different areas of interventions. The Strategy is embodied in the "SADC Water Adaptation Cube" which was designed to raise awareness and facilitate coordination amongst stakeholders (figure 7). Climate change adaptation is a building block of climate resilience in Southern Africa.

Figure 7: SADC Water Adaptation Cube



The following section presents the priority measures indentified to improve climate resilience and reduce climate vulnerability in the SADC region. Based on the SADC Water Adaptation Cube, the adaptation measures are presented based on the three areas of interventions, each constituting a slice of the cube. All the adaptation measures identified are cross cutting by nature and they should be implemented as such, in the sense that each measure rests on the implementation of activities at different levels of interventions and different stages of the adaptation process



PART 2

ADAPTATION MEASURES



2.1 WATER GOVERNANCE

Water governance refers to the political, social, economic and administrative systems in place to develop and manage water resources at different levels of society. Water governance systems should be adapted to reflect the variations caused by climate change on water resources systems.

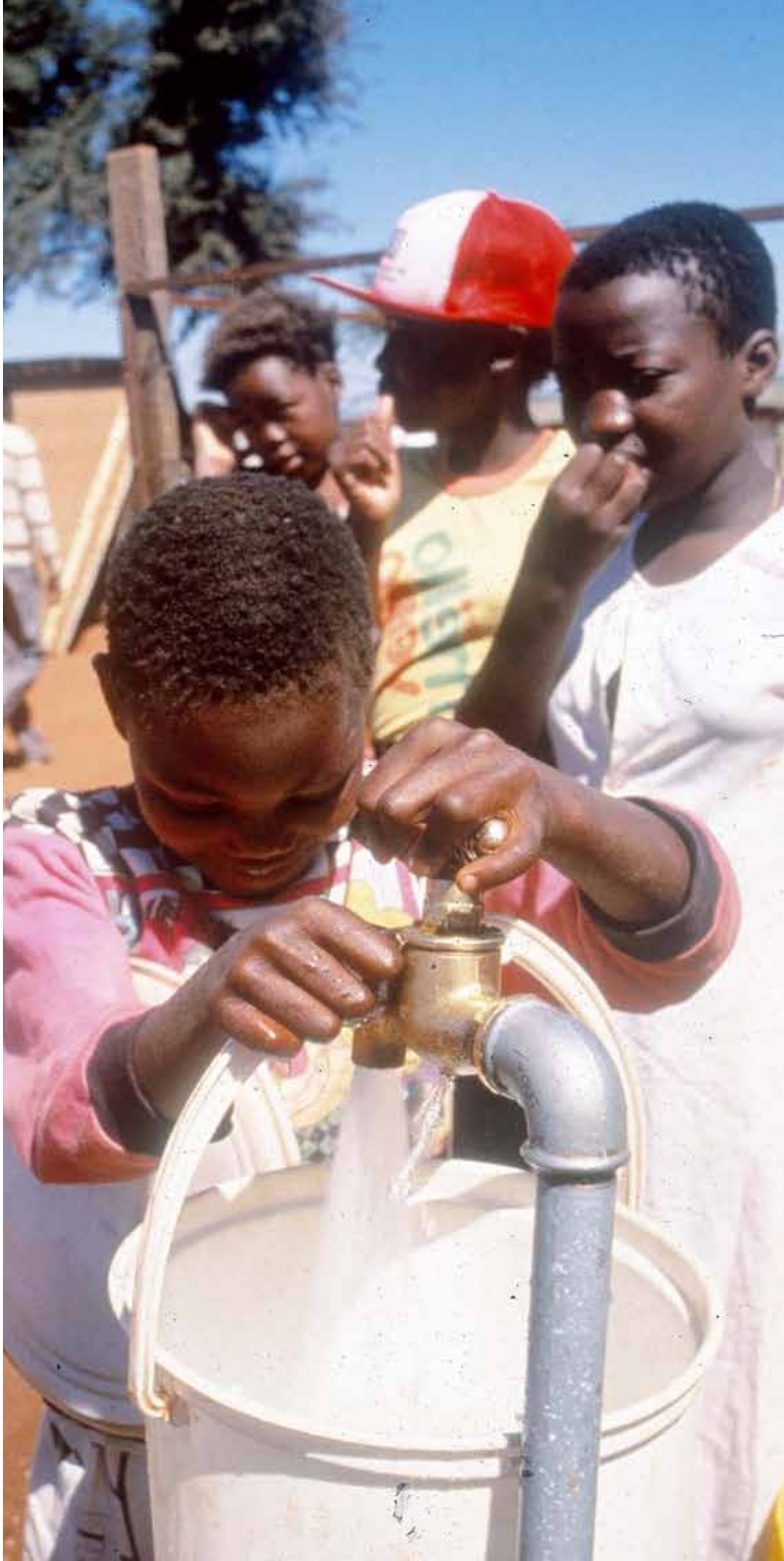
Indigenous knowledge: *Every year, after consulting the elders, the Lozi people move from Lealui in the flood plains to Limulaga on higher grounds, just before the Zambezi submerges the plains of Zambia.*

2.1.1 Awareness and Communication

People unaware of the risks associated with climate change are unlikely to change their behaviours. Indeed people are more likely to respond to a threat if they understand what they have to gain from changing their practices or what they risk losing if they decide not to act.

Climate change adaptation cannot be achieved by individuals alone, it must be accomplished as society as a whole, with all sharing a common understanding of the risks, impacts of climate changes and the measures necessary to adapt. At the moment, climate change means different things to everybody.

Objective: *Make climate science accessible to the average citizen to improve people's understanding of the problem and their receptiveness to changes.*



2.1.2 Education and Capacity Building

Climate change is an inter-generational phenomenon. Those who will be the most affected by climate change are either not born yet or still in school (Figure 8). As a society we must transmit our accumulated knowledge, skills and values from this generation to the other.

Education in the formal sector needs to take place at all points on the education timeline, from the early years through to higher learning. Capacity development should also be undertaken with the different stakeholders and professionals already involved with water management and climate change.

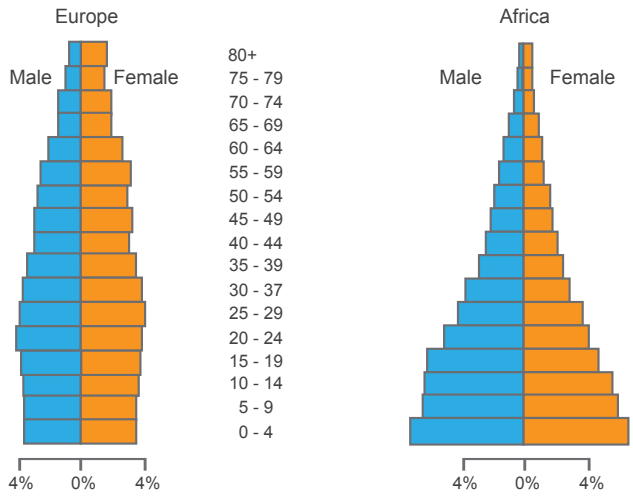
Objective: *Develop the ability of students and professionals to make informed judgements and choices in adapting to climate change.*

2.1.3 Research and Development

The challenges we face with climate change still largely exceed our understanding. The fact is that we do not have yet all the answers for solving the problem of climate change. Adaptation is not just about adjusting our systems to a changing climate it is also, about finding new ways to operate in an ever changing environment. Adaptation is then all about ingenuity, localized ingenuity, as the solutions to climate change adaptation need to be tailored to local and regional conditions and capacities.

Objective: *Develop the local knowledge and the technology necessary to adapt to climate change in the water sector.*

Figure 8: Population pyramids by regions



Source: US Census Bureau 2005



2.1.4 Stakeholder Participation

Climate change is everybody's business. In Southern Africa everybody will be impacted by climate change one way or another and everybody will have to adapt to a certain degree. Everybody has a stake in climate change. As such, all should be given an opportunity to take part in the decision making process so as to ensure that adaptation measures account for the interests of all actors and to ensure the implementation of socially agreed upon adaptation measures. Such a participatory approach should be promoted across sectors and between administrative levels.

Objective: *Inform, consult and involve all relevant stakeholders concerned with climate change.*

In order to ensure that CCA measures are informed by and adapted to local and regional conditions a study must be carried out to i) document, ii) analyze, iii) validate and iv) disseminate indigenous knowledge.

2.1.5 Water Advocacy

The largest impacts of climate change are likely to be on water resources and their management. Water is the primary medium through which climate change takes effect, as global warming transforms the hydrological patterns that determine the availability and quality of water. Droughts and floods will become more severe in many areas. Yet, in most cases, water management is not integrated with other sectoral



responses to climate change and water management is often underrepresented in national plans and international investment portfolios. A policy shift needs to take place to reflect the pivotal role of water in climate change adaptation.

Objective: *Integrate water into the regional policy discourse and international institutional framework on climate change.*

2.1.6 Reforms and Mainstreaming

Climate change requires that societies and governments rethink the way they function and operate, first to prevent that further changes take place, second to ensure that the observed and projected changes will have the lowest negative impacts on the society and the economy. As such, adaptation needs to be integrated formally into all sectors and processes susceptible to be affected by the impact of climate change. Governments should ensure that all existing policies are in line with the requirements of climate change adaptation and that existing sector policies do not conflict with and hamper adaptation in other sectors. This exercise should be based on solid scientific and economic analysis.

Objective: *Review and amend relevant policies and legislation to strengthen governance and facilitate climate change adaptation.*

2.1.7 International Negotiations

Most international agreements on climate change still largely focus on mitigation. While the reduction of GHG is a priority for all, most African countries are more immediately concerned with issues of adaptation, since most of them are already experiencing the negative effects of climate change and have been forced to adjust at once their natural and human systems. With a few exceptions, most African countries only emit small amount of GHG (Figure 9). International agreement should reflect better this reality and account more for the interests of African countries.

Objective: *Strengthen the position of Southern African countries in international negotiations on climate change.*

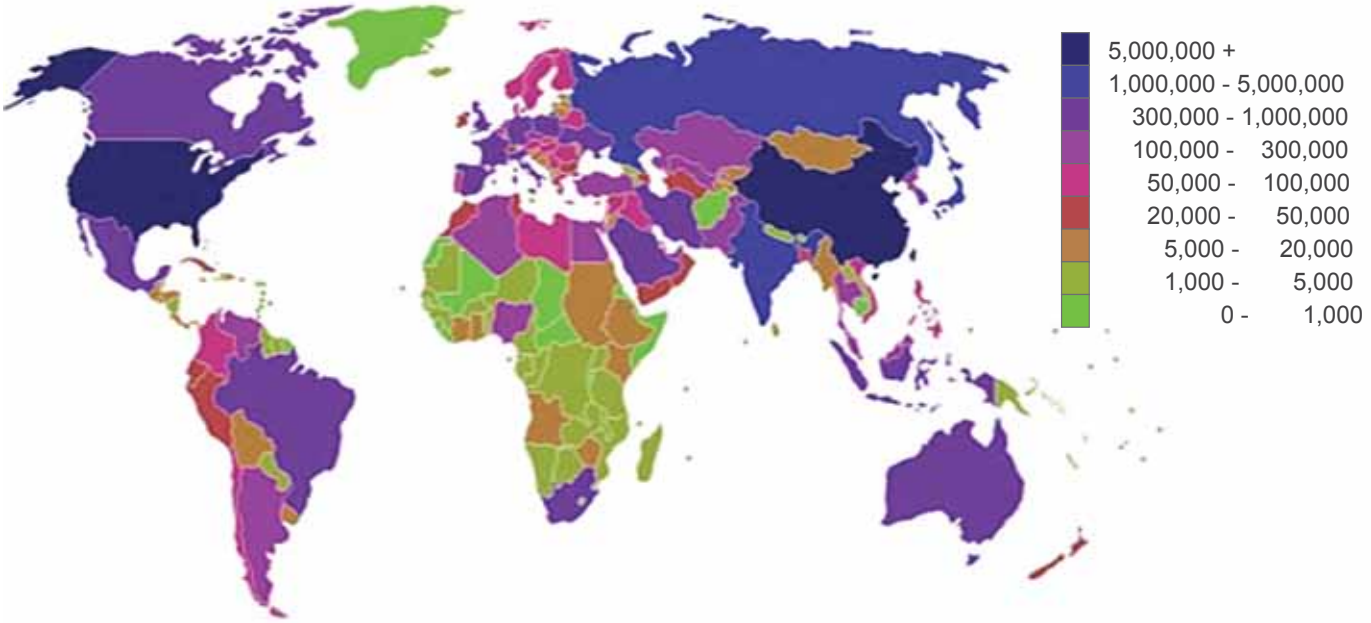
2.1.8 Climate Financing

Financial constraints constitute one of the greatest barriers to adaptation. In the water sector alone, the global costs of adaptation are estimated to be over USD 531 billion from now to 2030, almost twice the SADC aggregate GDP. Current global adaptation funds are limited and will not be able to meet such funding requirements. As of December 2010, USD 42,64 million have been channelled through bilateral and multilateral climate funds and funding mechanisms to support adaptation measures in Africa. Climate change adaption will have to be funded through several financing sources, such as public and private investments and insurance arrangements.

Objective: *Develop mechanisms to mobilize resources for climate change adaptation in the water sector.*



Figure 9: Greenhouse gas emissions (million tons)



Most African countries only emit small amount of greenhouse gases.

Source: Carbon Dioxide Information Analysis Center 2008

2.2 INFRASTRUCTURE DEVELOPMENT

Infrastructure development can be defined as the process of developing, financing, implementing and operating structures for irrigation, drainage, water supply and sanitation, hydro-power generation, flood management and other purposes. Water infrastructures are a necessary tool to manage water resources as they permit to stock and distribute water when and where it is needed the most. Water infrastructures allow breaking the dependency of societies on rainfall. The development of new infrastructures and the adaptation of existing infrastructure should be supported to improve climate resilience in Southern Africa.

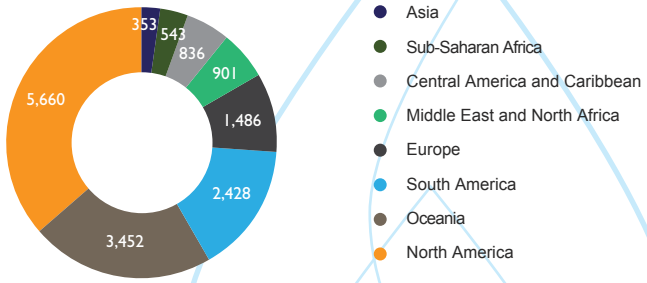
Indigenous knowledge: *The Basarwa tribe of Botswana have survived in the Kalahari desert relying on their unique abiliity to mobilize different water supply sources in this most arid environment.*

2.2.1 Multi-Purpose Water Storage

Countries in sub-Saharan Africa store only 4% of their annual renewable flows. In most industrialised countries this number ranges between 70 and 90% (figure 10). Water storage is essential to ensure reliable sources of water for irrigation, water supply, and hydropower and to provide a buffer against floods. The critical issue is to store massive quantities of rain falling in very short periods so that it can be used over the entire year. Water storage is an important mechanism to reduce seasonal differences in water availability and therefore essential to protect local communities against climate and rainfall variability.

Objective: *Increase water storage relying both on natural and constructed systems.*

Figure 10 Per capita water storage (m3)



Source: CGIAR 2011

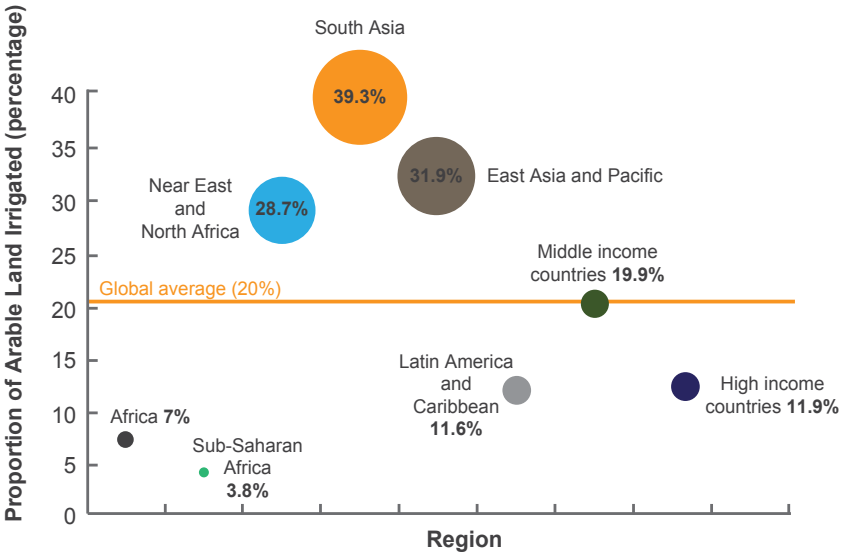


2.2.2 Water Supply and Sanitation

Water supply and sanitation is still relatively low in most SADC countries. Throughout the region more than 98 million people do not have access to safe drinking water and close to 154 million do not have access to improved sanitation facilities. Limited access to water and sanitation is a major cause of water borne diseases such as diarrhea, cholera, and schistosomiasis, which translates directly into the loss of revenues and the inability to sustain livelihoods. In addition, the time and energy lost in hauling water from long distance, predominantly undertaken by women and girls, deprives them to engage in livelihood generating activities. Access to water supply and sanitation is a critical development challenge as it limits the productive and adaptive capacity of individuals, households and communities.

Objective: *Accelerate service provision and address the vulnerabilities of existing water supply and sanitation systems.*

Figure 11: Irrigated land by regions



Source: UNEP 2010



2.2.3 Irrigation and Drainage

70% of the population in the region depends on agriculture for food, income and employment. The agricultural sector contributes to more than 35% of the SADC regional economy. For the most part this production is coming from rainfed production systems susceptible to droughts and floods. In most cases, increased rainfall variability and extreme events associated with climate change will increase the vulnerability of these systems.

Irrigation is critical to ensure food security and rural development. Less than 5% of cultivated land in the region is equipped for irrigation, and expansion is warranted (figure 11). Existing irrigation systems also have to be adapted to reduce water losses and improve water productivity.

Objective: *Improve food security though the development of efficient and resilient irrigation and drainage systems.*

Food security *is defined as a situation when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs (FAO).*

2.2.4 Groundwater Development

Groundwater provides a secure, sufficient and cost effective water supply. This is particularly true in dry regions where surface water is scarce or seasonal, and in rural areas with dispersed populations. Groundwater is the main source of water for 70 percent of the population in SADC. Groundwater is likely to play an even greater role for human survival and economic development under changing climatic conditions as it provides a cushion against drought and increasing uncertainty in surface water availability. A range of technical options are available for improving access to groundwater and securing recharge mechanisms in the long run.

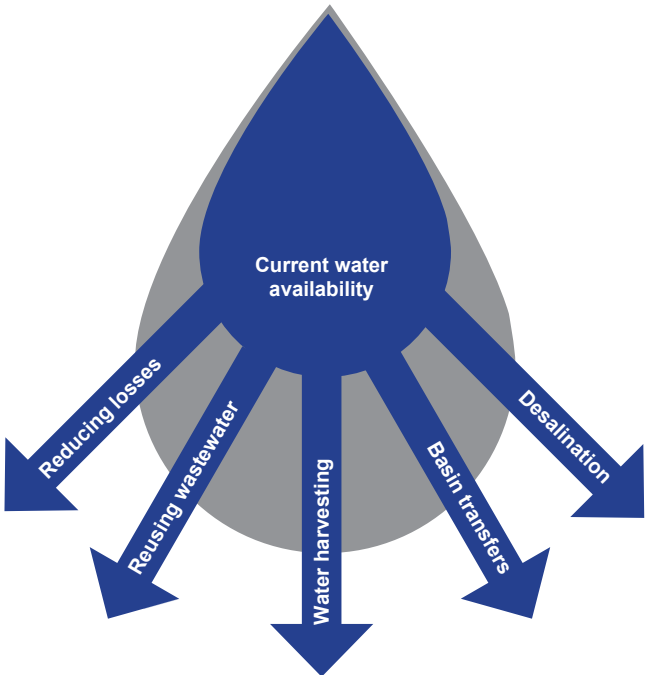
Objective: *Develop new groundwater sources and secure appropriate groundwater recharge.*

2.2.5 Alternative Water Supply Sources

By definition, water is a renewable resource replenished by natural processes with the passage of time. In regions where water is scarce, the volume of water available to support domestic and economic activities can be increased by using a wide range of methods and techniques, such as desalination, wastewater reuse and green water (figure 12). With a few exceptions, these techniques have not been used extensively in the region and they offer great potential to reduce pressure on existing water resources and improve the resilience of societies and economies to climate change.

Objective: *Diversify and improve water supply sources to reduce climate vulnerability.*

Figure 12: Alternative water supply sources



2.2.6 Flood Protection Structures

Because of climate change, the frequency and the intensity of floods in the region is most likely to increase, regardless of the different measures adopted to reduce the risks of flooding. Additional measures need then to be taken to protect further livelihoods and capital investments. Such measures include the construction of dikes, levees and flood embankments. However, since all flood protection measures inevitably disturb natural hydrological and morphological regimes, they should only be considered at local scale to protect high capital investment.

Objective: *Reduce the negative impact of floods on land, ecosystems and human settlements.*

2.2.7 Hydrogeo-Meteorological Monitoring System

There is still a lot of uncertainty about climate change and its potential impact on water resources in the region. More data and information is thus needed to better manage the risks associated with climate change. In most SADC countries, the systems for collecting and managing water related information are inadequate, and in some countries even deteriorating. Regional and global communication networks are also lacking to facilitate the exchange of data and information across sectors and between countries.

Objective: *Strengthen regional networks of hydrogeological and meteorological observatories to improve the dissemination and use of water related information.*



2.3 WATER MANAGEMENT

Water management is the activity of planning, developing, distributing, managing, and optimizing the different uses of water resources under defined water polices and regulations. Climate change is increasing the variability of precipitation patterns and water management systems should be adapted to deal with this added element of uncertainty. As such, water management practices should be strengthened to contribute holistically to the disaster management cycle (figure 13).

Indigenous knowledge: Local communities in the SADC region have long relied on traditional indicators to predict rainfall (e.g. behaviors of certain animals). Modern forecasting methods should build on this existing knowledge.

2.3.1 Data and Information

Information about the impacts of climate change is needed to guide decision-making on the urgency and desirability of certain adaptive measures. Data and Information is required to support the assessment of current and projected climate changes, the development of adaptation strategies and to assess vulnerability hot spots. Monitoring and assessment should be seen as a sequence of related activities starting with the definition of information needs and ending with the use of the information product. Data needed for impact modeling and subsequent vulnerability assessment include meteorological data, hydrological data, morphological data and water quality data.

Objective: *Develop systems to collect, store and share data and information to guide decision and policy making.*

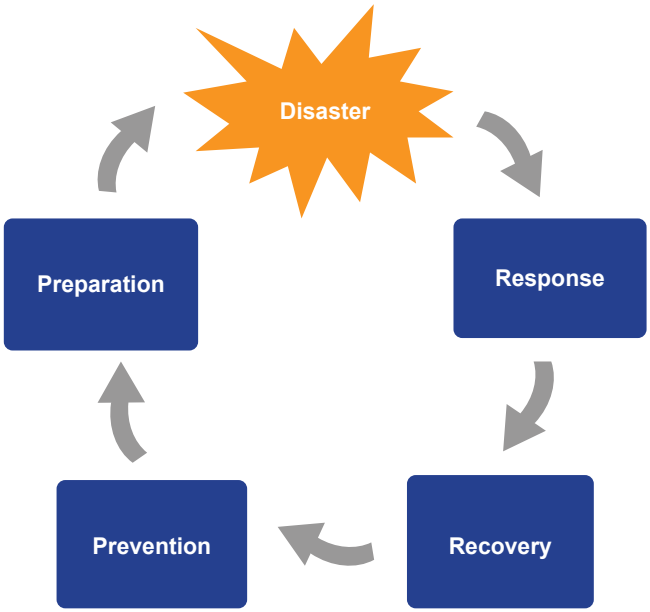


Figure 13: Disaster management cycle



2.3.2 Scenarios and Climate Modelling

Uncertainty about climate change makes the process of adaptation more difficult. Scenarios and models are tools to handle the uncertainty of a changing situation by providing information on possible futures. One could say that scenarios are used to create alternative image of the future while models are used to provide information on these possible futures. These tools should then be used to develop plans and strategies to cope with climate change. Many drivers need to be taken into account when developing scenarios, including demographic and economic developments.

Objective: *Incorporate uncertainty about the future climate into planning and decision making.*

2.3.3 Vulnerability Assessments

The limited resources available for climate change adaptation should be allocated in priority to the peoples and places the most vulnerable to climate change. Vulnerability is the degree to which a system is susceptible to cope with adverse effects of climate change. Vulnerability is a function of a system exposure to climate change, its sensitivity and adaptive capacity. Exposure is the nature and extent of the changes in climate that a region experiences or will experience. Sensitivity is the degree to which a system is affected, either adversely or beneficially, by climate related stimuli. Adaptive capacity is the ability of systems to adjust to climate change. A highly vulnerable system is one that is very sensitive to modest changes and for which the ability to cope is limited.

Objective: *Determine the groups, places, sectors and eco-systems that bear the highest risks associated with climate change.*

2.3.4 Precipitation and Flow Forecasting

Most water uses are dependent on the amount of water in the river systems. A key function of water management is to determine the amount of water available for future uses, based on predictions derived from historical flow and precipitation statistics. River flow forecasting is then employed to decrease uncertainty and reduce the risks associated with the use of water resources. Short-term forecasting can be used for hydropower, irrigation, flood management and water supply. Long term forecasting is useful to plan energy price and agriculture production as well as to prevent conflicts.

Objective: *Develop a sound scientific basis for predicting and forecasting.*

2.3.5 Early Warning System

Floods are a natural and inevitable part of life along the rivers of Southern Africa. Over the centuries losses of life and property associated with floods have been colossal. Just in 2000, more than 800 people lost their lives during the flood in Mozambique. In most cases, losses of lives can be prevented, providing that vulnerable communities are informed in due time of incoming floods. Early warning is used for alerting people and communities of the actual arrival of flood, to enable them to move to safer places. As floods become more unpredictable because of climate change, early warning systems constitute the last defense line to protect population against the disastrous effects of floods.

Objective: *Provide reliable and timely information on the likely incidence of floods and droughts.*



2.3.6 Optimisation of Dam Operation

The low storage capacity of most existing dams in Southern Africa suggests that they cannot be used to store major floods. The fact is that most dams in the region have been designed for other purposes than flood management, mainly to produce hydropower. Most dams are also operated in a stand-alone mode, with narrow objectives, within the framework of a single hydrological year. But if operated as systems, these same dams could play an important role in flood management.

Objective: *Improve the modes of operation of dams to balance the interests of environmental flows, flood reduction, agriculture and hydropower generation.*

2.3.7 Water Demand Management

Water is a scarce resource in Southern Africa. In several parts of the region, climate change will only exacerbate this situation. Water resources have then to be used wisely, making sure that every drops counts. At the moment, water use efficiency is very low in Southern Africa. Measures to improve water use efficiency are therefore clearly justified in the context of climate change. They also make economic sense. This involves a wide range of interventions, including changing the behavior of consumers, disseminating water efficient technologies, introducing efficiency-inducing pricing structures, reducing leakages in distribution networks and improving operating rules in supply systems.

Objective: *Minimize water losses and improve social equity and water use efficiency.*

2.3.8 Groundwater Management

Groundwater depletion and groundwater pollution are serious concerns around the world. Climate change will only make matter worse as more people turn to groundwater to protect themselves from the impact of climate variability on surface water resources. In Southern Africa future water security is closely linked with the adoption of better groundwater management practices. Sustainable groundwater management includes both quality and quantity aspects, as it requires to control subsurface contaminant loads and to ensure that withdrawal rates are not exceeding recharge rates. Moreover, groundwater should not be used and managed as part of a separate system but in conjunction with surface water resources.

Objective: *Protect groundwater resources and improve recharge mechanisms in the long term.*

2.3.9 Water Quality Management

Water pollution in Africa is expected to increase as a result of economic development, demographic growth and rapid urbanization. Many important African water bodies already contain unacceptable levels of pollutants and contaminants, posing serious threats to human and ecosystem health. The main polluting activities include poor sanitation practices, release of untreated sewage, disposal of solid wastes and discharge of industrial effluents. In areas where climate change is expected to lead to decrease of runoff the concentration of pollutants and contaminants will rise automatically.

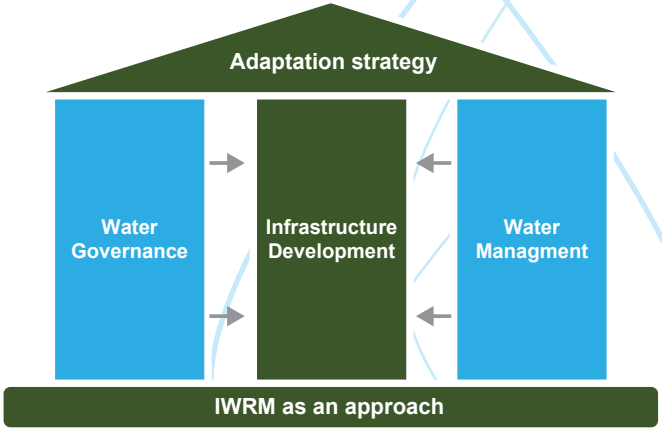
Objective: *Control water pollution and account for the potential impact of climate change on water resource quality.*

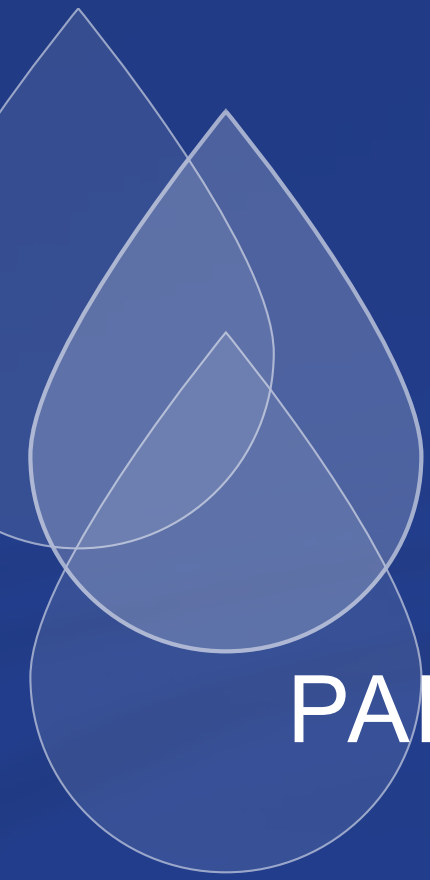
2.3.10 Integrated Water Resources Management

None of the adaptation measures presented in this strategy can alone protect societies and economies from the impact of climate change. Climate change adaptation and sustainable development in the water sector depends on the adoption of IWRM. As illustrated in the figure below, IWRM rests on three pillars, reflecting respectively the human, physical and engineering dimensions of water resources management.

Objective: *Coordinate the development and management of water, land and related resources.*

Figure 14: Pillars of IWRM





PART 3

IMPLEMENTATION



3.1 IMPLEMENTATION PLAN

3.1.1 Roles and Responsibilities

The adaptation measures identified in the Strategy provide a framework for climate change adaptation in Southern Africa. The first step for implementing the strategies is to determine the roles and responsibilities of all relevant actors having a stake in climate change. Such exercise should be undertaken for all the adaptation measures identified in the Strategy. As illustrated in the figure below, for each adaptation measure, stakeholders should come to an agreement on their respective roles and responsibilities at the different intervention levels and at the different stages of adaptation.

Table 15 Roles and responsibilities

Adaptation measure ___:			
	Preparation	Response	Recovery
Regional			
River Basin			
Local			

The SADC Secretariat has primary responsibility for promoting, coordinating and monitoring the implementation of the CCAS, primarily through coordination and facilitation of resources for the RSAP III. Member States also have a responsibility to implement the CCAS through relevant RSAPIII projects with which they are associated, as well as to roll out the broad strategic principles of the Strategy.

3.1.2 RSAP III

At the regional level the implementation of the Strategy is achieved mainly through the SADC Regional Strategic Action Plan (in its current third phase: RSAP III). The RSAP is the official SADC programme for the Water Sector and is therefore the de facto implementation plan for the Strategy. The CCA Strategy was designed in alignment with the RSAP III strategic areas which are:

1. Water Governance
2. Infrastructure Development
3. Water management

Within each of these strategic areas the RSAP III provides a coherent set of activities to contribute to the achievement of three strategic objectives: i) capacity development, ii) climate change adaptation and iii) social development. Under climate change the RSAP calls for the achievement of three operational objectives:

1. Develop a common understanding on the risks and impacts of climate change;
2. Increase water storage capacities to improve climate resilience;
3. Reduce the risks and impacts associated with climate change;

The operational objectives are achieved through the implementation of a series of programmes. The table below outlines the 15 RSAP programmes, most of them making provision for the implementation of interventions relevant to the CCA Strategy.

Table 15 RSAP III programmes

Programme 1	RIVER BASIN ORGANISATIONS
Programme 2	REGIONAL INSTRUMENTS
Programme 3	PROGRAMME MANAGEMENT SUPPORT
Programme 4	COMMUNICATION AND AWARENESS RAISING
Programme 5	RESEARCH AND EDUCATION
Programme 6	STAKEHOLDER PARTICIPATION
Programme 7	INFRASTRUCTURE PROJECT PREPARATION
Programme 8	RESOURCE MOBILIZATION FOR INFRASTRUCTURE DEVELOPMENT
Programme 9	INFRASTRUCTURE PILOT PROJECTS
Programme 10	WATER SUPPLY AND SANITATION
Programme 11	GROUNDWATER MANAGEMENT AND DEVELOPMENT
Programme 12	WATER ECONOMICS
Programme 13	HYDROLOGY AND BASIN MANAGEMENT
Programme 14	ENVIRONMENTAL WATER MANAGEMENT
Programme 15	CLIMATE CHANGE ADAPTATION



3.2 MONITORING & EVALUATION

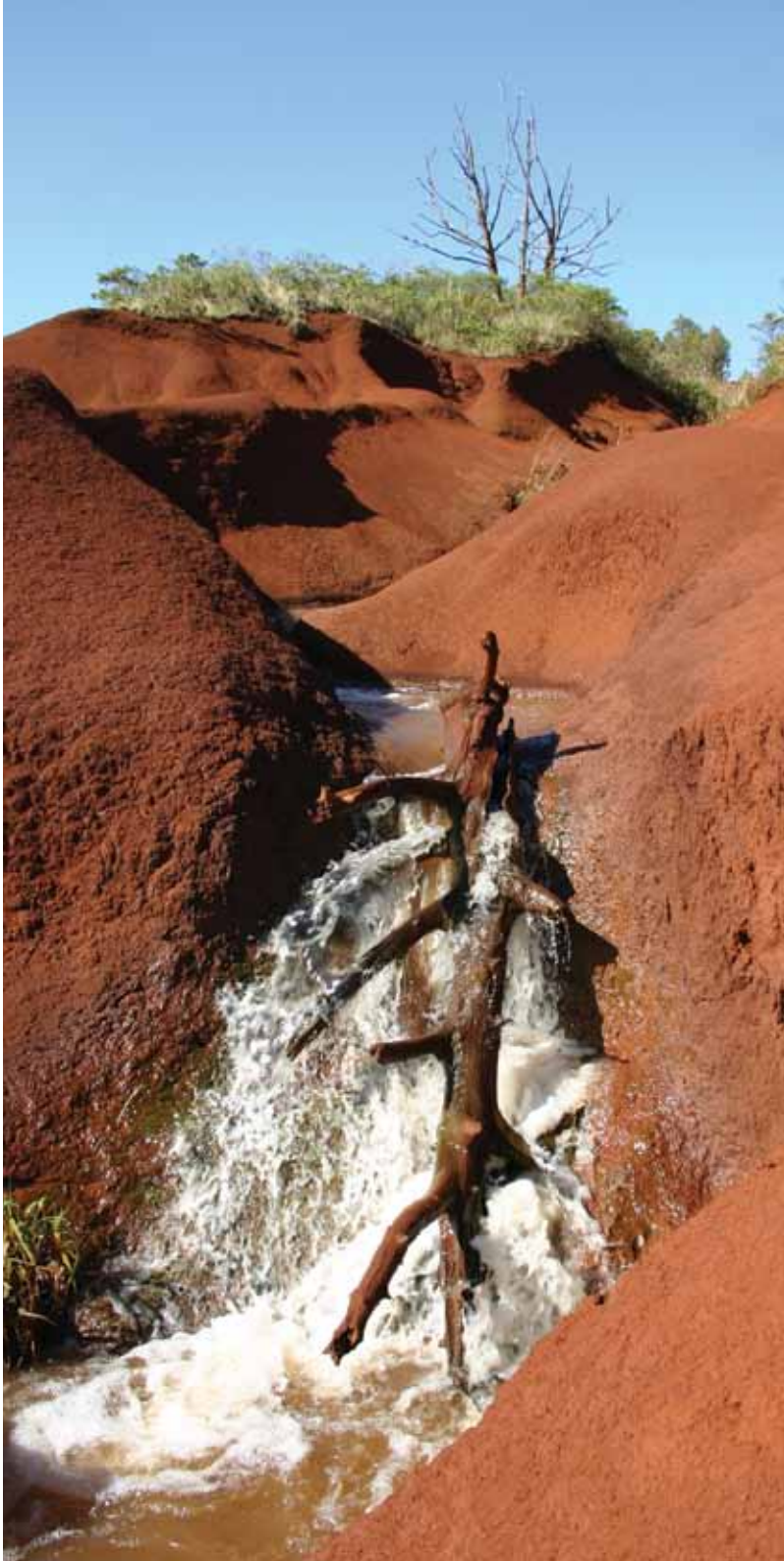
The Strategy is a broad statement of intent which shall be affected through specific action plans such as the SADC Strategic Action Plan. Therefore, the monitoring and evaluation (M&E) of the Strategy will be achieved mainly through these action plans.

In the case of the Strategy, the need for M&E is particularly high because of the complexity and inter-related nature of adaptation measures, and the number of stakeholders involved with its execution.

The responsibility for monitoring and evaluating the Strategy lies primarily with the SADC Secretariat, in close collaboration with Member States and other role players.

Key principles that shall be considered include:

- M&E should not be viewed as a punitive measure, but rather as a supportive management tool to facilitate rapid learning and support management functions.
- The monitoring and evaluation framework should be used as a base to promote results-based programme and project implementation in a complex regional environment.
- The framework should be based on manageable processes and measurable and verifiable indicators. M&E systems and technology must be based on simplicity and be related to the available resources to carry out the monitoring.



- M&E must inform management and mobilize appropriate and purposeful intervention where this is necessary. Acting on M&E feedback implies capacity beyond the M&E function itself, i.e. authority and capacity to act on the findings.
- M&E capacity must be transferred to a spread of durable water sector institutions to be sustainable. Among these institutions are shared watercourse institutions, regional and country water partnerships and national water departments.
- M&E systems and M&E implementation must be a part of all project memoranda and contracts. In this context the M&E must be compatible with the requirements of the cooperating partners and the Member States involved in a particular project or group of projects.

Photo credits: Horst Vogel, Peter Qwist-Hoffmann and SADC Communications

Gaborone, Botswana. November, 2011

5-0299 www.studio112.co.za

Supported by:

giz

On behalf of
Federal Republic of Germany
The Federal Government

UKaid
from the Department for
International Development

Australian AID

SOUTHERN AFRICA

Global Water Partnership
Southern Africa

ISBN 978-99912-475-6-4