

Climate Change Vulnerability and Adaptation Preparedness in Southern Africa – A Case Study of Botswana

March 2010

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This report presents the findings of one of three studies commissioned by the Heinrich Böll Stiftung Southern Africa (HBS) in Botswana , South Africa and Zimbabwe to evaluate the state of preparedness for climate change adaptation in the region.

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ACRONYMS

BSAP	Biodiversity Strategy and Action Plan
CSO	Central Statistics Office
DMES	Department of Meteorological Services
EWS	Early Warning System
HIES	Household Income Expenditure Survey
HIV/Aids	Human Immunodeficiency Virus / Acquired Immuno-Deficiency Syndrome
IPCC	Intergovernmental Panel on Climate Change
LDCs	Least Developed Countries
MEWT	Ministry of Environment, Wildlife and Tourism
NAPA	National Adaptation Programmes of Action
NCCC	National Committee on Climate Change
NWMP	National Water Master Plan
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

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Executive Summary

Climate change is increasingly recognised as a global concern. Available information on the impacts of climate change in southern Africa suggests that Botswana is highly vulnerable to climate change. This study, commissioned by Heinrich Böll Foundation Southern Africa, is part of a larger project aimed at studying and characterising vulnerabilities and state of adaptation preparedness in southern Africa. It aims to understand and evaluate the state of climate change adaptation in the context of climate vulnerability in Botswana, and concludes by making policy recommendations for adaptation to climate change.

Preparation of this paper involved a review of the relevant literature, including vulnerability reports for various sectors of Botswana's economy. In addition, a review of related United Nations Framework Convention on Climate Change (UNFCCC) documents and analyses of its climate negotiations was conducted in

on livestock for their livelihoods, and over 70 percent are involved in arable rain-fed agriculture. The yields from this type of farming, however, are very low, due to unreliable and low rainfall and the rudimentary level of technology used for the type of farming. Given predictions for a hotter, drier climate, potential crop yields for the major crops—sorghum and maize—are expected to be reduced by 30 percent.

Diseases most likely to be influenced by climate change in Botswana are malaria and paediatric diarrhoea. Malaria has historically been confined to the northern parts of Botswana, which also experience lots of rain. In years of high rainfall, outbreaks appear further south; and due to climate change, the endemic malaria regions appear to be shifting southwards. It is further estimated that the population living in malaria-prone areas will double by 2021. Control of the disease at such a large scale will be difficult.

It is predicted that climate change will lead to the increased incidence of both floods and drought in Botswana. Furthermore, higher water temperatures and changes in extremes due to climate change may exacerbate many forms of water pollution.

order to understand priorities for Botswana, and to assess possibilities for vulnerability and adaptation projects in the country. This was meant to be strictly a desktop study; however, due to the limited available documents on climate change in Botswana, interviews with key informants such as the UNFCCC focal point were held to fill in the information gap.

It is predicted that climate change will lead to the increased incidence of both floods and drought in Botswana. Furthermore, higher water temperatures and changes in extremes due to climate change may exacerbate many forms of water pollution. Water supply reliability, health, agriculture, energy and aquatic ecosystems will all feel the impact of these changes to the water cycle. There are limited sources of surface water, and over 60 percent of the population relies on groundwater. The most vulnerable to these predicted changes will be the rural poor, who rely on groundwater for all of their water needs.

Forty-nine percent of Botswana's households rely

With the above predicted impacts, adaptation to climate change in Botswana becomes vital. Although uncertainty remains regarding the actual impacts of climate change in some sectors, there is sufficient evidence that climate change will exacerbate the existing stresses, thus affecting the most vulnerable sectors and communities. Effective adaptation to climate change will therefore entail adjustments and changes at every level, from local to national and international. Local communities must build their resilience and, if necessary, diversify their livelihoods in order to cope with existing and future stresses. Local coping strategies and traditional knowledge systems need to be strengthened and used to complement local and government interventions and policies.

It should be stressed that there is no dedicated policy or strategy that addresses climate change mitigation or adaptation in Botswana. This is because there is no specific requirement in the UNFCCC text for parties other than the Least Developed Countries (LDCs)



to develop and implement National Adaptation Programmes of Action (NAPAs). In Botswana, environment and climate change concerns are, however, acknowledged and articulated in a combination of different policy documents. Underpinning all policy development and development planning in Botswana is the recognition that long-term growth must be sustainable.

Recommendations

In the absence of an adaptation strategy, this paper makes the following recommendations:

- The implementation of the UNFCCC is too centralised in Botswana—mainly, in the capital city, Gaborone. This limits the institution's capacity to reach out to people in other parts of the country. Activities are not cascaded down to the district level. However, the Department of Meteorological Services (DMES) has offices and weather stations in most parts of the country. An opportunity therefore exists for the department to cover most parts of the country in terms of carrying out its mandates, meeting obligations of the UNFCCC and creating awareness about climate change in the country.
- More time and financial resources have been given to mitigation studies, rather than to adaptation, under the climate change umbrella. For example, the National Climate Change Committee (NCCC) commissioned a technology needs assessment to investigate mitigation, without consideration of technology needs for adaptation. Adaptation has the potential to reduce adverse impacts of climate change, enhance beneficial impacts and reduce vulnerabilities of communities and systems. Adaptation should therefore be viewed as a necessary strategy at all levels to complement climate change mitigation efforts.

Although Botswana is still collecting and analysing information in the form of vulnerability assessments,

this should not stop ongoing efforts to integrate climate change into national development planning processes. At all levels, planning and implementation of adaptation should take place in the context of sustainable development, along with integration of adaptation into policy. Climate change solutions need to identify and exploit synergies, as well as tradeoffs, among the multiple sectors of the economy. Policies are needed that lessen pressures on resources, improve management of environmental risks and increase the welfare of the poorest members of society. Such policies can simultaneously advance sustainable development and equity, enhance adaptive capacity, and reduce vulnerability to climate and other stresses.

Early warning systems (EWS) should be strengthened at a national level. System application should be extended to include new sources of information that can enhance drought monitoring and early planning. Such new data sources include projection of food consumption requirements, annual agricultural surveys, household surveys on health status and household income surveys (Morgan, 1985). At a district level, drought committees should make better use of the data that is sent to and transmitted from the EWS.

In order to promote innovation and diversified livelihood strategies, it becomes important to understand the contribution of non-agricultural income-generating activities and their contribution to livelihoods. By broadening economic opportunities and strengthening productive livelihood strategies (including targeting female-headed households), this will reduce food insecurity; increase employment opportunities and income; and permit people to accumulate assets, which will improve their ability to cope with future shocks to their livelihoods without falling deeper into poverty.



CHAPTER 1: Introduction

Climate change is increasingly recognised as a global concern. Available information on the impacts of climate change in southern Africa suggests that Botswana is highly vulnerable to climate change. This study, commissioned by Heinrich Böll Foundation Southern Africa, is part of a larger project aimed at studying and characterising vulnerabilities and state of adaptation preparedness in southern Africa. The objective is to better understand these vulnerability and adaptation issues in order to make policy recommendations for adaptation to climate change. Using literature from previous studies on climate change adaptation and national policy documents, this report focuses on Botswana's known vulnerabilities and the country's response to them.

1.1 Background

Climate change will have wide-ranging effects on the environment, in particular the water, agriculture and food security, human health, and biodiversity sectors. Unless it is effectively mitigated and adapted to, climate change will have a dramatic impact on the environment, and on economic and social development (IPCC Fourth Assessment Report, 2007).

According to the business-as-usual scenario in the Intergovernmental Panel on Climate Change (IPCC) reports, greenhouse gas emission could rise globally by 25–90 percent by 2030 and temperatures could increase by 3°C within this century (IPCC, 2007). The IPCC predicts that even with a smaller temperature rise of 1–2.5°C, the consequences could still be severe, exerting far-reaching impacts on the livelihoods of many people. Botswana is not immune to these impacts: the country's 2001 Initial Communication to the United Nations Framework on Climate Change (INC, 2001) predicts that Botswana will experience a temperature rise of 1–3°C in the next hundred years and a decline in rainfall of 25 percent (or an increase of 10 percent, depending on which climate model is used).

Botswana signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, and ratified it in 1994. Having committed to the obligations of the convention, Botswana needs to put measures and efforts in place to meet them. Article 4.1 (f) states that all parties shall take climate change considerations into account, to the extent feasible,

in their relevant social, economic and environmental policies and actions, and employ appropriate methods/ measures in order to mitigate or adapt to climate change (UNFCCC, 1992).

1.2 Study objectives

The ability of human systems to adapt to and cope with climate change depends on factors such as wealth, technology, education, information, skills, infrastructure, access to resources and management capabilities. Individuals, populations and communities are variably endowed with these attributes. Those with less access to them have lesser capacity to adapt and are more vulnerable to climate change, just as they are more vulnerable to other stresses.

While mitigation of anthropogenic climate change is vital globally, the blunt reality is that Botswana, being particularly vulnerable, must also adapt to climate change. Additionally, Botswana is said to be a net carbon sink for greenhouse gases, since its contribution to global emissions is very low. Adaptation to climate change is therefore considered urgent, and should be given a high priority in Botswana. This study aims to understand and evaluate the state of climate change adaptation in the context of climate vulnerability in Botswana.

Specifically, the study will attempt to answer the following questions:

What are the impacts of and vulnerability to climate change in Botswana?

What climate change adaptation policies, plans and strategies exist in Botswana, and what are their genesis and appropriateness in relation to current knowledge of vulnerabilities at the national level?

Who are the main institutional actors involved in climate change adaptation policy and responses in Botswana, and do they have adequate capacity and efficacy to implement adaptation policies?

How much awareness exists about climate change, and particularly adaptation, within the public sphere?

What is the role played by state and non-state actors in the international climate change negotiations?

1.3 Methodology

Preparation of this paper involved a review of the relevant literature, including vulnerability reports for various sectors of Botswana's economy. In addition, a



review of related United Nations Framework Convention on Climate Change (UNFCCC) documents and analyses of its climate negotiations was conducted in order to understand priorities for Botswana, and to assess possibilities for vulnerability and adaptation projects in the country. The report draws heavily from documented national studies on climate change, existing policies and strategies listed in the reference section, below. This was meant to be strictly a desktop study; however, due to the limited available documents on climate change in Botswana, interviews with key informants such as the UNFCCC focal point were held to fill in the information gap.

1.4 Limitations

A study of this nature requires access to the most recent information and documents on climate change. Information on climate change in Botswana is managed and disseminated by the UNFCCC focal point; this information, however, is not easy to access. Most of

the documents have not been released into the public domain, and permission is required in order to access them.

A large amount of information is undocumented and unpublished, and therefore impossible to access by means of a desktop study. Efforts were made to get the undocumented information by organising interviews, where possible, with those involved in UNFCCC work through the Department of Meteorological Services and the Ministry of Environment, Wildlife and Tourism. This also proved a challenge, as only four staff members between those two institutions were able to provide information on climate change. It was difficult to get appointments because of their busy time schedules.

Insufficient time was another challenge in the collection and review of information. Extensive time resources are required in order to fully appreciate and gather information and data on vulnerability and adaptation in Botswana.



CHAPTER 2: Botswana Country Profile



Figure 1: Map of Botswana

Botswana is a landlocked, arid to semi-arid country located in the southern part of Africa, covering an area of 582,000km². It shares borders with Namibia in the west and northwest, Zambia in the north, Zimbabwe in the northeast, and South Africa in the east and south. It lies between longitude 20 and 30 degrees east of Greenwich and between latitudes 18 and 27 degrees south of the equator (National Development Plan 9, 2003). Much of the country lies north of the Tropic of Capricorn, within the sub-tropical zone.

2.1 Population and economics

Botswana enjoys democratic governance and a stable macro-economic environment and development, which are critical ingredients to sustainable poverty reduction.

According to the census of 2001, Botswana's population was 1.68 million, with an estimated growth rate of 1.2 percent annually. In 2007, the United Nations Population Fund estimated that the

population had grown to 1.8 million. The statistics show that 55 percent of the population resides in urban areas, while 45 percent lives in rural areas (CSO, 2001). According to the Household Income and Expenditure survey (HIES) of 2004, female-headed households constituted approximately 46.4 percent of total households in Botswana in the year 2002/03.

Since independence, Botswana has experienced one of the fastest rates of economic growth worldwide, with an average annual GDP growth rate of 9 percent in the period between 1966 and 1999. As a result, it has been transformed from one of the poorest countries in the world to a middle-income country, with a standard of living on par with countries like Turkey and Mexico (DOS, 2009). Per capita income in Botswana is estimated at between US\$5,600 and US\$7,690 (purchasing power parity) (UN Botswana, n.d.; World Bank, n.d.).

These impressive figures are attributable to stable



government and shrewd investment of the diamond revenues that are the major source of income. However, they mask the vast inequalities that exist in Botswana, where poverty levels are still considered high. It is estimated that 36.7 percent of the population was living below the poverty datum line in 2002 (National Strategy for Poverty Reduction, 2003). In addition, recent data on Botswana (UNDP, 2002) indicate that poverty is higher and more severe in rural than in urban areas. Unemployment is high, at 23.8 percent, mostly affecting the age group between 15 and 29 years (HIES, 2004).

The advent of HIV/Aids has further complicated Botswana's development challenge. The 2000 Botswana Macro-Economic Impact of HIV/Aids Study concluded that unless a concerted effort is made to fight the scourge, in the long term, current prevalence rates could raise the proportion of households below the poverty datum line by 6 percent, and of poor individuals by 4 percent.

Gender analysis of household income data shows that female-headed households are amongst the poorest in both rural and urban areas. National studies (e.g. Dithale and Wright, 2003) indicate that there are more female-headed households (41 percent) than male-headed households (34 percent) living below the poverty line. This reaffirms that poverty is more widespread in females than males, making females more vulnerable to climate stresses and climate variability. Table 1 below illustrates this further.

Table 1: Distribution of households: cash income by sex of head

MONTHLY INCOME (PULA)	MALE-HEADED HOUSEHOLD	FEMALE-HEADED HOUSEHOLD
100-999	49.0	62.1
1000-5999	39.6	33.0
6000-19999	10.2	4.9
20000+	1.1	0.2
Total	100	100

SOURCE: HIES, 2004.

2.2 Biophysical setting

Climate

Botswana's climate is influenced by the inter-tropical convergence zone (ITCZ) to the north, and the El Niño-Southern Oscillation (ENSO) phenomenon to the east.

Box 1 below contains a summary of Botswana's climate.

Box 1: Summary of Botswana's climate

The country is arid to semi-arid, with highly erratic rainfall. The mean annual rainfall ranges from over 650 mm in the northeast to less than 250 mm in the southwest. The national average rainfall is 475 mm per year, which is half of the global average annual rainfall. Most rain occurs in the months from October to April, and falls as localised showers and thunderstorms.

During the summer months, the ITCZ moves south and brings with it moisture for the northern parts of the country. The moist air, combined with intense sunshine, results in storms. In addition, rainfall in Botswana is highly correlated with the ENSO phenomenon. During strong El Niño years, the rainfall over most of Botswana is severely depressed. These conditions may persist for several years in succession, bringing great hardship.

Daytime air temperatures are generally warm to hot, but can drop to near-freezing in winter. Mean maximum temperatures range from 29.5°C to 35°C in summer and 19.8°C to 28.9°C in winter. Mean minimum temperatures range from 14.6°C to 20.8°C in summer and 2.9°C to 11.6°C in winter.

Water is a scarce resource in Botswana, due to high evaporation rates combined with the absence of permanent surface water bodies and low and variable rainfall. Drought is therefore a recurrent feature of Botswana's climate.

Botswana is highly vulnerable to climate change effects because of the variable nature of the country's rainfall frequency and volume. Botswana is also susceptible to variations in climate induced by global sea-surface temperature (SST) anomalies. In particular, El Niño events in the east tropical Pacific lead to negative departures from the norm in respect of rainfall over arable land in the country, while La Niña events tend to enhance rainfall amounts.

SOURCE: Botswana Initial National Communication to the UNFCCC, 2001

Water resources

Botswana falls within the catchment basins of four transboundary river basins: the Okavango, Limpopo, Orange and Zambezi River Basins. In fact, all of Botswana's main rivers are shared with other countries; no river rises and terminates entirely within its borders (SOER, 2002). The low rainfall and high rates of evaporation in Botswana, combined with flat topography, result in low rates of surface runoff; thus, permanent surface water sources are only found in the Okavango Delta and in the Chobe River system (ibid).

High evaporation and low, variable rainfall also contribute to low rates of groundwater recharge. Groundwater is a vital resource in Botswana; it is estimated that approximately 80 percent of the population is reliant on this resource for domestic, agricultural and industrial use (NWMP Review, 2006). In rural areas, almost the entire population is dependent on this resource.



Biodiversity

Botswana possesses a wide diversity of wild fauna and flora, with ecosystems varying from some of the driest and most biologically hostile areas in the Kalahari Desert and Makgadikgadi Salt Pans to the richest biodiversity found in the Okavango Delta. The variety of habitats and species is immense, each with its own important and sometimes unique function in the ecosystem. Botswana also possesses globally endangered flora and fauna (SOER, 2002; Biodiversity Stocktaking Report, 2003).

Tree and woodland products, including medicine, are an important part of rural livelihoods. Hunting is also important for rural livelihoods, but over the past several decades wildlife numbers have been declining due to illegal hunting, drought and habitat destruction. Access has also been severely hampered by the introduction of hunting permits (SOER, 2002; Biodiversity Stocktaking Report, 2003). According to the 2007 Revised Botswana Biodiversity Strategy and Action Plan (BSAP), major threats to biodiversity include habitat destruction, rangeland degradation, inappropriate harvesting methods, climate change, excessive harvesting of fuel wood, the presence of alien and invasive species, the inadequate management of waste in urban and rural areas, and fire.

Agriculture and food security

The contribution of agriculture to the national economy as measured by GDP has fallen from 2.7 percent in 1999 to 1.8 percent in 2008 (Bank of Botswana, 2010). The agriculture sector in Botswana is made of up two distinct sectors: crop production and livestock rearing. Forty-nine percent of Botswana's households rely on livestock for their livelihoods, and the livestock sub-sector accounted for half of the country's agricultural GDP (INC, 2001; SOER, 2002). While diminishing in importance in comparison to diamonds and tourism, the commercial livestock sector is still an important contributor to the national economy. The cattle economy generates considerable informal economic activity, and it is estimated that it directly or indirectly employs up to 50 percent of the rural population (Masike and Urich, 2008).

Botswana has a harsh climate and poor soils, which are generally not suitable for rain-fed arable agriculture (SOER, 2002). However, it is reported that 70 percent of Botswana's population derives a livelihood from traditional arable farming, and 90 percent of cultivated area is occupied by traditional farming systems (Masike and Urich, 2008). The main rain-fed crops are sorghum, maize, beans, cowpeas, watermelons and groundnuts.

Millet is also grown, but mostly during times of drought. Most of these crops are grown for household use and used as staple foods. The yields from this type of farming, however, are very low due to the unreliable and low rainfall and the rudimentary level of technology used (NAMPAD, 2000). The only region suitable for commercial arable farming is to the north of the country, in Pandamatenga, where the black cotton soils, relatively high rainfall and irrigation from the Chobe River provide a relatively conducive environment. Botswana therefore imports a large part of its grain needs.

The Food and Agriculture Organisation (FAO) describes food security as "the access by all people, all the time to enough acceptable food for an active, healthy life" (FAO, 1997). The main issues relating to food security in southern Africa, and to a lesser extent in Botswana, are food availability and the ability to acquire it (which is hampered by high levels of poverty); crop failures and livestock deaths due to climate variability; and in particular, drought (BIDPA, n.d.). In Botswana, the main constraint on food security lies in the fact that Botswana is a net food importer (ibid). Other challenges include high HIV/Aids prevalence rates; relatively high rates of poverty (36 percent); low contribution of agriculture to GDP; and the dominance of the beef sector in agriculture.

2.3 Climate change impacts and vulnerability

2.3.1. Vulnerability to climate change

The Fourth Assessment Report (FAR) of the Intergovernmental Panel on Climate Change (IPCC) has shown that Africa will suffer severely from climate change, yet has little capacity to adapt to it. In Africa, the climate significantly influences day-to-day economic activities from household to regional levels, particularly in the agricultural and water sectors (Boko et al, 2006). Africa is particularly vulnerable to climate change because a large proportion of the population resides in rural areas and is heavily dependent on climate-sensitive livelihoods such as agriculture, and on water and non-timber forest products. In fact, although more than half of the land area in southern Africa is marginal, a majority of southern Africans rely on rain-fed subsistence agriculture (Wamukonya and Rukato, 2001). This land is likely to get more marginal with climate change, as demonstrated in the following discussion.

In the environmental change discourse there are several definitions of vulnerability. Kelly and Adger (1999) define vulnerability as "the ability of individuals and social groupings to respond to, cope with, recover from and



adapt to, an external stress placed on their livelihoods and well-being”. This definition factors current socio-economic conditions and institutional constraints on coping strategies and adaptation into its estimation of individuals’ and social groups’ capacity to respond to future threats (Kelly and Adger, 1999). In this definition, vulnerability is not measured as a product of the future threat or stress, but as a result of existing capacities, threats and stresses.

Ziervogel et al (2006) define vulnerability as “the degree to which people or the environment are susceptible to harm”. This definition encompasses the threats and stresses faced by individuals and communities and the “internal ability to cope with, recover or adapt to such stresses” (Ziervogel et al, 2006). Neumayer and Plumper (2007) adopted the following definition of vulnerability: “the characteristics of a person or group and their situation influencing their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard”. As they explain, this approach to vulnerability captures the different levels of exposure

attention will now be paid to the predicted changes to Botswana’s climate and their related impacts.

2.3.2. Changes predicted for Botswana’s climate

It is important to note here that the most recent modelling of Botswana’s climate (2008–2009) has been undertaken by the Department of Meteorological Services (DMS) in preparing the Second National Communication (SNC) to the UNFCCC. The SNC has not yet been made public, and so most of the information in the following section is taken from the Initial National Communication (INC), published in 2001—although where possible, more recent information is used.

It is predicted that Botswana will become hotter over the next few decades, with an expected increase of 2°C by 2050—a rate of warming of 0.27°C per decade (INC, 2001). It is also predicted that the spatial and temporal distribution of rainfall will be disrupted by climate change. By 2050 there will be an annual decrease in rainfall of 5 percent in the northern and western regions

Vulnerable households tend to be those with low levels of human capital; poor access to information; limited access to credit and risk-management instruments; and few productive and financial assets. Vulnerable households tend to suffer from physical and psychological disabilities, social exclusion and inadequate social support networks.

to and capacity to cope with risks. This characterisation of vulnerability is adopted here, as it encompasses both the external impacts of, and the internal capacity to cope with and adapt to, climate change. Vulnerability to climate change is not uniform. Different individuals, households, communities, sectors, regions and countries will be differently vulnerable to climate change (Erikson, 2008). This is true also for Botswana.

In general, studies have found that vulnerable households tend to be those with low levels of human capital; poor access to information; limited access to credit and risk-management instruments; and few productive and financial assets. Vulnerable households tend to suffer from physical and psychological disabilities, social exclusion and inadequate social support networks. They tend to be situated in harsh agro-climatic environments with limited natural resources, and are part of communities with little entrepreneurial activity.

With this framework of vulnerability in mind,

of the country, while southeastern regions are expected to experience a 5 percent increase in annual rainfall (ibid). During the rainfall seasons, it is expected that there will be a 10–20 percent increase during the peak rainfall months (December to February), while other months will yield reduced rainfall. The rainy season will be shorter and less reliable due to climate change, and it is expected that most rain will fall as short, sharp events (ibid). Although this calculation has not been sufficiently modelled, it is expected that an increase in temperature would equal an increase in the rates of evaporation and transpiration.

Other components of Botswana’s climate have not been modelled enough, and therefore predictions cannot be made on how they are expected to change. It is sufficient, for this report, to rely on the predicted changes in temperature and rainfall, as they have a strong impact on the various sectors of the economy and on different aspects of livelihoods.



2.3.3. Expected impacts of climate change

It is predicted that climate change will have a significant effect on Botswana's economy and society. These impacts are likely to be felt across several sectors such as water, health, agriculture and food security, ecosystems and biodiversity, and rural livelihoods.

Water

Climate change directly affects the water cycle, and through it, the quantity and quality of water resources available to meet human and environmental demands. In Botswana it is predicted that climate change will lead to the increased incidence of both floods and drought (INC, 2001). Furthermore, higher water temperatures and changes in extremes due to climate change may exacerbate many forms of water pollution. Water supply reliability, health, agriculture, energy and aquatic ecosystems will all feel the impact of these changes to the water cycle. The demand for water is also affected by climate change. The importance of water for sustainable social and economic development cannot be underestimated, yet Botswana is already facing multiple water challenges, all of which will be compounded by climate change. Box 2 below highlights the existing challenges to the country's water resources.

Box 2: Existing challenges for water resources management in Botswana

As mentioned above, Botswana is an arid country with high levels of water scarcity. There are limited sources of surface water, and over 60 percent of the population relies on groundwater (NWMP Review, 2006). The volume/quantity of groundwater in Botswana is large, but saline in areas such as Kgalagadi District. Current rates of groundwater extraction are, however, so unsustainable as to be considered mining of the resource (NWMP Review, 2006). It is estimated that the country will not meet the growing demand for water at sustainable rates of groundwater extraction. Recharge of the groundwater resource is sensitive to climate change, and the predicted reduction in rainfall will have a negative impact on these resources, particularly where they are an important source of water (ibid).

The domestic, industry and mining, agriculture (irrigation and livestock), and energy sectors are all competing users of water resources. The environment is also an important user of water, albeit difficult to quantify and usually ignored. However, according to Zhou and Masundire (1998), the water resources currently available in Botswana are inadequate to meet the demands of all these sectors by the year 2075. Climate change will increase this deficit by 10 percent (ibid; SOER, 2002).

The most vulnerable to these predicted changes will be the rural poor, who rely on groundwater for all of their water needs. Although Botswana has been very successful relative to the rest of Africa in providing reticulated water to the rural population, there are increasing instances of boreholes going dry and whole villages going without water.

Agriculture and food security

The impact of climate change on agriculture in Botswana will be twofold: on livestock, and on crops (SOER, 2002).

Livestock rearing is based on the grazing of natural rangelands, which are highly sensitive to climate variability. For example, during the severe droughts of the 1980s and the early 1990s (which were strongly associated with the El Niño phenomenon), about one-third of the national herd was lost (ibid). It is reported that successive droughts lead to progressive degradation of rangelands, as resilience is severely hampered. It is predicted that future increases in temperature and decreases in rainfall will lead to more frequent and longer droughts (ibid). Poorer households with fewer livestock will be more vulnerable to climate change than those households with larger herds.

Following predictions for a hotter, drier climate, potential crop yields for the major crops—sorghum and maize—are expected to be reduced by 30 percent (INC, 2001; SOER, 2002).

There is an increasing number of female farmers, currently estimated at 40 percent of all farmers. A main characteristic of female-headed households is low incomes, compared with male-headed households. The National Agricultural Master Plan for Agricultural Development (NAMPAD) (2000) also shows that 65–70 percent of female-headed households do not own cattle, compared with only 45–50 of male-headed households. This means that female farmers who engage in traditional rain-fed agriculture have less draught power and are therefore more vulnerable, given the exposure to drought and their limited adaptive capacity to deal with the shock.

Health

The INC found that the diseases most likely to be influenced by climate change in Botswana are malaria and paediatric diarrhoea (INC, 2001). Malaria has historically been confined to the northern parts of Botswana, which also experience lots of rain. In years of high rainfall, outbreaks appear further south, and due to climate change, the endemic malaria regions also appear to be shifting southwards (ibid; SOER, 2002). It is further estimated that the population living in malaria-prone areas will double by 2021. Control of the disease at such a large scale will be difficult.

In Botswana, water-borne diseases such as diarrhoea are very common in children below the age of five years.



Poor sanitation, lack of hygiene and unclean water contribute to the occurrence and spread of the disease. According to the INC, 5 percent of all patients who visited the clinic in 1994 reported having diarrhoea. Diarrhoea has been noted to be more prevalent during the early rainy season, when residents of rural and peri-urban areas prefer to collect water from ponds and shallow streams (INC, 2001; SOER, 2002). Climate change may lead to more widespread contamination of water supplies due to flooding, the increased use of contaminated water, or both, which in turn may lead to an increase in the prevalence of diarrhoea.

Other diseases that may be affected by climate change include dengue fever, rickettsia, cholera, yellow fever and bilharzia, as well as asthma and heat stress (INC, 2001).

and flooding by up to 68 percent; and by increasing temperatures and evapo-transpiration rates (FNR, 2009).

Climate change will have a negative impact on the large migratory species on which the tourism industry is based, as well as on several habitats that are expected to shift their ranges within the next 100 years or so. For example, it is expected that the Mopane Woodlands, an important source of income in the eastern parts of the country, will shift eastwards due to climate change, thereby endangering the livelihoods of those in the area (Ibid).

Moreover, climate change will have a negative impact on the livelihoods of those most dependent on biodiversity for their survival. This is because biodiversity contributes to livelihoods by providing cash and in-kind incomes (Biodiversity Stocktaking Report, 2003).

Access to biodiversity strengthens the ability of rural households to meet their livelihood requirements and makes those livelihoods more secure. climate change will have a negative impact on the livelihoods of those most dependent on biodiversity for their survival.

The groups most vulnerable to climate change impacts on health will be the rural poor, particularly in the malaria prone areas; those who cannot afford reticulated water; and those who prefer to collect water from ponds and streams, rather than travel long distances to government boreholes.

Ecosystems and biodiversity

The latest information on the status of biodiversity in Botswana is contained in the Fourth National Report to the Convention on Biological Diversity (FNR), which was completed in May 2009. The report finds that while climate change is one of the major threats to biodiversity in Botswana, little or no research has been conducted to quantify the impacts (FNR, 2009).

Furthermore, research on biodiversity in Botswana is carried out in a largely ad-hoc manner. Most attention is devoted to the Okavango Delta, making it difficult to draw conclusions on the status of biodiversity in the country and the possible impacts of climate change on it. However, it is clear that although the full effect of climate change is unknown, it will have a largely detrimental effect on biodiversity (FNR, 2009). It is expected that climate change will have a negative impact on the Okavango Delta by reducing in-flows, rainfall

Furthermore, access to biodiversity strengthens the ability of rural households to meet their future livelihood requirements; to make those livelihoods more secure; and finally, to supplement rural diets through the use of wild plants and animals (Biodiversity Stocktaking Report, 2003).

Climate change is not the only threat to biodiversity in Botswana—nor is it the most urgent. The FNR (2009) states that the biggest threats to biodiversity are currently population growth and the associated expansion of urban areas; the introduction of invasive alien species; unsustainable water extraction in the Okavango Delta; pollution and land degradation; and habitat destruction. Climate change will place an additional burden on biodiversity, which will have negative consequences for the country.

Gender-differentiated impacts of climate change

In 2008, the HBS commissioned a study into the gender-differentiated impacts of climate change in southern Africa. Box 3 below summarises the findings of the Botswana country study.



Box 3: Summary of gender-differentiated impacts of climate change in Botswana

The Botswana country study found that women would be more severely impacted on by climate change than would men, since more than 50 percent of households in rural Botswana are headed by females, and subsistence arable farming (which is most affected by reduced rainfall and climate-related low yields) is predominantly a female activity (Omari, 2009).

The study found that biodiversity plays an important role in shaping rural livelihoods. The collection of grass and wild fruits, basket-making, hunting and fishing are some of the most biodiversity-related—and also some of the most gendered—activities conducted in rural Botswana (Omari, 2009). It found that if the predictions of reduced rainfall in the southern African region are realised, this will affect the amount and distribution of biodiversity available for harvesting, thus negatively affecting the women who rely on this resource to supplement their livelihoods (ibid).

The study also found that women's workload for reproductive and productive needs would increase tremendously, and families would get poorer. With a reduction in natural resource-based livelihood options, more people will be looking for employment in order to supplement their income/livelihood. In many cases, men are more likely to find formal employment, while women end up staying at home to take care of the children, elderly and the sick. In some areas of Botswana, women still have to walk long distances to collect water, although the government has been largely successful in providing reticulated water to rural areas (Omari, 2009). Since men will only collect water if they have some form of transport, they are not affected as much by climate variability.

If the predicted health impacts from climate change come to pass, not only would they affect the most vulnerable groups—the elderly, women and children—but they would also increase the burden on women in caring for the sick (Omari, 2009).

The supply of household energy is considered to be the responsibility of women; therefore, a changing environment that requires them to spend more time fulfilling this responsibility would exert a negative impact on them (Omari, 2009).

The study found that despite their increasing role in agricultural production, most women do not have control over land, and lack access to agricultural extension and credit. Furthermore, it found that most rural women's work is largely unpaid participation in subsistence production, or else part-time, seasonal work, which typically does not generate high income. Also, the numerous pressures of the HIV/AIDS pandemic have helped limit access to productive resources, services and skills. All these factors make women particularly vulnerable to the impacts of climate change (Omari, 2009).

SOURCE: HBS, "Gender Differentiated Impacts of Climate Change in Botswana"



CHAPTER 3: Climate Change Adaptation

Policy Analysis

Adaptation to climate change in Botswana is vital, given the environmental, social and economic circumstances. Although uncertainty remains regarding the actual impacts of climate change in some sectors, there is sufficient evidence that climate change will exacerbate the existing stresses, thus affecting the most vulnerable sectors and communities. Effective adaptation to climate change will therefore entail adjustments and changes at every level, from local to national and international. Local communities must build their resilience and, if necessary, diversify their livelihoods in order to cope with existing and future stresses. Local coping strategies and traditional knowledge systems need to be strengthened and used to complement local and government interventions and policies.

As argued in the IPCC's Third Assessment Report, policies that lessen pressures on resources, improve management of environmental risks and increase the welfare of the poorest members of society can simultaneously advance sustainable development and equity, enhance adaptive capacity, and reduce vulnerability to climate and other stresses. Inclusion of climatic risks in the design and implementation of national and international development initiatives can promote more sustainable equity and development that reduces vulnerability to climate change (IPCC, 2001). In other words, for adaptation to be effective, a conducive policy environment must be in place. The following sections analyse the policy environment for effective adaptation in Botswana.

It should be stressed that there is no dedicated policy or strategy that addresses climate change mitigation or adaptation in Botswana. This is because there is no specific requirement in the UNFCCC text for parties other than the Least Developed Countries (LDCs) to develop and implement National Adaptation Programmes of Action (NAPAs). At the UNFCCC COP7, it was acknowledged that LDCs are not equipped to deal with problems of adaptation to climate change, and established an LDC work programme. This programme includes the preparation and implementation of NAPAs. Botswana is not featured on the UN list that defines LDCs, and is therefore not required to develop a NAPA.

Environment and climate change concerns are, however, acknowledged and articulated in a combination

of different policy documents. Underpinning all policy development and development planning in Botswana is the recognition that long-term growth must be sustainable.

3.1 Legislation

Although Botswana is a constitutional democracy, the constitution does not contain any provisions dealing with environmental rights and duties. Nor does it contain any other comprehensive provisions specifically for the protection of the environment.

Botswana has approximately twenty-eight pieces of legislation that refer to the environment, but not all of these are relevant to climate change adaptation. This review of the legislation considers only those acts that have a direct or indirect effect on adaptation. Below is a brief description of each of the laws reviewed and their provisions pertaining to adaptation.

3.1.1. Framework environmental legislation

There is no over-arching environmental legislation in Botswana, despite the obvious benefits it would provide. This has led to the proliferation of incoherent and uncoordinated sectoral legislation. This fragmentation has also translated into duplication of legislation on the one hand and gaps in legislation on the other, leaving aspects of the environment unprotected and certain activities unregulated. Framework legislation would be useful as a basis for climate change adaptation.

3.1.2. Water resources legislation

The Water Act, Chapter 34:01

This act governs the administration of water resources, defines ownership of rights to the use of water and provides for the granting of water rights. The act provides for the establishment of a water apportionment board (WAB). The functions of the WAB include granting of water rights to use, divert, store, abstract or discharge any effluent into public water. The WAB is also charged with determining the quantities permitted and the duration of such rights.

Although water is important for climate change adaptation in Botswana, this legislation does not make provision for climate change adaptation. Other deficiencies of the act related to adaptation are the



absence of a definition of groundwater, which in turn excludes groundwater from the protections offered by the act. This legislation further lacks any legislative commitment to proper water resources planning.

3.1.3. Health legislation

The Public Health Act

The Public Health Act addresses public and environmental health as it relates to climate change adaptation—in particular, the spread of disease resulting from changing climatic conditions. The Public Health Act is meant to regulate seven broad areas so as to protect public health. These are: diseases subject to the international health regulations; prevention of the spread of smallpox; venereal diseases; diseases from sanitation and housing; diseases from foodstuffs, water and food supplies; prevention and destruction of mosquitoes; and cemeteries. This act also lacks any mention of climate change adaptation. It should be revised, as a matter of urgency, to consider expected changes in epidemiology.

3.1.4. Ecosystems and biodiversity legislation

The Wildlife Conservation and National Parks Act

The Wildlife Conservation and National Parks Act has consolidated the law relating to conservation and management of wildlife resources in the country. The law regulates how all wild animals (excluding fish resources) can be used. The act makes provision for national parks and activities therein; the licensing of hunting and other wildlife-related activities; and the protection and partial protection of species. Given that wildlife resources will be negatively affected by climate change, and that a significant proportion of rural households rely on wildlife for their livelihoods, it is important that this act address climate change. This is not currently the case.

The Agricultural Resources Conservation Act

This act makes provision for the conservation and improvement of agricultural resources in Botswana. *Agricultural resources*, as defined in the act, refers to soils, water, plant life, and the animal life and fauna of Botswana, including animals, birds, reptiles, fish and insects (there is clearly an overlap between this act and the Wildlife Conservation Act). The responsibility for creating appropriate policy and regulations to manage and conserve natural resources is vested in the act, which is implemented through the Ministry of Environment, Wildlife and Tourism.

This legislation fails to adequately address the

management and conservation of non-timber forest products (veld products), which have no known commercial value. This is of great concern, as the consequences of such non-control are felt mostly by the poor people in society, particularly those who need these resources for domestic consumption and income generation. Regulations have been promulgated under this act that control the use of several commercially exploited wild plant species important to rural livelihoods. The act is silent on the issue of climate change, although such change is likely to have a devastating effect on wild plant species, as well as on the livelihoods dependent on them.

3.2 Policies, strategies, plans and programmes of action

3.2.1. Overarching environmental policies and strategies

The National Policy on Natural Resources Conservation and Development

The National Policy on Natural Resources Conservation and Development (NPNRCD), also known as the National Conservation Strategy (NCS), was the first step Botswana took to ensure that development takes place in an environmentally sustainable manner. The NCS has developed two main objectives:

- to increase the effectiveness of natural resource use and management, maximise development-environment synergism and minimise harmful environmental side effects
- to coordinate the environmental activities of different sectors, ministries and interest groups throughout Botswana, thereby improving the development of natural resources through conservation

Furthermore, the NCS has developed a set of specific development and environmental goals requiring developmental strategies to address possible impacts on the environment. It was developed in 1988, well before the UNFCCC was promulgated, and therefore does not include relevant information on climate change adaptation. It does, however, recognise that drought, rangeland degradation and water resources conservation are important issues for the country, and that action should be taken to effectively manage these.

3.2.2. Climate change policies, strategies and plans of action

Initial National Communication to the UNFCCC

The Initial National Communication (INC) to the United Nations Framework Convention on Climate



Change for Botswana was completed in 2001. It is not itself a policy, but contains the most comprehensive policy response to climate change at the national level. The report includes, *inter alia*, anticipated impacts of climate change and proposed actions by Botswana to avoid and respond to it. It is an assessment of the country's present status with respect to climate change, and provides a basis for future decisions concerning climate change and national development.

The report summarises the vulnerabilities of the climate-sensitive sectors and provides recommendations on adaptation measures and responses. However, it lacks an implementation plan for the recommendations. In an effort to ensure that recommendations on adaptation are implemented, Botswana is developing its Second National Communication to the UNFCCC. One of the main outputs of this process is a national adaptation plan that guides all government departments in integrating adaptation into their planning processes. This document has not yet been made public.

3.2.3. Water resources policies, strategies and plans of action

National Water Master Plan

In view of the rapidly rising water demands in all sectors, and the need to develop a regional and national approach to water development, government embarked on the formulation of the National Water Master Plan (NWMP) in 1993. A review of the NWMP, initiated in 2006–2007, yielded a key policy recommendation: namely, the formulation of a national rainwater harvesting policy. Rainwater harvesting is an important aspect of climate change adaptation.

Another key recommendation was that strategies be developed to meet Botswana's water demand for the next thirty years. To achieve this, the NWMP calls for water resources stewardship and water demand management, rather than capital development works. This is due to the fact that the water development phase for Botswana is coming to an end. All major surface water resources developments have been, or are on track to be, completed.

The challenges Botswana's water planners and managers face are therefore (a) to shift their focus away from exclusively water supply development strategies to a water resources conservation paradigm; and (b) the development of skills and institutional arrangements for the assessment and protection of both already-harnessed surface water resources and all major groundwater

resources. The review of the NWMP (2007) recognises the challenges of water resources management in Botswana, including over-exploitation and climate change, and sets about creating mechanisms to deal with these.

3.2.4. Agriculture and food security policies, strategies and plans of action

National Master Plan for Agricultural Development

The objective of the National Master Plan for Agricultural Development (NAMPAD) is to improve the performance of the sector and ensure sustainable use of the country's natural resources. The plan identifies the potential for agricultural production and strategies for improving the sector, and makes policy recommendations for sustainable agricultural production. The plan recognises rain-fed farming, particularly traditional rain-fed farming, as the most vulnerable agricultural practice. The subsistence farmers who use this method invest very little in production, and rely heavily on family labour for operations.

The master plan recommends the formation of farming groups that could benefit from large-scale cultivation operations. It is proposed that these bigger farming groups will most effectively benefit the country if they receive financial, legal and technical assistance from government. The existence of large groups of farmers will minimise the high risks associated with rain-fed farming by individuals, while strengthening the capacity of human, financial and technological resources to deal with climatic pressures on crops.

The NAMPAD is, however, heavily informed by economic models. As such, it lacks crucial support from the three pillars of sustainable development: social, environmental and economic. For example, the plan is not clear on how land should be acquired, nor on how benefits will be shared.

3.2.5. Biodiversity policies, strategies and plans of action

In response to its obligations to the Convention on Biological Diversity, Botswana produced the National Biodiversity Strategy and Action Plan (BSAP) in December 2004. The BSAP contains eleven strategic objectives, each proposing measures for the conservation and sustainable use of biodiversity.

Although the BSAP was produced in 2004 and updated in 2007, there has not been any formal implementation to date. Some aspects of the plan have been overtaken by events and are no longer relevant; others have been implemented as offshoots of other



government initiatives, rather than as direct results of the BSAP. Also, stakeholders rarely use the biodiversity plan as a reference document—for example, in deciding priorities for government and donor funding, or when developing new government initiatives.

The BSAP contains some far-reaching proposals for climate change adaptation. In failing to formally implement it, Botswana has lost out on the opportunity for coordinated management of the many components of biodiversity and adaptation to climate change.

3.2.6. Livelihoods policies, strategies and plans of action

Revised National Policy for Rural Development (2002)

The Revised National Policy for Rural Development was developed by the Ministry of Finance and Development Planning in 2002. The review was based on the realisation that the 1973 National Policy on Rural Development was no longer relevant, given the new development challenges such as HIV/Aids and more complex urban and rural economies. The new revised policy is aligned with both the contemporary situation and the aspirations of the country's Vision 2016.

The policy aspires to a more integrated but diversified approach to rural development, incorporating other sectors of the economy besides agriculture. Given that agriculture is the sector most vulnerable to climate change, affecting mostly the poor, the move to diversify from the agricultural sector is vital in the adaptation to climate change.

The policy recognises that, given the recurrence of droughts in Botswana, rural dwellers' over-reliance on rain-fed agro for their livelihoods is one of the major problems in the context of vulnerability to climate variability. Hence, the policy calls for diversification of the rural economy as an absolute necessity.

The following are specific objectives of the policy particularly relevant to adaptation to climate change:

- reduce rural poverty
- promote sustainable livelihoods
- stimulate rural employment and income generation by identifying and exploiting profitable alternatives to livestock and arable agriculture, such as rural industries, services and crafts; attraction of skilled youth; and the promotion of private sector initiatives

The guiding principles of the policy include particular attention to gender aspects of rural development, and the optimal and environment-friendly utilisation of natural resources.

National Strategy for Poverty Reduction of 2003

The aim of the National Strategy for Poverty Reduction is to ensure that Botswana's anti-poverty programmes are coordinated and focused, and that the impact of the programmes is felt across the different sectors. The strategy acknowledges several causes of poverty, including reduced employment opportunities, lack of access to natural resources, lack of access to credit for productive land use, and the HIV/Aids pandemic. Drought is also cited as one of the main causes of poverty.

The central thrust of the strategy is to provide opportunities for sustainable livelihoods. The connection between poverty and vulnerability creates a need for climate change policies to work in concert with poverty reduction policies.

3.2.7. Other relevant policies, strategies and plans of action

National Development Plan 9, 2003/04–2008/09

The Botswana National Development Plan 9 (NDP9) for the planning phase 2003/04 to 2008/09 has taken unprecedented steps to integrate environmental management principles in development planning. The plan addresses the need to translate the National Policy on Natural Resources Conservation and Development into specific macro-economic policies, programmes and instruments that will simultaneously protect the environment. Specifically, the plan calls for the promulgation of an overarching Environmental Management Act (EMA) and the Environmental Impact Assessment Act (EIA). Both these acts are founded on the principle of sustainable development.

Climate change is not mentioned in the NDP-9, and is not given particular attention or priority. The issue of climate change should be placed more centrally within the evolving socio-economic and development context. This context is critical to understanding the vulnerability of all sectors to climate change, and to the development of integrated adaptation strategies to address the impact of climate change on Botswana's developmental sectors. This is important for the integration of the strategies and programmes into the national development plans and policies, and to balance tradeoffs among the multiple objectives of sustainable development.

Botswana National Action Programme to Combat Desertification, 2006

The National Action Programme (NAP) outlines strategies and activities for implementing the objectives



of the United Nations Convention to Combat Desertification (UNCCD). The NAP, developed in 2006, was prepared in line with other development initiatives, national development planning processes, National Vision 2016 and the Millennium Development Goals.

The UNCCD emphasises a bottom-up implementation approach that promotes increased participation of local communities, community-based organisations and marginalised groups, including youth and women. The NAP was developed as a largely consultative tool to address poverty alleviation and community empowerment through viable and sustainable alternative livelihood projects; capacity building; and the coordination of activities among stakeholders in all efforts to combat desertification and drought.

There are clear synergies between the objectives of the UNCCD and UNFCCC. Therefore, any National Adaptation Plan under the UNFCCC should build on the work of the NAP to avoid duplication of efforts and resources.

six to ten not attending school; children of Remote Area Dwellers (as established by government); severely malnourished children; and medically selected pregnant and lactating women.

Beginning in 1980, Botswana implemented a broad, integrated programme for drought relief and recovery that combines food supply management, employment generation and agricultural assistance. Also in the 1980s, the government initiated the Labour Intensive Public Works Scheme, meant to empower the rural poor whose only asset was their unskilled labour (Jacques, 1995). Additionally, the programme aimed to retain the capital base and future incomes in the rural sector by avoiding reductions in stock number (mainly cattle) by providing vaccinations and funding borehole development. Free seeds were given to help small farmers stay on or return to the lands during and after drought periods.

An evaluation of the Drought Relief and Recovery Programme of 1992 revealed that rural incomes were lower than they had been ten years previously, and that

Policies must embrace and strengthen the capacities of those local communities and institutions responding to climate variability.

Botswana Drought Relief and Recovery Programme
Botswana's recurring drought problem has major economic and social impacts. Recognising this problem as endemic, the government started to develop the Drought Relief Programme as early as the late 1970s, during the 1979–80 drought. It continues to be a central government response to drought, and will remain so for the foreseeable future.

The objective of drought relief and recovery programmes, according to the Ministry of Finance and Development Planning is “the relief of human suffering, to avoid loss of life, reduce malnutrition and reduce migration from rural areas”. Activities under the programme are twofold: income support and investment protection. *Income support* refers to transferring resources to the vulnerable group on a temporary basis, either directly through cash, food or commodities, or indirectly through job creation. *Investment protection* is aimed primarily at the preservation or enhancement of capital assets, to enable the vulnerable group to resume production after the drought.

Those acknowledged as vulnerable during drought are all children five years and younger; children aged

rural wealth had become more concentrated in fewer hands. These findings raised questions about the success of the drought relief programme.

It is possible that the proportion of rural households facing poverty had increased with the increase in population. It is also possible that prolonged and successful relief efforts have masked an underlying poverty problem, which drought has exacerbated, but not caused. Whatever the case, it is clear that the Drought Relief and Recovery Programme can increase dependence on government. Therefore, the programme needs to promote self-reliance while providing a safety net during difficult times. It should empower and enable people to sustain their families after the drought programme ends.

United Nations Development Programme (UNDP)—Environment Programme

Through the UNDP office, the Environment Programme in Botswana has supported the development and implementation of several projects aimed at sustainable management and utilisation of natural resources. The programme and projects were



developed under the following six thematic areas:

1. Frameworks and strategies for sustainable development
2. Effective water governance
3. Sustainable land management to combat desertification and land degradation
4. Conservation and sustainable use of biodiversity
5. Access to sustainable energy sources
6. Policy and planning to control emissions of chemicals

Thematic areas 5 and 6 have a special focus on mitigating the effects of climate change. Some of the activities undertaken under these areas—access to sustainable energy sources, for example—include

promoting clean energy technologies, and increasing access to investment financing for sustainable energy through the Clean Development Mechanism.

Thematic areas 1 to 4, on the other hand, are more focused on adaptation to climate change. Although adaptation is not a specific objective of the programme, the projects do address some of the most pressing issues of adaptation, such as the promotion of innovative and alternative sustainable land practices and livelihoods. Land degradation being a major cause of rural poverty, the promotion of sustainable land management and drought preparedness—particularly in drylands where the most vulnerable and poorest communities reside—is helping to reduce poverty.



CHAPTER 4: Climate Change Adaptation: Institutional Analysis

This section contains information regarding the main institutions that deal directly with climate change in Botswana. It should be noted that climate change and impact issues cut across all sectors; but for purposes of this report, only those institutions that deal directly with the implementation of UNFCCC initiatives will be discussed.

4.1 Ministry of Environment, Wildlife and Tourism

The Botswana Government holds the biggest responsibility for climate change adaptation. This responsibility is not explicitly located within one government department, but is scattered across several ministries and departments. Figure 2, below, shows a schematic representation of most of the government departments that should be responsible for climate change adaptation activities. Foremost among these is the Ministry of Environment, Wildlife and Tourism (MEWT).

Climate change coordination

To improve the coordination of climate change programmes and activities, MEWT established a national climate change coordinating unit on the 27th

January 2010. Its mandate covers the following national and international functions:

National functions

- coordinate GHG inventory and reporting
- coordinate vulnerability assessments and promotion of climate change adaptation actions
- enhance capacity building
- develop and implement a public awareness strategy
- enable participation of the public and other non-state actors in climate change programmes
- coordinate ratification of climate change agreements
- integrate and institutionalise climate change work

International functions

- enhance effective participation in the climate change discussion
- improve the development and defence of country position and interests in COPs and other forums
- enhance participation in the scientific forum for climate change (IPCC and other forums)
- develop specific strategies to engage developed and developing country partners in addressing climate change concerns

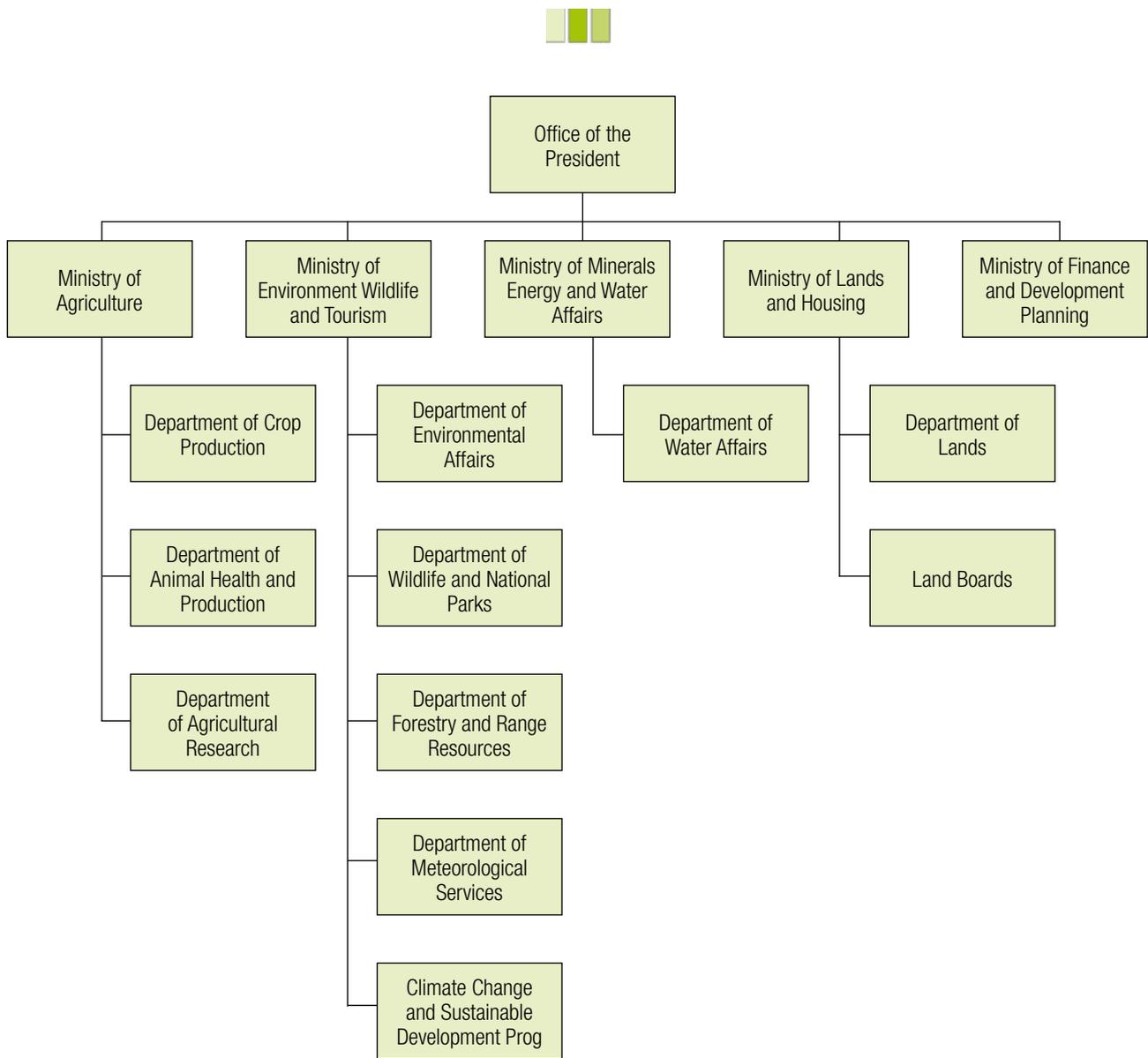


Figure 2: Institutional map of government departments involved in environmental management and by extension climate change adaptation

The organisational setup of the Climate Change and Sustainable Development Programme will take the following shape:

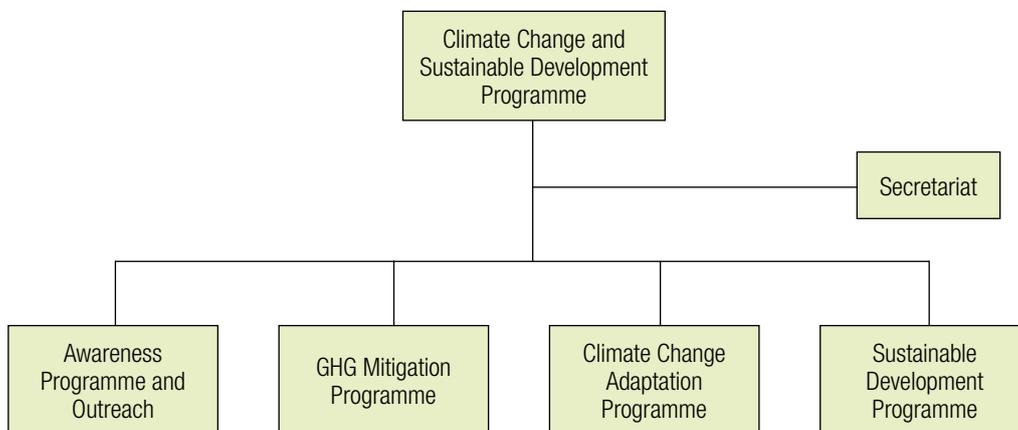


Figure 3: Climate change and sustainable development programme for Botswana

SOURCE: Ministry of Environment, Wildlife and Tourism, 2009



Two areas are proposed for the climate change and adaptation programme: vulnerability maps and a climate change adaptation strategy. The climate change functions based at the MEWT will be linked to several ongoing programmes and activities, such as climate change monitoring, sector programmes, and industry and civil society programmes that are addressing climate change. Additionally, committees and working groups will be represented by various stakeholders from outside MEWT, including NGOs and the private sector, but chaired by the permanent secretary.

The move of the climate change coordinating function to MEWT is a positive one. The ministry is in a better position to facilitate the development of integrated adaptation strategies across the sectors, and to ensure the integration of strategies and programmes into the national development plans and policies.

4.2 The National Committee on Climate Change

The Department of Meteorological Services (DMES) was initially the national focal point responsible for climate change consideration and for meeting Botswana's obligations under the UNFCCC. The National Committee on Climate Change (NCCC) was established as an advisory body to the DMES to assist with UNFCCC implementation at a national level. The NCCC is chaired by the director of DMES, and has representatives from government (mainly), non-governmental organisations and the private sector.

Before January 2010, the NCCC's main activities included planning and coordinating the elements and activities of all climate change projects; communication with stakeholders; public awareness raising; and management of all climate change projects. Technical reports were reviewed by appropriate experts within the NCCC. With the new structure discussed above, the coordination functions of all climate change activities will move to MEWT. All work with the IPCC will remain within NCCC; however, the decision making functions of the NCCC and all other advisory groups will be coordinated from MEWT.

4.3 Department of Meteorological Services

To understand the local climate, and thus be better able to predict local climate changes, an adequate national systematic observation and forecasting system is essential. The Department of Meteorological Services (DMES), under the Ministry of Environment, Wildlife and Tourism, is responsible for collecting such data. The

major climate variables measured include temperature, rainfall, and wind speed and direction. This information is essential to monitor and detect changes to climate, understand the dynamics of the climate system and provide information for climate models.

Until recently, DMES was responsible for the coordination of all climate change activities, including adaptation. Assessing the impacts of and vulnerability to climate change, and subsequently developing adaptation actions, requires good quality data. Non-climate change information also needs to be collected for effective adaptation planning in the water, agriculture, health, food security and biodiversity sectors. Using the information collected, DMES should be in a position to provide various options for adaptation, including the establishment of early warning systems for extreme events such as drought or floods, improved water management, improved risk management and biodiversity conservation.

The Draft National Capacity Self Assessment for the implementation of the Multilateral Environmental Agreements Report (2009) has made the following recommendations for building essential technical climate change adaptation capacities and tools within DMES:

- stronger capacity to collect consistent and reliable data to support vulnerability and adaptation assessment
- stronger capacity to analyse data; integrate it with socio-economic data and analyses across a range of sectors; and tailor results for policy-makers and stakeholders
- enable methods and tools for using climatic information and geographical information systems
- harness local and indigenous knowledge relevant to local and community level response

4.4 Non-Governmental Organisations (NGOs)

Overall, environmental NGOs aim to improve the quality of life of Botswana's people through the sustainable management of natural resources and conservation of the environment. They achieve this through several means, but mainly through advocating for effective responses to urgent environmental problems and opportunities by other actors—in particular, government. NGOs also build capacity through education and training; act as mediators in cases of conflict; and monitor transparent decision making to encourage appropriate and harmonised environmental policies.



The involvement of NGOs in Botswana's climate change scenario is very limited. However, some NGOs do work in sectors such as forest and veld products, water resources management and waste management. These organisations can create entry points for climate change adaptation opportunities.

NGOs aspiring to help improve the livelihoods of the rural poor through the sustainable use of forest and veld products include the Permaculture Trust of Botswana; Thusano Lefatsheng; Veld Products Research and Development; the Forestry Association of Botswana; and the Kalahari Conservation Society. Such organisations, however, face numerous challenges. These include lack of donor funding due to donor withdrawal in Botswana; limited capacity and difficulties in staff retention; limited

expertise in climate change and adaptation issues; and lack of coordination in environmental and climate change activities.

4.5 Private sector

The involvement of Botswana's private sector in climate change adaptation is virtually non-existent. Nonetheless, organisations working in the area of climate change mitigation do exist. Examples include companies that supply and maintain energy-efficient technologies, solar technologies and water conservation technologies. Some have organised themselves into associations, such as the Solar Association of Botswana. Opportunities do therefore exist for collaboration and partnership with the private sector.



CHAPTER 5: Public Awareness of Climate Change

According to the first comprehensive poll of global opinions on climate change, conducted by Gallup in 2007–2008, industrialised countries are more aware than developing countries of climate change, with Africa the least aware. It was reported that 38 percent of the population interviewed in Botswana had some knowledge about climate change. This low percentage is consistent with general observations in print and broadcast media to the effect that Botswana, in general, are not aware of climate change or its impacts.

It is worth pointing out that Botswana currently does not have an awareness strategy or programme for climate change. Activities so far have been sporadic, uncoordinated and ad-hoc. For example, before Botswana's delegation left for the UNFCCC COP15 in Copenhagen, the minister of Environment, Wildlife

and Tourism gave the country's position on climate change on Botswana Television. This was a one-way presentation, however, and did not allow the general public to contribute to or even interrogate Botswana's position. No national consultations preceded Botswana's adoption of a position on climate change.

The UNFCCC focal point at the DMES does facilitate workshops, seminars and cabinet briefings; but, as mentioned earlier, these are not coordinated or structured, and only target a select group.

The newly established Climate Change and Sustainable Development Programme should therefore make a deliberate effort to develop awareness and outreach programme on climate change. This would not only assist farmers, but also to fulfill the programme's obligations under the UNFCCC.



CHAPTER 6: Regional and International Actions

Botswana has set up a team of high level government representatives, who attend UNFCCC negotiations and their preparatory meetings regionally and internationally. MEWT's minister and permanent secretary are ultimately responsible for selecting climate change negotiators, but the selection criteria are not known. Currently, the negotiators are all from government departments that deal with climate change. The delegation does not include NGO or private sector representation. There are plans to include other actors in climate change negotiation, but the matter is still under discussion at the ministry level.

Botswana recently submitted a response to the UNFCCC secretariat's call for information on mitigation actions, as required under paragraph 5 of the Copenhagen Accord of the Copenhagen Climate Change COP15, 2009. This response commits Botswana to developing a long-term mitigation and adaptation

strategy to study the country's mitigation potential, and to develop specific adaptation actions. Botswana proposes to develop simultaneous mitigation and adaptation strategies, contingent on adequate and appropriate technology transfer, capacity building and predictable finance from developed countries.

While mitigation will focus on reducing GHG emissions and energy conservation and efficiency, proposed adaptation measures include strategies to reduce vulnerability, build resilience, address poverty and improve livelihoods.

Botswana has committed to reporting mitigation and adaptation actions through national communications already established. According to the submission, domestic measurements will be developed, with reporting and verification shared through national communications and internationally in accordance with COP guidelines.



CHAPTER 7: Conclusions and Recommendations

Adaptation has the potential to reduce adverse impacts of climate change, enhance beneficial impacts and reduce vulnerabilities of communities and systems. Science has shown that human and natural systems will, to a small degree, adapt autonomously. However, planned adaptation can supplement autonomous adaptation, though options and incentives for adaptation of human systems are greater than for adaptation to protect natural systems. Adaptation should therefore be viewed as a necessary strategy at all levels to complement climate change mitigation efforts.

In Botswana's climate change scenario—as, indeed, the world over—mitigation studies have enjoyed more time and financial resources than has adaptation. For example, the technology needs assessment commissioned by the NCCC focused exclusively on mitigation, without considering technology needs for adaptation. In Botswana, GHG emissions are negligible, and two-thirds of the country is a desert. Thus, adapting to climate change should be treated as an urgent issue.

Botswana has proposed to develop a national adaptation plan within the year 2010. It is recommended that the following considerations be factored into the development of the plan, and into all future climate change strategies.

7.1 Integrate climate change and adaptation issues into national development planning

Although Botswana is still collecting information and assessing vulnerability, it is not too early to integrate climate change into national development planning processes. Adaptation plans and implementation that address sustainable development should be integrated into policy at all levels. Climate change solutions need to identify and exploit synergies, as well as tradeoffs among the multiple sectors of the economy.

Many communities that are vulnerable to climate change are also under pressure from forces such as population growth, resource depletion and poverty. Therefore, policies that lessen pressures on resources, improve management of environmental risks, and increase the welfare of the poorest members of society can simultaneously advance sustainable development and equity, enhance adaptive capacity, and reduce vulnerability to climate and other stresses.

7.2 Document current environmental stresses

Adaptation to current climate variability and extremes often produces benefits as well as forming a basis for coping with future climate change. Various sources in the adaptation literature, as well as the most recent work of the IPCC, indicate that efforts to address adaptation to climate change can benefit from a better understanding of adaptation to current climate and environmental stresses. Thus, documenting successes in adaptation and/or coping strategies in the context of semi-arid or arid environments (or in areas experiencing floods) may be of some value in addressing vulnerability and adaptation to climate change.

7.3 Recognise synergies between UNFCCC and other MEAs

Climate change is not an isolated environmental and social issue; it is intimately connected to other recognised natural hazards and global environmental problems. In many cases, separate environmental conventions and processes that address these issues include scientific assessment/enquiry—and ultimately, a plan or strategy to implement the convention. Clear scientific and policy links between these conventions and those of the UNFCCC demonstrate that unnecessary tradeoffs can be avoided and potential multiple benefits realised.

The three Rio Earth Summit conventions—the UNCCD, the Convention on Biological Diversity (CBD) and the UNFCCC—are interrelated, and their implementation should therefore be coordinated to avoid duplication of efforts and to promote sustainable resource utilisation. Promotion of synergies amongst the three conventions is critically important, considering their similarities, overlaps, and the interrelatedness of the issues. Resolute efforts in this area can better utilise the limited financial and human resources available.

7.4 Strengthen early warning systems (EWS)

The EWS should be strengthened at a national level, and should be extended to include new sources of information to enhance drought monitoring and early planning. Such new data sources include projections of food consumption requirements; annual agricultural surveys; household surveys on health status; and household income surveys (Morgan, 1985). At a district



level, drought committees should make better use of the data sent to and transmitted from the EWS.

- An effective EWS must:
- provide timely information dissemination to users of the data
- foster greater partnership between the providers and users of data
- package data for different users in relevant formats, and disseminate it via appropriate media so that the audience can understand and use it effectively to better deal with and prepare for extreme events
- ensure that data are easily accessible
- integrate climate change data, including future impacts and vulnerabilities, with socio-economic data and analyses across different economic sectors in order to generate policy-relevant outputs
- share data with relevant sectors, such as agriculture, water, drought relief programme financing and the public at large

A regional early warning system for SADC, known as the Southern Africa Regional Climate Outlook Forum (SARCOF), needs to be strengthened. This will ensure that data collection and reporting methods are harmonized across the region; encourage a general exchange of experience and lessons learnt; and promote discussion of long-term improvement of drought monitoring and food security planning, for the benefit of the whole region.

7.5 Gender-specific vulnerability assessments

Research documented in the previous sections has shown that female-headed households are economically disadvantaged relative to male-headed households, which have relatively better access to productive resources. Further, women are often excluded from better jobs, other activities that generate high income and, in some cases, even education. Women are more dependent on informal employment in the arable sector, for which payments are traditionally very low, and are also more involved in the climate-sensitive sectors of the economy. As the group most affected by poverty, women are therefore more vulnerable to extreme events such as droughts and floods. Gender-specific vulnerability assessments need to be undertaken in order to understand those inequalities.

7.6 Adopting efficient technologies

Local communities are familiar with the efficient and cost-effective technologies for climate change

mitigation and adaptation strategies, such as efficient cooking stoves and zero-tillage agriculture. Solar PV technologies (for water pumping, as off-grid electricity supply) are still too expensive for large-scale implementation, and hence can only be disseminated through a government subsidy. Such a subsidy can only be justified if the benefits are directed to the poor.

There is also limited application of solar cooling and passive designs in Botswana, due to limited expertise and the cost of designs. Through the UNDP RE-Botswana project, individuals who are not connected to the grid are provided with technologies such as improved stoves that use less fuel than traditional wood stoves. This reduces the time needed to collect fuel wood, which has reportedly been increasing over the years.

7.7 Integrated water resources management

It is vital that responses to climate change also focus on water. Addressing water resource management is recognised as a priority internationally, and is an inescapable part of reducing vulnerability and promoting adaptation to climate change. A balance between mitigation and adaptation strategies has to be established at policy and programme levels so that 'win-win' solutions can be realised.

Water catchment from rooftops and underground tanks to collect rainwater should be encouraged and promoted to ease pressure on Botswana's limited resources. Research into cost-effective technologies should be undertaken to enable the affordable utilisation of rainwater.

At national levels, water governance must be expanded to, and integrated with, non-water sectors. Access to technology, science and information should be increased for sound planning; and development efforts need to be checked for potential maladaptations with regards to water. At regional levels, collaborative water management for shared surface and groundwater should be emphasised.

7.8 Strengthen indigenous coping strategies

Local communities have reduced their vulnerabilities by developing and implementing extensive adaptation strategies to climate change. Communities in climate-sensitive areas have used indigenous knowledge systems to resist and adapt to climate change variability. Examples include farming techniques, the selection of suitable crops/seeds, organisation of herding and selling



cattle. It therefore becomes imperative to link top-down and bottom-up approaches in adaptation planning. The top-down approaches, which include models and scientific data, must be complemented with bottom-up approaches, which recognise and augment local coping strategies and indigenous knowledge.

Policies must embrace and strengthen the capacities of those local communities and institutions responding to climate variability. Building upon existing coping strategies at the local level, rather than focusing on scenario-based modeling, can greatly enhance assessments of future vulnerability and adaptive responses at local and national levels. Involving different stakeholders at both levels is integral to crafting effective coping strategies.

7.9 Promote alternative livelihood strategies

The principal goal of any livelihood strategy is to ensure household economic and social security. The

main economic activities in the more vulnerable communities include employment, arable subsistence agriculture, livestock keeping (including small stock) and informal markets (such as basket and craft making and thatching)-all mostly done by women

However, as agriculture is the most vulnerable sector to climate change, it is important to understand the contribution of non-agricultural income-generating activities and their contribution to livelihood. Such understanding is required in order to promote innovation and diversified livelihood strategies. By broadening economic opportunities and strengthening productive strategies (including targeting female-headed households), food insecurity will be reduced; employment opportunities and income will increase; and people will be able to accumulate assets, improving their ability to cope with future livelihood shocks without falling deeper into poverty.



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