

# Understanding vulnerability and adaptation in semi-arid areas in Botswana

**Climate change is impacting and will continue to impact all sectors of the economy and society. In semi-arid areas there are opportunities to adapt to climate change but currently barriers exist to realize the full potential of these opportunities.**

**Semi-arid areas in Botswana** are characterised by high rainfall variability, frequent droughts, low soil moisture and extreme events such as flash floods which normally combine with governance shortcomings and structural inequalities to exacerbate the vulnerability of communities. Such communities are generally dependent on primary production and natural resources<sup>1</sup>, rely on rainfed agriculture<sup>1</sup>, have limited livelihood options and employment opportunities<sup>2</sup>, depend on activities that are sensitive to the impacts of climate change<sup>1</sup>, face high levels of poverty<sup>2,3,4</sup>, are exposed to high levels of HIV/AIDS, have limited infrastructure and services<sup>4</sup>, and are affected by limited institutional capacity and weak resource governance. The climatic and socio-economic environment in semi-arid areas in Botswana makes communities vulnerable to food insecurity and unstable livelihoods as well as leading to unsustainable agroecological systems, crop failure<sup>1</sup> and unproductive rangelands<sup>3</sup>.

**Climate change** is expected to lead to an increased frequency and intensity of droughts. There is expected to be delayed onset of rain and a shorter rainy season with fewer rainy days. It is also possible that there will be more heavy rainfall events.

Some of the impacts of climate change include:

- Reduced yields of maize and sorghum of between 10 and 35% in Botswana between ~1985 and ~2050<sup>5</sup>.
- Reduced water availability and water quality<sup>6</sup> impacting economic development, food security, health and sanitation.
- Increased occurrence of vector-borne diseases e.g. malaria<sup>7</sup>.
- Loss of soil fertility<sup>7</sup> and accentuated soil erosion.
- Risks of failure in livestock production.
- Increased damage to infrastructure including roads and buildings.
- Inequality and marginalisation as a result of scarcer natural resources.
- Risk of extinction of endemic species.
- Loss of ecosystem services such as water purification and filtration, medicinal plants and biomass energy.
- Decline in nature-based tourism due to ecosystem degradation, changes in weather patterns, and shifts in wildlife<sup>6</sup>.
- Increased pressure on urban centres as people migrate from rural areas.

In this context, researchers from the ASSAR project have sought to better understand the current status of vulnerability and adaptation in semi-arid areas in Botswana and the current barriers to adaptation.

<sup>1</sup> Sallu S.M., Twyman, C. & Thomas, D.S.G. (2009). The multidimensional nature of biodiversity and social dynamics and implications for contemporary rural livelihoods in remote Kalahari settlements, Botswana. *African Journal of Ecology* 47, 110-118.

<sup>2</sup> Twyman, C., Sporton, D. & Thomas, D.S.G. (2004). "Where is the life in farming?": The viability of smallholder farming on the margins of the Kalahari, Southern Africa. *Geoforum* 35, 69-85.

<sup>3</sup> Dougill, A.J., Fraser, E.D. & Reed, M.S. (2010). Anticipating Vulnerability to Climate Change in Dryland Pastoral Systems: Using Dynamic Systems Models for the Kalahari. *Ecology & Society* 15, 17.

<sup>4</sup> Statistics Botswana. (2014). Population and Housing Census 2011 Analytical Report. Statistics Botswana, Gaborone.

<sup>5</sup> Chipanshi, A.C., Chanda, R. & Totolo, O. (2003). Vulnerability assessment of the maize and sorghum crops to climate change in Botswana. *Climatic Change* 61, 339-360.

<sup>6</sup> Hambira, W.L., Athlopheng, J., Saarinen, J. & Manwa, H. (2012). Tourism Industry Reaction to Climate Change in Kgalagadi South East District Botswana. *Development Southern Africa* 29, 273-285.

<sup>7</sup> Urquhart, P. & Lotz-Sisitka, H. (2014). SARUA Climate Change Counts Mapping Study: Botswana Country Report: SARUA Volume 2 country report 2. The Southern African Regional Universities Association (SARUA).

As part of the ASSAR project, researchers reviewed the literature on vulnerability and adaptation in semi-arid areas in southern Africa and interviewed key informants at national, sub-national and local levels of government as well as community members.

### **Vulnerability to climatic variability and change in Botswana**

In Botswana some of the key vulnerabilities in semi-arid areas include limited institutional capacity especially at the local scale<sup>2,8</sup>, lack of markets to sell products, lack of overarching policy on climate change, fragmented and conflicting policies, conflicting government programmes and programmes that increase dependence, reduced availability of natural resources e.g. reduced distribution of mopane worms and rivers being dammed for domestic and industrial use in Gaborone, prevalence of Foot and Mouth Disease impacting livestock production, lack of parental care of the youth, lack of opportunities for the youth, and lack of incorporation of local practices into national policies<sup>9</sup>. Within this myriad of vulnerabilities women, the elderly, youth and marginalised groups are often more vulnerable than other groups.

### **Coping with climate variability and change in Botswana**

Approaches that are used for coping with climate variability and change in semi-arid areas in Botswana include the sale of livestock, supplemental feeding of livestock and the use of social networks e.g. the provision of remittances<sup>2</sup>. The sale of livestock and supplemental feeding are both supported by government. Where there are Foot and Mouth Disease restrictions some compensation is paid for animals and during drought periods farmers receive fodder for animals at a subsidized price and are advised regarding options for supplemental feeding.

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<sup>8</sup> Dube P.O. & Sekhwela, M. (2007). Community Coping Strategies in Semiarid Limpopo Basin part of Botswana: Enhancing Adaptation Capacity to Climate Change. *AIACC Working Paper*, 47, 42.

<sup>9</sup> Dube P.O. & Sekhwela, M. (2008). Indigenous knowledge, institutions and practices for coping with variable climate in the Limpopo basin of Botswana. In: *Adaptation to Climate Change*, Leary et al. (Eds) Earthscan.

## Adapting to climate variability and change in Botswana

Some approaches that are being used to adapt to climate variability and change include:

- Ploughing and planting multiple times within a season after rainfall events.
- Soil and water conservation including water harvesting<sup>2</sup>.
- Diversification of livelihoods including harvesting mopane worms and basketry.
- Diversification of crops and livestock<sup>2</sup> and the use of drought resistant crop varieties and livestock breeds<sup>5</sup> e.g. shifting from maize to sorghum and pearl millet.
- Moving livestock to alternative grazing areas<sup>10</sup>.

### Constraints to responding to climate variability and changes

A number of factors in semi-arid Botswana constrain the adaptive capacity of rural communities. These include:

- Lack of institutional support in the provision of policy, planning, information, technical support and infrastructural<sup>3</sup> support in the form of market places and infrastructure to start businesses.
- A disconnect between national and local government<sup>2</sup>.
- Poverty and limited access to capital<sup>2</sup>.
- The provision of aid relief and implementation of initiatives that make people dependent.
- Limited access to natural resources.
- Cultural beliefs.
- Funder driven initiatives.
- Being reactive versus planning ahead.
- Limited opportunities for youth.
- Limited adaptation options including alternative livelihoods.
- The prevalence of HIV/AIDS and Foot and Mouth Disease.
- Lack of information on the costs of adaptation measures and socio-economic impacts.

### Details of two response constraints

1. **Cultural beliefs and superstition** may make communities vulnerable to the effects of climate change as they constrain the uptake of adaptation measures. Rural communities in Botswana attribute climatic changes to a number of factors related to their belief systems, superstitions and limited understanding of information they have at hand. For example in Bobonong some people believe that observed climate anomalies are the result of their people displeasing God whereas others believe extreme droughts are a consequence of their people displeasing their ancestors. Rural communities have a strong preference for traditional crop varieties and approaches and they are reluctant to adopt new measures that are unknown to them, they may not use a measure without proof of its effectiveness and may stop using measures because of superstition e.g. not using a new crop variety again after it is eaten by Quelea birds the first time it is planted.
2. The **provisions of government programmes** that create dependency and stop people from pursuing other productive, more sustainable initiatives make communities vulnerable by reducing their adaptive capacity. For example the uptake of an effective and sustainable beekeeping project in Botswana may have been constrained by the relief provision programme called lpelegeng.

<sup>10</sup> Mogotsi, K., Moroka, A.B., Sitang, O. & Chibua, R. (2011). Seasonal precipitation forecasts: Agro-ecological knowledge among rural Kalahari communities. *African Journal of Agricultural Research* 6, 916-922.

## Conclusions

A review of adaptation measures that have been adopted in semi-arid areas in Botswana suggests that there is an adaptation deficit i.e. a gap between the current state of the system and a state that would minimize adverse impacts from existing climate variability and change. Current adaptation actions are not sufficient and there are many measures that could be applied that are not being applied or are only being applied in localised areas. Further, based on climate projections, which predict temperature increases of more than 1°C by 2050, adaptation measures and livelihoods that are currently relied on may no longer be viable into the future

## Recommendations

- Improved technical capacity to understand climate change and its effects at the national and sub-national level and develop responses and adaptation strategies for implementation<sup>11</sup>.
- More integration and a common goal across different sectors in policy and practice to work towards achieving the implementation of widespread and effective adaptation.
- Alternative livelihood options to be understood and strengthened at the local level.
- Policies and programmes that encourage new and diverse livelihood options<sup>2</sup> and the generation of financial capital<sup>12</sup>.
- Building capacity to increase agency.
- More inclusive adaptation planning.
- Information on adaptation options to be made more readily available.
- An evidence base of the benefits of adaptation as well as demonstrations of these benefits.
- Further understanding and strengthening local coping and adaptation strategies.

**For more information see the ASSAR Regional Diagnostic Studies report for Southern Africa**

<http://www.assar.uct.ac.za/assar-outputs>

## Stakeholder engagement in ASSAR

In the next phase of the ASSAR project, research is going to be conducted in Bobirwa sub-district on well-being, vulnerability, current adaptive responses, barriers and enablers to adaptation and climate vulnerability, impact and adaptation knowledge. Research conducted in the ASSAR project intends to be driven by stakeholder needs and the project aims to influence policy and practice. Therefore stakeholders are invited to actively participate in the research and to provide information on: the most critical issues relating to climate impacts, vulnerability and adaptation in semi-arid areas (including wider development pressures or challenges), and their main research needs to address these issues and strengthen resilience (especially of the more vulnerable social groups), as well as any key initiatives, projects, upcoming events, upcoming policies and documents we should know about. We also welcome requests for climate and adaptation information as well as requests for any information needed to influence policy and practice. Later on in the project stakeholders will be invited to participate in the research findings feedback events, Science-Policy Dialogues and Transformative Scenario Planning workshops aimed at developing adaptation strategies.

<sup>11</sup> Lesolle, D. (2012). SADC policy paper on climate change: assessing the policy options for SADC member states. SADC Secretariat, Gaborone.

<sup>12</sup> Sallu, S.M., Twyman, C. & Stringer, L.C. (2010). Resilient or vulnerable livelihoods? Assessing livelihood dynamics and trajectories in rural Botswana. *Ecology & Society* 15, 3.

