

## Helpdesk Research Report: Climate Change and Zimbabwe

02.10.09

**Query:** What research has been done on climate change in Zimbabwe in the last 3-5 years? How will Zimbabwe be affected by climate change? Who is likely to be most affected and how? What can be done to support Zimbabwe's poor to adapt to the impacts of climate change?

**Enquirer:** DFID Zimbabwe

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### 1. Overview

Little research has been carried out on climate change in Zimbabwe over the past 5 years. In particular, there is a paucity of literature which attempts to disaggregate vulnerability to climate change for different groups in Zimbabwe. Given these gaps, this report also includes broader literature on climate change in southern and eastern Africa where this is deemed to offer transferable lessons for the Zimbabwean context.

#### Impacts

Zimbabwe is vulnerable to climate change principally through shifting rainfall patterns and extreme events. Decreases in rainfall will occur across all seasons but especially during the early and late rains. Increased incidence of drought is expected to be a particular problem. Other potential changes include increased temperatures (especially in the dry season), localised floods and decreased/varying river flow.

Climate change is expected to pose a particular challenge for food production. More frequent and prolonged droughts and increases in temperature can seriously reduce crop yield, especially maize, which is a staple crop in Zimbabwe. Research has shown that net farm revenues are affected negatively by increases in temperature and positively by increases in precipitation. As a consequence, downstream agriculture-based manufacturing industries will also be affected.

Reduced water runoff is also expected to affect the quality and quantity of water available for domestic and industrial use, and limit hydropower production, most significantly at Kariba hydropower station. Other vulnerable sectors include biodiversity, tourism and infrastructure.

Social, economic and political processes affecting human settlements, agricultural patterns and natural resources are likely to exacerbate all of these climate impacts.

The effects of climate change on human health continues to be a matter of scientific debate. Some assessments suggest that climate change can lead to an expansion of the areas suitable for malaria transmission. In the case of Zimbabwe, malaria transmission is more likely to increase than decrease in the central plateau where the population is currently concentrated. However it is noted that non-climatic factors will also influence the future geographic distribution of malaria, including parasite drug resistance, demographic change, changes in land-use patterns, the success of intervention programmes, civil unrest, deterioration of public health systems, and HIV proliferation.

#### Vulnerability

Very little work has been carried out specifically on the vulnerability of different social groups to climate change in Zimbabwe. One recent study in the predominantly rural district of Chiredzi found that the most vulnerable households included female headed households, households with no access to irrigation, and poor households. Furthermore, it has been noted that many rural areas have experienced significant exodus of younger people to urban areas or neighbouring countries in recent years, leaving agricultural activities to the older people and the very young who may not be able to maximise the use of land. As well as the rural poor, the urban poor in Zimbabwe have become increasingly vulnerable over the past few years as urban planning and sanitation systems have become weaker.

More research has been done in other regions of Africa which may offer important lessons for Zimbabwe. Within any country, vulnerability can vary from village to village and even within villages, where droughts or floods often create both winners and losers. One important message is that it is not always the poorest who are most vulnerable to climate change. In some cases for example, irrigation farmers may be at greater risk from an increased frequency of droughts because they are less diversified, and they face a combination of both market and climate risks. Thus, the most vulnerable are often those who are unable to specialise in a non-risky activity, or unable to diversify their livelihoods. They may also include those who are affected by HIV/AIDS, malaria, and other infectious diseases, those who lack access to forests or productive land, and those who have been displaced from their homes due to floods, conflicts, or livelihood shocks. The vulnerable often live in areas that are marginal in terms of services and are also often exposed to a breakdown of security during periods of climate-related stress.

#### Adaptation

According to one commentator, current capacity to adapt to climate change in Zimbabwe has largely been shaped by the strong capacity that the country has built up in the areas of agricultural research, technology development and education on the one hand, and recent socio-economic and political trends that have acted as severe shocks to an otherwise robust system on the other hand.

It is widely noted that farmers in Zimbabwe and southern Africa are already using some adaptation strategies. These include: diversifying crops, planting different crops or crop varieties, replacing farm activities with nonfarm activities, changing planting and harvesting dates, increasing the use of irrigation, and increasing the use of water and soil conservation techniques. Other strategies include engaging in collective action for income-generating activities and access to markets, credit and relief; cash transfers and remittances; and exchange of labour for food.

Communities have considerable experience in adapting to climate variability, and the literature offers a number of conclusions and recommendations for supporting existing adaptation strategies. However, it is recognised that indigenous strategies alone are likely to be inadequate because they often have to operate without any formal government support. Transparent governance is seen as a prerequisite for effective adaptation to climate change. Schooling, basic

professional training and medical care are essential elements of community-level capacity and are indispensable for adaptation to climate variability and change. Other key messages include:

- Financial interventions, where possible, should go directly to communities or through organisations with grassroots connections
- Adequate extension information services are needed to ensure that farmers receive up-to-date information about rainfall patterns
- Increased farmer training and more access to credit and aid facilities are needed.
- Empowerment must be a key component of any adaptive strategy, including policies that enable, rather than inhibit, local and regional adaptation options and that enable greater local freedom to choose appropriate practices
- Policies that ensure that tenure arrangements are safeguarded are needed
- Policies should target women's groups and associations in smallholder rural communities
- Further support for research and development in the agricultural sector is needed.

## 2. Zimbabwe

### Livelihoods/agriculture

**Chigwada, J., 2005, 'Climate Proofing Infrastructure and Diversifying Livelihoods in Zimbabwe' IDS bulletin Vol. 36, No. 4**

According to this paper Zimbabwe is vulnerable to climate change principally through shifting rainfall and extreme events. Social, economic and political processes affecting human settlements, agricultural patterns and natural resources such as water, vegetation and forestry, are likely to exacerbate climate impacts. Drought already affects water supplies, agriculture and access to food which impact negatively on basic health and survival. Zimbabwe is also vulnerable to having a perennially high number of malaria cases.

According to Zimbabwe's Initial National Communications under the United Nations Framework Convention on Climate Change (see further resources), likely impacts in Zimbabwe caused by present trends in climate change include:

- increased water demand for irrigation due to increased evapotranspiration
- a decrease by approximately 30–40 per cent in water yield per dam
- worsening water supply/demand for both industrial and agricultural purposes
- reduced generation of electricity at Kariba hydropower station
- reduced biodiversity and inflow of tourists
- an impact on food security, especially maize, the staple food
- an impact on agriculture-based manufacturing industries
- an impact on health, especially malaria and nutrition.

The second part of this paper (pp 112-116) examines a small group of villages in southern Zimbabwe who have chosen livelihood diversification strategies as a way of increasing their resilience to the pattern of drought and unpredictable events. Based on this and other case studies, it draws the following lessons:

- Communities have considerable experience in adapting to climate variability and deploy sophisticated livelihood diversification strategies if obstacles (lack of legal status, bank accounts) are removed and additional resources provided.
- Regional and national policy makers have realised that by decentralising authority to the local-traditional leaders, the natural resources of the country will be better protected than if determined externally on the basis of someone else's priorities.

- Financial interventions, where possible, should go directly to communities who should form legal entities or through organisations with grassroots connections that practice bottom-up approaches.
- All new infrastructure should be “climate proofed”, i.e. designed to take into account potential climate change impacts which are unlikely to resemble past impacts. Climate proofing may mean ensuring building standards are set for the construction of dams, bridges and roads and guarantee infrastructural development.

The paper also identifies the following priorities for future research:

- Identifying and mapping vulnerable areas and regions to climate change in Zimbabwe
- Documenting indigenous knowledge systems on coping mechanisms to climate variability
- Scaling up best practices by communities on adaptation to climate variability
- Communicating information on weather forecasting to rural communities as adaptation strategies to climate variability
- Finding resistance to drugs of vector-borne disease and ways of eradicating them
- Formulating policies and programmes to address the impact of climate change with a bottom-up approach and the associated socio-economic benefits
- Mainstreaming adaptation into country developmental programmes

**Mano, R, and Nhemachena, C., 2007, ‘Assessment of the Economic Impacts of Climate Change on Agriculture in Zimbabwe: A Ricardian Approach’ CEEPA discussion paper 11**  
<http://www.ceepa.co.za/docs/cdp11.pdf>

A shorter policy note based on this paper can be downloaded from:  
<http://www.ceepa.co.za/docs/POLICY%20NOTE%202011.pdf>

This study examines the potential economic impact of climate change on agriculture in Zimbabwe. The empirical results show that net farm revenues are affected negatively by increases in temperature and positively by increases in precipitation. Changes in net revenue are very high for dryland farming compared to farms with irrigation, indicating that irrigation is an important adaptation option to help reduce the impact of further changes in climate.

The study examined some simple climate scenarios to see how agricultural production in the country would respond to climate change. These showed that:

- a 2.5°C increase in temperature would result in a decrease in net farm revenues by US\$0.4 billion for all farms and increase net revenue from farms with irrigation by US\$0.3 billion.
- a 5°C increase in temperature would result in a decrease in net revenues across all farms, dryland farms and farms with irrigation by US\$0.4 billion, US\$0.5 billion and US\$0.003 billion respectively.
- a 7% and a 14% decrease in precipitation would result in a decrease in net farm revenue by US\$0.3 billion for all farms.

An overview of farmer adaptation to changing climate indicates that farmers are already using some adaptation strategies – such as dry and early planting, growing drought resistant crops, changing planting dates, and using irrigation – to cushion themselves against further anticipated adverse climatic conditions.

Important policy message from the empirical findings are:

- adequate extension information services are needed to ensure that farmers receive up-to-date information about rainfall patterns in the forthcoming season so that they make well-informed decisions on their planting dates.

- net farm performances for smallholder farms can be improved by ensuring increased farmer training and more access to credit and aid facilities and by helping farmers acquire livestock and other important farm assets.
- ensuring the availability and accessibility of fertilizers and crop seeds before the onset of the next cropping season can significantly improve net farm performances across households.

**Unganai, L., 2009, 'Adaptation to climate change among agropastoral systems: case for Zimbabwe' IOP Conf. Series: Earth and Environmental Science 6**  
[http://www.iop.org/EJ/article/1755-1315/6/41/412045/ees9\\_6\\_412045.pdf?request-id=f338a5ab-0177-412e-bdfd-73cf01a7e8f0](http://www.iop.org/EJ/article/1755-1315/6/41/412045/ees9_6_412045.pdf?request-id=f338a5ab-0177-412e-bdfd-73cf01a7e8f0)

This abstract gives a brief overview of the Government of Zimbabwe – UNDP/GEF supported pilot adaptation project: 'Coping with Drought and Climate Change Project' (2008-2012) in the Chiredzi district of south-eastern Zimbabwe. It draws preliminary lessons for adaptation initiatives from the inception phase of the project.

The primary objective of the Project is to demonstrate and promote a range of gender segregated approaches for adaptation to climate change among rural communities currently engaged in agriculture in vulnerable areas of Chiredzi District as a national model. Specific objectives of this project include:

- to develop local capacity to expand the knowledge base on climate change for effective adaptation in the agriculture sector
- to demonstrate a range of viable long term livelihood adaptation options to manage climate variability and change among men and women agropastoralists in Chiredzi district based on identified climate risks;
- to develop local capacity to use climate early warning systems to strengthen adaptation/livelihood strategies in Chiredzi district;
- to disseminate project generated lessons and foster public awareness about potential impacts of climate change to encourage policy changes that encourage adaptation.

The lessons, challenges and experiences emerging from the inception phase revolve around the role of climate information, traditional and contemporary social systems/institutions, and perceptions of roles and approaches for adaptation. The project illustrates the importance of systematic local level climate risk assessment and generating climate change scenarios at appropriate spatial and temporal scales for formulation of adaptation options at a local scale. It also shows that poverty and other core causes of vulnerability often need to be addressed first before impact-oriented adaptation efforts can be effective.

**JIMAT Development Consultants, 2008, 'Coping with Drought and Climate Change Project: Baseline Study', Final Report to EMA and UNDP, Harare**  
<http://www.undp.org.zw/component/content/175.html?task=view&3a1ed061a28f8a5e62fd4865066ea7fa=dirxelcs>

This baseline study for the joint Government of Zimbabwe – UNDP/GEF 'Coping with Drought and Climate Change' Project is based on household questionnaires, focus group discussions and key informant interviews in the Chiredzi district of Zimbabwe. The key findings for the project area were:

- *Vulnerability baseline:* 57% of households were classified as poor, 31% as very poor and 5.6% and 6.5% as better off and moderate, respectively. 59% of Chiredzi's rural population required urgent food assistance. Most vulnerable households included female headed households, households with no access to irrigation and poor households.

- *Exposure and sensitivity to climate shocks:* Drought is the main climate change risk in Chiredzi. Droughts are expected every 3 years, with a major drought expected every ten years. Soils are acidic, high annual rainfall variation, the risk of reduced agricultural productivity is high. Sensitivity to drought was higher for farmers relying predominantly on dryland farming relative to those with access to irrigation schemes.
- *Adaptive capacity:* Current adaptation mechanisms are centred on timing of planting and use of drought tolerant crops and varieties. However, seed availability is in short supply. For livestock farmers, providing feed and water to animals was the main strategy used. There is limited diversification away from agriculture. Level of knowledge of adaptation options is moderately high, but resources for implementation are scarce.
- *Use of seasonal climate forecasts:* 32% of farmers were using scientific climate forecast to inform farm decision making. Use of traditional indicators for predicting climate was also relatively low, mainly because of weak transfer of indigenous knowledge. The key limitations to use of climate forecast information were previous history of unreliability, lack of access and inadequate non-locus specific information for decision making.
- *Awareness of climate change risk:* 81% of respondents interviewed believe that the climate has changed. The main change observed was the delayed season onset (48%), longer and more intense midseason drought spells (21%) and early cessation of rainfall (15%). These changes ultimately culminate in a reduced agricultural season length.
- *Awareness and technical capacity to support climate change adaptation:* Both were low. Linkages between climate change and various sectors were unclear to respondents in both Government and the NGO institutions interviewed. The agricultural commodity marketing policy is constraining adaptation mechanisms.

In addition, the report identifies current practices for adaptation to drought in the project area (pp 64-65):

- *For crop production:* Early planting; dry planting; staggering planting; drought tolerant crops like sorghum and millets; use of wetland to extend growing season length; livelihood diversification into non agricultural activities; non use of fertilizer; conservation farming; early ploughing for moisture conservation; drip irrigation; and supplementary livestock feeding
- *For livestock production:* Harvesting crop residues (stover) and keeping it for the dry season; collecting water for livestock drinking; feeding cattle and goats on Zhombe and Mopane leaves and cane tops and molasses.
- *For coping with food shortage:* Exchange of labour for food (31%); begging from friends and relatives (29%); reduced number and quantity of meals (14%); depending on food aid (14%); barter trade (9%) and sale of livestock to purchase food (1%).

Some of the perceived barriers to adaptation identified were (p 67):

- Limited access to credit
- Limited access to irrigation
- Limited access to social protection mechanisms
- Limited access to climate information
- Gender of decision maker
- Limited access to draught power
- Reliance on monocrops
- Reliance on maize production
- Weak institutions
- Poor access to communication infrastructure
- Markets and policy failure

## Water

**Levina, E., 2006, 'Domestic Policy Frameworks for Adaptation to Climate Change in the Water Sector Part II: Non-Annex I Countries. Lessons Learned from Mexico, India, Argentina and Zimbabwe', OECD, Paris**

<http://www.oecd.org/dataoecd/46/15/37671630.pdf>

This paper examines domestic policy frameworks in the water sector in four developing countries (Argentina, India, Mexico, and Zimbabwe) and identifies how adaptation to climate change can be integrated into these frameworks.

In the case of Zimbabwe the paper offers the following key findings (pp 66-69):

- *Climate change impacts and vulnerability:* Drought is expected to be the biggest problem facing Zimbabwe. Recent projections of precipitation and runoff in Africa suggest a drop of up to 10% in precipitation in most of southern Africa (including Zimbabwe) by 2050. Since some 80% of Zimbabwe's 12.5 million inhabitants are farmers, with 30% of them being city-dwellers but also engaged in agro-industry, the economic damage and human suffering associated with droughts are enormous. Also, 80% of Zimbabwe's electricity supply comes from the Lake Kariba dam, making not only agriculture but also electricity supply reliant on sufficient water.
- *Domestic legal framework:* Zimbabwe has introduced a system of time-limited water abstraction permits, which increase flexibility and allow abstraction to be stopped when water levels become too low. Removal of the private ownership of water and the preferential rights of water owners should allow more equal access to water, which will be important as precipitation patterns change. However, implementation of this system of water abstraction permits is still very weak. Furthermore, land-use provisions and indigenous institutions also play an important role in the water resource management.
- *Institutional set-up:* The water system is very hierarchical in Zimbabwe with successively lower and more local levels having more 'hands-on' responsibilities in the management and allocation of water, but less or no legal standing. Local communities in Zimbabwe are not connected to the whole system of water management. Local concerns and tools used to cope with water stresses are not taken into account by government agencies. As a result, whilst the institutional arrangements for disaster management in Zimbabwe may be in place, the extent to which they can deal with disasters is limited.
- *Water management:* Zimbabwe has moved towards more integrated water resource management. However, implementation is impeded due to the lack of capacity, funds and water users who are able to pay the full cost of water. Some plans have been created to address floods and storms, including warning mechanisms and evacuation procedures. However, there remains a lack of capacity to effectively implement these initiatives.
- *Water policies:* In Zimbabwe demand-driven approaches include attempts to encourage more efficient water use through water pricing and reducing waste through leakage control and improved irrigation efficiency. However, water demand exceeds or threatens to outstrip sustainable levels of supply – and this is likely to be accentuated under climate change.
- *Information availability:* Zimbabwe has a comprehensive data gathering and monitoring network which brings together government, universities, and research institutions.

The paper also draws some broader lessons from all four case study countries about the roles that national policy frameworks can play in adaptation to climate change in the water sector (pp 6-7). A key message is that those factors that contribute to ineffective governance also add to the vulnerability to existing extreme weather events and climate change. Transparent governance based on the rule of law, cooperation among government agencies, and involvement of stakeholders (including local communities) in the decision-making process are prerequisites for effective adaptation to climate change. Schooling, basic professional training and medical care

accessible to all are essential elements of community-level capacity and are indispensable for adaptation to climate variability and change.

Further lessons include:

- A fair and functioning system of water abstraction permits is an important tool that could help reduce water conflicts and encourage efficient use of water.
- Market mechanisms for water sharing provide flexibility and opportunity in water access and should be further developed and incorporated into legal frameworks.
- Institutional capacity and co-operation are essential for effective implementation of water laws and policies, some of which could help adaptation to climate change if enforced.
- The decentralised approach to water resource management could be effective and facilitate adaptation when based on principles of cooperation and information sharing.
- Stakeholder participation should be an integral part of decision-making. Poor communities in drought and flood-prone areas are most vulnerable to extreme weather events. They are currently too far removed from laws and institutions and need to be included in a process of water management, for example, through water user associations.
- The water infrastructure of many developing countries needs further development, since existing infrastructure often cannot provide water security during droughts and protect people during floods.

## Health

**Ebi, K. et al., 2005, 'Climate Suitability for Stable Malaria Transmission in Zimbabwe under Different Climate Change Scenarios', *Climatic Change*, Vol. 73, No. 3**

<http://www.springerlink.com/content/p10m402h13279507/>

Using a range of future climate scenarios, this paper finds that climate suitability for malaria transmission in Zimbabwe is more likely to increase than decrease in the central plateau where the population is currently concentrated. It suggests that most of Zimbabwe could have near-complete climate suitability for stable malaria transmission by 2050 under the scenario showing the greatest change (4.5 °C warming). Among all scenarios, the highlands become more suitable for transmission.

The paper argues that decision makers need to understand how quickly climate suitability might change, because rapid climate change might require different mitigation and adaptation options than a gradual change in climate. For this they need to establish the capacity to monitor changing temperature and precipitation patterns and to establish surveillance programmes to determine changes in malaria incidence or intensity along the edges of its established range.

However, the author stresses that potential geographic distribution does not directly translate into actual cases of malaria. Non-climatic factors will influence whether the future geographic distribution of malaria is different from today, including parasite drug resistance, demographic change, changes in land-use patterns, the success of intervention programs such as Roll Back Malaria (RBM) and the Multilateral Initiative on Malaria (MIM), civil unrest, deterioration of public health systems, and HIV proliferation.

The paper also makes the point that diseases such as malaria create something of a vicious cycle for poorer countries. Malaria is likely to persist without the creation and maintenance of an appropriate public health infrastructure. However, the economic development necessary for these improvements is directly hindered by the presence of malaria itself. Changes in climate have the potential to make it even more difficult for poor countries to reduce the burden of malaria. Thus, a key research goal is to identify which of these many factors are most likely to drive the future distribution of malaria.

### 3. Southern and eastern Africa

#### Micro-level

**IFPRI, 2008, Micro-Level Analysis of Farmers' Adaptation to Climate Change in Southern Africa** <http://www.ifpri.org/sites/default/files/publications/ifpridp00714.pdf>

A shorter research brief based on this paper can be downloaded from:

[http://www.ifpri.org/sites/default/files/publications/rb15\\_07.pdf](http://www.ifpri.org/sites/default/files/publications/rb15_07.pdf)

This study assesses smallholder farmers' adaptation to climate change in southern Africa. It identifies farmers' perceptions of climate change and the determinants of farm-level adaptation strategies, and recommends policies that could help stabilize national and regional food production given the anticipated adverse effects of climate change.

Using cross-sectional survey data and econometric analysis for South Africa, Zambia, and Zimbabwe, the study finds that:

- Most farmers detect a rise in temperature over the past 20 years, drier conditions, and pronounced changes in the timing of rains and frequency of droughts.
- 67 percent of survey respondents are adopting some form of adaptation. Common adaptation measures include diversifying crops, planting different crops or crop varieties, replacing farm activities with nonfarm activities, changing planting and harvesting dates, increasing the use of irrigation, and increasing the use of water and soil conservation techniques.
- Lack of credit, lack of information on climate, and insufficient access to inputs are key obstacles to adaptation
- Awareness of climate change is an important determinant of farm-level adaptation. Access to credit, markets, and free extension services also significantly increase the likelihood of farmers adopting adaptation measures.
- Households with access to electricity and technology such as tractors, heavy machines, and animal power are more likely to adapt to changes in climatic conditions.
- Farmers with access to technology are also more likely to diversify into non-farming activities, although households with large investments in farm equipment and machinery may find such diversification to be costly.
- Farmers who own their land are more likely to invest in adaptation options, including crop and livestock management practices and water conservation.
- Farmers engaged in mixed crop and livestock farming, as well as those engaged in subsistence farming, are more likely to adapt to changes in climatic conditions than are farmers in specialized farming systems.
- Female-headed households are more likely to take up adaptation options than male-headed households.
- Farming experience increases the probability of uptake of all adaptation options.

Policy implications are;

- Policies that ensure access to affordable credit increase farmers' financial resources, allowing them to make better use of available information on climate change and to meet the costs associated with the various adaptation options.
- Policies that ensure farmer access to free extension services have the potential to significantly increase farmers' awareness of changing climatic conditions and their knowledge of appropriate adaptation measures
- Governments should ensure that tenure arrangements are safeguarded, even in the communal systems that characterise most of the region's smallholder farming systems.

- Policies targeting women's groups and associations in smallholder rural communities could further promote adaptation given that women do much of the agricultural work in many rural smallholder farming communities in the region.
- Governments need to support research and development in the agricultural sector, disseminate appropriate technologies, and ensure that cheap technologies are available to smallholder farmers.

**Eriksen, S., Brown, K. and Kelly, P.M., 2005, 'The Dynamics of Vulnerability: Locating Coping Strategies in Kenya and Tanzania', *The Geographical Journal*, 171(4), pp 287-305**  
<http://www3.interscience.wiley.com/cgi-bin/fulltext/118643956/PDFSTART>

This paper uses two case studies of household coping strategies in Kenya and Tanzania to draw out implications for adaptation and adaptive policy more broadly. Whilst recognising that the detailed characteristics of vulnerable households cannot necessarily be transferred to other contexts, it is, they argue, possible to draw conclusions of wider significance:

- In the cases studied, people's own strategies rather than interventions, such as food aid, were critical in managing climate stress. Thus, empowerment must be a key component of any adaptive strategy.
- Various factors exclude sections of the population from adopting particular coping strategies. For example, gendered access to labour power, capital, natural resources and skills and restricted mobility exclude many women from successfully specialising in principal coping strategies. Policies and institutional arrangements should address the factors that enable people to respond effectively.
- At present, some policies may be maladaptive and actually work to re-enforce and enhance constraints. For example, the Tanzania and Kenyan policy focus on increasing the resistance of agriculture to climate variability, including promoting drought resistant crop species and improving water supply to agriculture, might actually reinforce the exclusion of population groups in drylands. Furthermore, these policy efforts met with several challenges: farmers were reluctant to adopt certain drought-resistant species, partly because of their low market and consumption values, and partly because of the high labour investment associated with the cultivation of these species. In addition, the high costs of increasing drought water supply, for example, meant that local efforts would have to be supplemented with external donor funding.
- Relatively few investments go into improving the viability of coping strategies. It may be that the reason that many development interventions are unsuccessful is inadequate understanding of the way that people make a living and build their lives.
- Because of the diverse nature of the coping responses that are employed, and their dynamic nature, no one model for decision-making and policy intervention can easily be applied across any community.

### **Macro-level**

**Eriksen, S., O'Brien, K. and Rosentrater, L., 2008, 'Climate Change in Eastern and Southern Africa. Impacts, Vulnerability and Adaptation', *Global Environmental Change and Human Security (GECHS)*, Oslo** <http://www.bvsde.paho.org/bvsacd/cd68/ClimAfrica.pdf>

### **Impacts**

According to the IPCC, climate change will be a particular challenge for food production in the region. More frequent and prolonged droughts can seriously reduce crop yield and thus affect food security; people making a living in marginal areas will be most severely impacted. Drought-prone areas of Namibia, Botswana, Zimbabwe, Sudan and Ethiopia are likely to be more vulnerable to climate change than more humid areas. For the region as a whole, net productivity

reductions of more than 10 percent are possible in the case of maize and other major crops such as sorghum, millet, sugar cane, and wheat.

Intense rainfall events will increase the incidence of flooding in many areas. However, reduced runoff overall will exacerbate current water stress, reduce the quality and quantity of water available for domestic and industrial use, and limit hydropower production. Water scarcity may also have international consequences and become a source of conflict.

The effects of climate change on human health continue to be a matter of scientific debate. Some assessments suggest that climate change can lead to an expansion of the areas suitable for malaria transmission, and thus increase risk of the disease. Others argue, however, that malaria risk must be interpreted on the basis of local environmental and socioeconomic development, where land use decisions and the ineffectiveness of malaria control programmes may in fact be driving risk.

#### Vulnerability

Within any country, vulnerability can vary from village to village. A comparison of climate vulnerability in two villages in Zimbabwe showed that unequal distribution and access to markets, power structures and breakdown of social networks affect vulnerability differentially. Vulnerability can also vary within villages, where droughts or floods often create both winners and losers. Importantly, it is not always the poorest who are most vulnerable to climate change. In some cases for example, irrigation farmers may be at greater risk from an increased frequency of droughts because they are less diversified, and they face a combination of both market and climate risks.

Thus, the most vulnerable are often those who are unable to specialise in a non-risky activity, or unable to diversify their livelihoods. They may also include those who lack access to forests or productive land, and those who have been displaced from their homes due to floods, conflicts, or livelihood shocks without receiving adequate humanitarian assistance. The vulnerable often live in areas that are marginal in terms of services, leading to health problems, difficulty accessing water, and crop and livestock disease. These people are also often exposed to a breakdown of security during periods of climate-related stress. Households that are affected by HIV/AIDS, malaria, and other infectious diseases are often more vulnerable to climatic events, as they may experience labour shortages during critical periods or a breakup of the family. The report identifies the following groups as particularly vulnerable: elderly populations (especially women), orphans, urban residents, fisheries.

In the case of Zimbabwe, the report identifies the following broad dimensions of vulnerability:

- *Climatic challenges:* Increase of temperature; increased incidence of droughts; decrease in rainfall; seasonal shifts in rainfall; localised floods; decreased/varying river flow; and wildfires.
- *Vulnerable sectors:* Water scarcity; biodiversity loss/tourism; health/disease outbreaks; hydropower; infrastructure; agriculture and food security; and livestock
- *Vulnerability context:* Conflict/post-conflict/insecurity; inequitable land distribution; low education; poor infrastructure; gender inequality; dependence on climate-sensitive resources; poor health status; and HIV/AIDS

#### Adaptation

Across eastern and southern Africa, key strategies for coping with and adapting to the consequences of climate change include: engaging in collective action for income-generating activities and access to markets, credit and relief; cash transfers and remittances; and economic and ecological diversification.

A key point made in this report is that traditional strategies for coping with or adapting to observed changes in climate require a certain degree of flexibility. This requires policies that enable, rather

than inhibit, local and regional adaptation options and that enable greater local freedom to choose appropriate practices.

However, experience from the region so far shows that real local participation and accounting for household coping strategies remain real challenges in the development of adaptation policies because there is a tendency for interventions to focus on sectoral transfers of technology based on physical impacts of projected changes in climate. There is a danger that adaptation solutions prescribed nationally without the participation of those intended to adopt the practices will actually limit rather than create spaces for local adaptation.

Notwithstanding, it is argued that indigenous strategies alone are inadequate for reducing vulnerability to climate change largely because they largely have to operate without any formal government support or facilitation. The local knowledge, networks, customary institutions and local biodiversity that are used for coping are often ignored by the formal financial, technological and institutional framework of most countries.

**Boko, M., I. Niang, A. Nyong, C. Vogel, A. Githeko, M. Medany, B. Osman-Elasha, R. Tabo and P. Yanda, 2007, 'Africa. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change', M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge UK, 433-467. <http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter9.pdf>**

#### Impacts

Section 9.4. of this chapter from the IPCC's 4<sup>th</sup> Assessment Report presents some of the impacts and vulnerabilities that may arise under a changing climate in Africa, using the various scenarios and model projections as guides. It is noted that these estimations are at macro-scales and may mask a range of complex interactions and local-scale differences

- *Water:* There will be a likely increase in the number of people who could experience water stress by 2055 in northern and southern Africa. For southern Africa, almost all countries except South Africa will probably experience a significant reduction in streamflow. Parts of southern Africa are projected to experience significant losses of runoff.
- *Energy:* Even in the absence of climate change, a number of changes are expected in the energy sector. Africa's recent and rapid urban growth will lead to increases in aggregate commercial energy demand and emissions levels, as well as extensive land-use and land-cover changes. These changes will alter existing surface microclimates and hydrology and will possibly exacerbate the scope and scale of climate-change impacts.
- *Health:* By 2100, changes in temperature and precipitation could alter the geographical distribution of malaria in Zimbabwe, with previously unsuitable areas of dense human population becoming suitable for transmission. Strong southward expansion of the transmission zone will probably continue into South Africa. Climate variability may also interact with other vulnerabilities such as populations affected by HIV/AIDS and conflict in the future, resulting in increased susceptibility and risk of other infectious diseases (e.g., cholera) and malnutrition. The potential for climate change to intensify or alter flood patterns may become a major additional driver of future health risks from flooding.
- *Agriculture:* Northern and southern Africa are expected to experience losses of 0.4% to 1.3% GDP as a result of negative changes to agriculture. Southern Africa may experience notable reductions in maize production under certain conditions.

#### Adaptation

Section 9.5. looks at adaptation constraints and opportunities. Of the emerging range of livelihood adaptation practices being observed, diversification of livelihood activities, institutional architecture (including rules and norms of governance), adjustments in farming operations,

income generation projects and selling of labour (e.g., migrating to earn an income) and the move towards off- or non-farm livelihood incomes in parts of Africa are widespread.

The design and use of proactive rather than reactive strategies can also enhance adaptation. Proactive, *ex ante*, interventions, such as agricultural capital stock and extension advice in Zimbabwe, can raise household welfare and heighten resilience during non-drought years. In many cases these interventions can also be coupled with disaster risk-reduction strategies. Other factors that could be investigated to enhance resilience to shocks such as droughts include: national grain reserves, grain future markets, weather insurance, the role of food price subsidies, cash transfers and school feeding schemes.

**IISD and NSS, 2007, 'Early Lessons from Implementation of Climate Change Adaptation Projects in South-eastern Africa', Regional Workshop in Maputo, Mozambique, April 24 and 25 [http://www.iisd.org/pdf/2007/early\\_lessons\\_workshop\\_report.pdf](http://www.iisd.org/pdf/2007/early_lessons_workshop_report.pdf)**

The key lessons which emerged from this regional workshop on adaptation experiences in south-eastern Africa were:

- There is a clear need across the region to form partnerships and understand vulnerabilities to climate variability and change. However, this needs to be accomplished from the affected communities' perspectives. Existing institutional arrangements must be used to identify and understand vulnerabilities and response strategies. The sustainability of responses, both to short-term natural disasters and long-term adaptation must be incorporated into planning. For disaster response, there must be integration into development strategies.
- Impacts and adaptation in the health sector is important for most countries. More research into this field is needed. In this sector also, the inclusion and participation of various stakeholders is crucial.
- Better energy policy and regulation is required to mitigate negative effects on this sector. However, most technologies (for alternative energy creation) and costs still lie with developed countries and not enough 'hand-over' takes place to developing countries.
- There is a need for more rigorous, participatory and socially-sensitive project processes (including learning assessments). Understanding must reach the donor sectors, so that more projects can be funded and the adaptive capacity of vulnerable communities can be ensured.

#### **4. Further resources**

##### **Zimbabwe**

**Zimbabwe Ministry of Mines, Environment and Tourism, 1998, 'Zimbabwe's Initial National Communication on Climate Change', prepared for the United Nations Framework Convention on Climate Change', Government of Zimbabwe, Harare**  
<http://unfccc.int/resource/docs/natc/zimnc1.pdf>

**Government of Zimbabwe, 1998, 'Expected Impacts of Climate Change Vulnerability and Adaptation Assessments in Zimbabwe;**  
<http://www2.ohchr.org/english/issues/climatechange/docs/submissions/Zimbabwe.pdf>

**Government of Zimbabwe, 2009, 'Report on the Climate Change Roundtable', Kadoma, 15 - 16 April**  
[http://www.africaclimatesolution.org/features/Report\\_climate\\_change\\_roundtable\\_Zimbabwe.pdf](http://www.africaclimatesolution.org/features/Report_climate_change_roundtable_Zimbabwe.pdf)

Zimbabwe Ministry of Environment and Tourism, 2008, 'Report on the Climate Change Awareness and Dialogue Workshop for Mashonaland Central and Mashonaland West Provinces', Caribbea Bay Hotel, Kariba, Zimbabwe, 29-30 September  
[http://www.undp.org.zw/images/stories/Docs/Climate%20Change%20Awareness%20and%20Dialogue%20\(2\).doc?3a1ed061a28f8a5e62fd4865066ea7fa=dirxelcs](http://www.undp.org.zw/images/stories/Docs/Climate%20Change%20Awareness%20and%20Dialogue%20(2).doc?3a1ed061a28f8a5e62fd4865066ea7fa=dirxelcs)

Zimbabwe Ministry of Environment and Tourism, 2004, 'Technology Transfer Needs Assessment In Zimbabwe', Report to UNFCCC  
[http://unfccc.int/ttclear/pdf/TNA/Zimbabwe/Zimbabwe-draftTNA%20\\_Combined.pdf](http://unfccc.int/ttclear/pdf/TNA/Zimbabwe/Zimbabwe-draftTNA%20_Combined.pdf)

'We Need Policies That Address Climate Change' Interview with Washington Zhakata, national coordinator of Zimbabwe's Climate Change Awareness Programme  
<http://www.ipsnews.net/news.asp?idnews=43325>

UNDP Zimbabwe: Support for Strengthening National Capacity for Disaster Management  
<http://www.undp.org.zw/component/content/193.html?task=view&3a1ed061a28f8a5e62fd4865066ea7fa=ayuodyvj>

UNFCCC Database on Local Coping Strategies: <http://maindb.unfccc.int/public/adaptation/>

Adaptation Learning Mechanism: Zimbabwe country profile:  
<http://www.adaptationlearning.net/country-profiles/zw>

#### **Key resources on adaptation**

AIACC, 2007, 'A Stitch in Time: Lessons for Climate Change Adaptation from the AIACC Project', Working paper, Assessments of Impacts and Adaptations to Climate Change (AIACC) Project  
[http://www.aiaccproject.org/working\\_papers/Working%20Papers/AIACC\\_WP48\\_Leary\\_etal.pdf](http://www.aiaccproject.org/working_papers/Working%20Papers/AIACC_WP48_Leary_etal.pdf)

AIACC, 2007, 'Climate Change Vulnerability and Adaptation in Developing Country Regions Draft Final Report of the Assessments of Impacts and Adaptations to Climate Change (AIACC) Project, April  
[http://www.aiaccproject.org/Final%20Reports/Final%20Reports/Draft%20Final%20Report\\_AIACC\\_April%202007.pdf](http://www.aiaccproject.org/Final%20Reports/Final%20Reports/Draft%20Final%20Report_AIACC_April%202007.pdf)

OECD, 2009, 'Policy Guidance on Integrating Climate Change Adaptation into Development Co-operation', OECD, Paris  
[http://www.awepa.org/images/stories/2009\\_2010/Programmes/Climate\\_change/oecd%20guidelines%20cc.pdf](http://www.awepa.org/images/stories/2009_2010/Programmes/Climate_change/oecd%20guidelines%20cc.pdf)

Eriksen, S. et al., 2007, 'Climate Change Adaptation and Poverty Reduction: Key interactions and critical measures', GECHS, Oslo  
<http://www.sei.se/mediamanager/documents/Publications/Climate/climatechangeadaptationpovertyreduction.pdf>

Commission on Climate Change and Development, 2009, 'Closing the Gaps: Disaster risk reduction and adaptation to climate change in developing countries', CCCD, Stockholm  
[http://www.awepa.org/images/stories/2009\\_2010/Programmes/Climate\\_change/report%20swedish%20climate%20committee.pdf](http://www.awepa.org/images/stories/2009_2010/Programmes/Climate_change/report%20swedish%20climate%20committee.pdf)

Tearfund, 2006, 'Adapting to climate change. Challenges and opportunities for the development community', Tearfund, Teddington  
<http://www.tearfund.org/webdocs/website/Campaigning/policy%20and%20research/Adapting%20to%20climate%20change%20discussion%20paper.pdf>

## 5. Additional information

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### **Websites visited include:**

IIED, IDS, World Bank, Zero Regional Environment Organisation, Coordination Unit for the Rehabilitation of the Environment (CURE), Malawi, CLACC, IISD, AllAfrica.com, SADC, Centre for Environmental Economics and Policy in Africa (CEEPA), CIESIN, IPCC, Millennium Ecosystem Assessment, OECD, Community Based Adaptation Exchange, ACTS Kenya, Practical Action, IDRC, AIACC, GECHS, African Journal of Agricultural and Resource Economics, UNFCCC, ALM, Wikiadapt, UNEP, IUCN Southern Africa

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