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Climate change impacts, vulnerability and adaptation in Zimbabwe

Donald Brown, Rabecca Rance Chanakira, Kudzai Chatiza, Mutuso Dhliwayo, David Dodman, Medicine Masiiwa, Davison Muchadenyika, Prisca Mugabe and Sherpard Zvigadza

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This paper reviews impacts, vulnerability and adaptation to climate change in Zimbabwe, with the intention of providing a broad overview of the key issues related to climate change facing this particular country. It draws on a set of background papers that were produced by the Policy and Advocacy for Climate Change in Zimbabwe project funded by the UK Department for International Development (DfID) and implemented by IIED, the Zimbabwe Regional Environment Organisation (ZERO), and Dialogue on Shelter. These papers examine climate trends, scenarios and projections for Zimbabwe and draw upon a variety of case studies on adaptation projects (see Annex 1). This working paper highlights the main themes, findings and conclusions arising from these studies and examines their implications for future research and policy. While its primary relevance is for policy-makers, practitioners and researchers in Zimbabwe, it is anticipated that the general lessons are relevant for a broader set of countries that are dealing with similar environmental, demographic and institutional challenges, particularly in sub-Saharan Africa.

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Background research papers and case studies addressed Local Climate Change Impacts in Zimbabwe (Prisca Mugabe); Economics of Climate Change Adaptation in Zimbabwe (Medicine Masiiwa); Policy and Legal Framework for Climate Change (Mutuso Dhliwayo); Climate Change and Housing in Zimbabwe (Kudzai Chatiza and Davison Muchadenyika); Climate Change and Gender (Rabecca Rance Chanakira); Meeting the Health Needs of People Living with HIV and Aids in the Framework of Climate Change in Zimbabwe (Verengai Mabika); Impacts of Climate Change on Agriculture in Zimbabwe (Leonard Unganayi); Water and Gender Issues in Zimbabwe (Swedish Cooperative Centre); and Climate Change Impact on Water Resources in Zimbabwe (ZIMNET).

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Contents

Acronyms

ACTS	African Centre for Technological Studies
AfDB	African Development Bank
CADS	Cluster Agriculture and Development Service
CBA	Community-based Adaptation
CBAA	Community based Adaptation in Africa
CGA	Climate Governance in Africa
CSS	Community Systems Strengthening
DfID	UK Department of International Development
DRI	Development Reality Institute
ECA	Economic of Climate Adaptation
GDP	Gross Domestic Product
GEF	Global Environment Facility
GNI	Gross National Income
GoZ	Government of Zimbabwe
HDI	Human Development Index
ICT	Information Communication Technology
IDRC	International Development Research Centre
IEC	Information, Education and Communication
IIED	International Institute for Environment and Development
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
LDC	Least Developed Country
LDS	Lutheran Development Services
MDGs	Millennium Development Goals
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NGO	Non-governmental Organisation
ORAP	Organisation for Rural Associations of Progress
PLHIV	People Living with HIV/ AIDS
SADC	Southern African Development Community
SEI	Stockholm Environmental Institute
SNC	Second National Communication
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDESA	United Nations Department for Economic and Social Affairs
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
UNHRC	United Nations Human Rights Council
UNICEF	United Nations Children's Fund
UNISDR	United Nations International Strategy for Disaster Reduction
WEDO	Women's Environment and Development Organisation
ZELA	Zimbabwe Environmental Law Association
ZERO	Zimbabwe Regional Environment Organisation
ZIMNET	Zimbabwe National Environment Trust
ZNNP+	Zimbabwe National Network of People Living with HIV and AIDS

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Executive summary

THIS PAPER REVIEWS IMPACTS, VULNERABILITY AND adaptation to climate change in Zimbabwe, with the intention of providing a broad overview of the key issues related to climate change facing this particular country. It draws on a set of background papers that were produced by the Policy and Advocacy for Climate Change in Zimbabwe project funded by the UK Department for International Development (DfID) and implemented by the International Institute for Environment and Development (IIED), the Zimbabwe Regional Environment Organisation (ZERO) and Dialogue on Shelter. These papers examine climate trends, scenarios and projections for Zimbabwe and draw upon a variety of case studies on adaptation projects. This working paper highlights the main themes, findings and conclusions arising from these studies and examines their implications for future research and policy. While its primary relevance is for policy-makers, practitioners and researchers in Zimbabwe, it is anticipated that the general lessons are relevant for a broader set of countries that are dealing with similar environmental, demographic and institutional challenges, particularly in sub-Saharan Africa.

Climate records demonstrate that Zimbabwe is already beginning to experience the effects of climate change, notably rainfall variability and extreme events. These conditions, combined with warming trends, are expected to render land increasingly marginal for agriculture, which poses a major threat to the economy and the livelihoods of the poor due to Zimbabwe's heavy dependence on rain-fed agriculture and climate sensitive resources. It is expected that farmers, who represent approximately 62 per cent of the total population, will bear disproportionate impacts due to their limited adaptive capacity. Consequently, climate change poses a major threat to sustainable development at the micro and macro levels.

Climate change is expected to have adverse effects on a variety of socio-economic sectors that are closely linked to the Millennium Development Goals (MDGs). Climate-induced water stress threatens to decrease the quantity and quality of drinking water in rural and urban areas, reduce the run-off necessary to sustain the country's hydro-electric power supply, and contribute to declining agricultural productivity. The increasing frequency and intensity of extreme weather events are likely to intensify the existing natural hazard burdens for at-risk populations (especially in cities) and damage and destroy infrastructure. The increasing geographic range of infectious disease vectors (e.g. malaria) will also affect public health, especially among people living with HIV/ Aids (PLHIV) groups. In addition, climate change is likely to intensify the gender dimensions of vulnerability, especially among female-headed households.

In response, a growing number of non-governmental organisations (NGOs) and research organisations, including United Nations (UN) agencies, are engaging in adaptation and development activities using a variety of approaches including community-based adaptation (CBA). Many of the projects demonstrate that autonomous strategies that were effective in dealing with past climate variability are becoming increasingly ineffective for coping with emergent climate change. As a result, there is a growing need for accurate and useful climate data to inform adaptation strategies that can anticipate future climate. Effective climate governance is also needed in order to guide coordinated action.

Zimbabwe has prepared its Second National Communication for submission to the United Nations Framework Convention on Climate Change (UNFCCC), and the Ministry of Environment and Natural Resources Management has begun to develop a national 'Climate Change Response Strategy' through a consultative process involving other government ministries, civil society organisations, academic institutions, and the private sector. Although climate change is addressed by environmental legislation, it is widely recognised that such policies are insufficient in light of the severity of climate change and the scale and scope of vulnerability. Governance is also fraught with institutional challenges, including limited capacity and poor relations between civil society and the government. Within this policy context, applied research has an important role to play in informing the development of adaptation strategies that respond directly to the needs and vulnerabilities of women and men, in raising climate change as a policy priority at all levels, and in informing an integrated approach to future climate policy-making.

1 Introduction

Recent reports produced by the Intergovernmental Panel on Climate Change (IPCC) (2001, 2007, 2012) conclude not only that green-house gas emissions are already beginning to change the global climate, but also that Africa will experience increased water stress, decreased yields from rain-fed agriculture, increased food insecurity and malnutrition, sea-level rise, and an increase in arid and semi-arid land as a result of this process. Extreme weather events, notably flood, drought and tropical storms are also expected to increase in frequency and intensity across the continent (IPCC, 2007). These projections are consistent with recent climatic trends in southern Africa, including Zimbabwe. The effects of this exposure to changes in climate are exacerbated by the high levels of sensitivity of the social and ecological systems in the region, and the limited capacity of civil society, private sector and government actors to respond appropriately to these emerging threats.

It is widely recognised that Africa is one of the most vulnerable regions in the world due to widespread poverty, limited coping capacity and its highly variable climate (Madzwamuse, 2010; UNFCCC, 2007). Zimbabwe is particularly vulnerable due to its heavy dependence on rain-fed agriculture and climate sensitive resources (Chagutah, 2010). Agriculture's sensitivity to climate-induced water stress is likely to intensify the existing problems of declining agricultural outputs, declining economic productivity, poverty and food insecurity, with smallholder farmers particularly affected. Extreme weather events, notably drought, flood and tropical storms, are also likely to threaten development gains across a variety of sectors and intensify existing natural hazard burdens for at-risk populations in both rural and urban areas. Consequently, climate change presents risks to lives and livelihoods at the individual level and to the economy and infrastructure at the regional and national levels (Hellmuth *et al*., 2007). Climate change adaptation is therefore a principal development challenge in Zimbabwe.

Addressing the challenges of climate change will ultimately require both taking action to reduce emissions in an effort to prevent irreversible changes to climate (i.e. mitigation) and taking action to limit climate impacts in an effort to deal with the changes that are expected to occur (i.e. adaptation). Specifically, the UNFCCC (2007) urges developing countries to prioritise climate change adaptation due to their higher vulnerable. This paper synthesises recent background papers on climate change adaptation in Zimbabwe, which were produced by the Policy and Advocacy for Climate Change in Zimbabwe project led by IIED-ZERO (see Appendix 1 – Summaries of Background Papers). The papers examine climate trends, scenarios and projections for Zimbabwe and

Box 1

Key terms and definitions

- **Climate change:** A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer (IPCC, 2007).
- **Climate change impacts:** The effects of climate change on natural and human systems (IPCC, 2007).
- **Vulnerability:** Vulnerability is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity (IPCC, 2007).
- **Adaptation:** The process through which societies increase their ability to cope with an uncertain future, which involves taking appropriate action and making the adjustments and changes to reduce the negative impacts of climate change (UNFCCC, 2007).
- **Disaster risk reduction:** "The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broader context of sustainable development." (UNISDR, 2004, pp. 17)

draw upon a variety of case studies on adaptation projects. This working paper highlights the main themes, findings and conclusions arising from these studies and examines their implications for future research and policy.

This paper is composed of four sections: Section 1 examines climate change, trends and projections within the Zimbabwean context; Section 2 examines aspects of vulnerability; Section 3 examines adaptation case studies; and Section 4 examines the legislative framework and climate governance. The conclusion synthesises challenges and lessons learnt from the case studies, and presents recommendations for future research and policy.

1.1 Socio-economic context

Zimbabwe is a landlocked country in southern Africa, bordered by Zambia to the northwest, Mozambique to the east, Botswana to the southwest and South Africa to the south (see Figure 1). Zimbabwe has a total land area of 391, 000 square kilometres and a population of approximately 13 million people (AfDB, 2011). The highest levels of economic growth were recorded between 1980 and 1990 with an average GDP growth rate of 5.5 per cent - higher than the average for sub-Saharan Africa during the same period. However, economic performance declined sharply between 2000 and 2008 due to economic mismanagement, governance issues and the loss international support (*ibid*). The economic collapse was largely triggered by disruptions to the commercial agricultural sector following the introduction of Zimbabwe's Fast Track Land Reform Programme in 2000. The programme facilitated the acquisition of large-scale commercial farms for redistribution to primarily landless indigenous populations (Chagutah, 2010). During this period, poverty levels grew markedly leading to an increased dependence on natural resource exploitation. This period also corresponded with temperature increases, erratic rainfall patterns and recurrent drought, all of which exacerbated suffering, especially for people living in rural areas where approximately 62 per cent of the population resides (*ibid*).

Figure 1. *Location map of Zimbabwe*
Source: Mapcruzin.com

1.2 Climate change in Zimbabwe

Zimbabwe lies in a semi-arid region with limited and unreliable rainfall patterns and temperature variations. Rainfall exhibits considerable spatial and temporal variability (see Figure 2) characterised by shifts in the onset of rains, increases in the frequency and intensity of heavy rainfall events, increases in the proportion of low rainfall years, decreases in low intensity rainfall events, and increases in the frequency and intensity of mid-season dry-spells (Unganai, 2009). Extreme weather events, namely tropical cyclones and drought have also increased in frequency and intensity (Mutasa, 2008). Moreover, according to the Zimbabwe Meteorological Service, daily minimum temperatures have risen by approximately 2.6°C over the last century while daily maximum temperatures have risen by 2°C during the same period (see Figure 3).

Changes in climate have resulted in more arid environments for agricultural production, which has shifted Zimbabwe's five main agro-ecological zones (or 'natural regions') (see Appendix 2 – Zimbabwe's Agro-Ecological Zones). Rainfall patterns and crop production progressively deteriorate from Region I to V. For example, Chinhoyi and Chibero and their surroundings have shifted from natural region II to natural region III while Kwekwe and its surroundings have shifted from natural region III to natural region IV. In addition, natural region I has reduced in size, natural region II has shifted further east and natural region III has shifted to the north. Overall, the climate in Zimbabwe is regionally differentiated, but is generally becoming warmer with more erratic rainfall patterns.

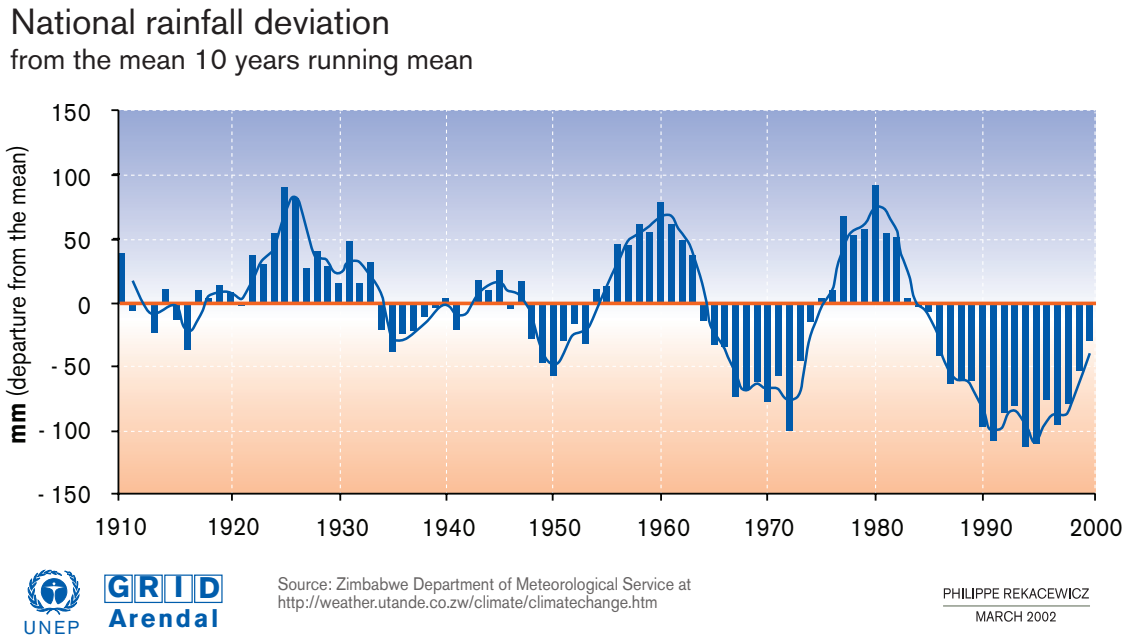

Figure 2. *National rainfall deviation*

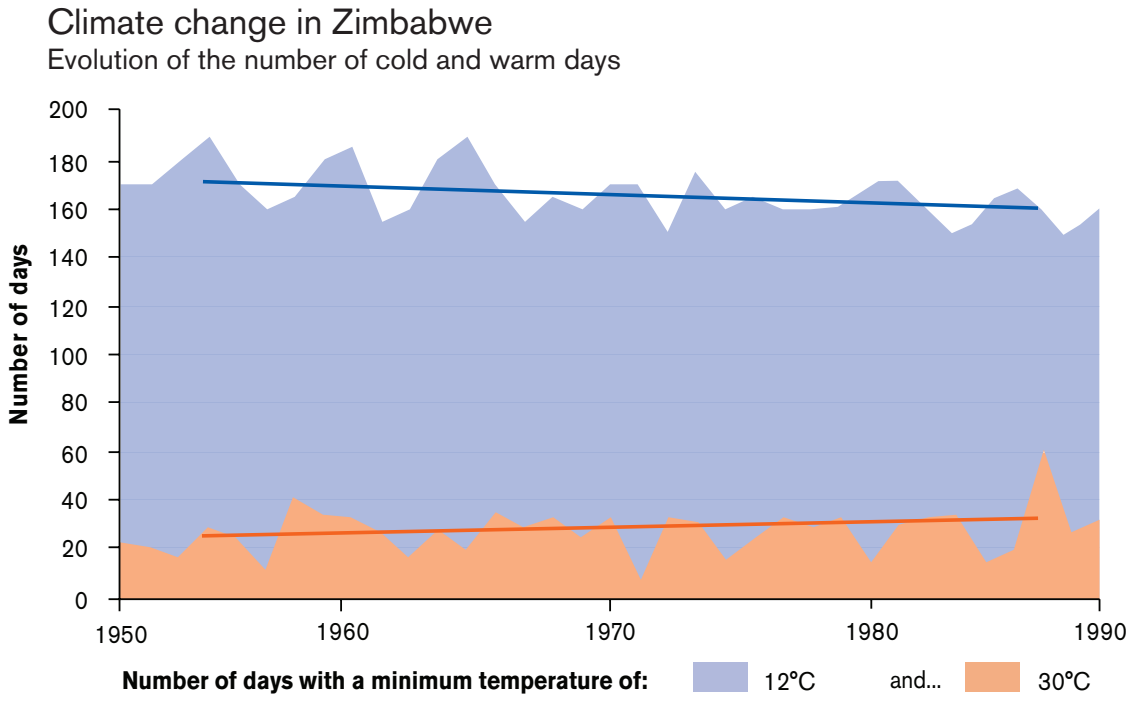

Figure 3. *Evolution of the number of cold and warm days*

Two studies by the Department of Geography and Environmental Science at the University of Zimbabwe (Murwira, unpublished; Murwira *et al*., unpublished) developed best and worst case regional climate change scenarios for the years 2020, 2050 and 2080 using CSIRO and HADLEY Global Climate Models. Table 1 demonstrates that the projected climate impacts are regionally differentiated and likely to adversely affect a variety of sectors. Overall, warming trends and water stress caused by rainfall variability are likely to generally increase the vulnerability of communal agricultural land. However, while land suitable for maize production is expected to decrease overall, land suitable for other crops (i.e. sorghum and cotton) is expected to increase in some areas, but decrease in others. Water stress is also likely to adversely impact public health, water availability, forestry and biodiversity, rangelands, human settlements and tourism.

Table 1

Sectoral climate change issues in Zimbabwe

Sector	Projected climate change impacts
General	■ Predicted warming of around 20 C by 2080 ■ Present southwest-northeast-east rainfall gradient will become steeper
Agriculture	■ General vulnerability of communal agriculture to climate change and variability ■ Generally, maize suitable areas will decrease by 2080, while cotton and sorghum suitable areas will increase by 2080 ■ In the south western parts of the country, sorghum and maize will become increasingly vulnerable to climate change while cotton will become less vulnerable ■ In the north central and eastern parts of the country, maize, sorghum and cotton will become less vulnerable
Water	■ Overall, surface water resources are projected to be reduced significantly by 2080 irrespective of the scenario used ■ North eastern and the eastern parts of Zimbabwe are predicted to experience a surplus in surface water while the western and southern parts of Zimbabwe are projected to experience a drying up ■ Runoff will decrease significantly in the Umzingwane, Shashe, Nata, and Save catchments
Health	■ The area under high to extremely high malaria hazard will tend to increase by 2080 ■ High malaria hazard will be concentrated in the low lying parts of the country including the Zambezi valley, and the South-east lowveld
Forestry and biodiversity	■ Expected minimum pressure on plant diversity for best and worst case scenarios is 42%
Rangelands	■ Net Primary Production (NPP) will decrease from the current average maximum of over 8 tonnes per hectare per year to just over 5 tonnes per hectare per year by 2080 ■ This translates to decreased rangeland carrying capacity for both livestock and wildlife ■ Southwest and north-western parts of Zimbabwe will experience more reductions in NPP than in other parts of the country
Human settlement	■ Any reduction in available water will lead to increased water scarcity
Tourism	■ With decreasing rainfall and rising temperatures, significant declines in biodiversity are expected to occur in most parts of the country especially the western regions where most of the park estates are located ■ Lower resilience of ecosystems to other global environmental changes

Source: Murwira, unpublished; Murwira, et al., unpublished)

The expected climate impacts presented in Table 1 correspond with four main IPCC (2007) projections for Africa: 1) agricultural production and food security will be compromised (with very high confidence); 2) water stress will be aggravated (very high confidence); 3) ecosystems will change at a rate faster than expected (very high confidence); and 4) human health, already compromised by a range of factors, will be further negatively impacted (e.g. malaria) (high confidence). In addition, according to the IPCC (2012) *Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*, there is medium confidence that droughts in southern Africa will intensify in some seasons due to reduced precipitation and/or increased evapotranspiration. The report also expects climate change to have significant impacts on the severity and magnitude of future climate extremes. Downscaled-empirical models for Zimbabwe reflect similar expectations, as demonstrated by Chiredzi District (see Box 2). The case studies presented on Wedza and Gokwe Districts (see Box 3 and 4) also demonstrate a concurrence between the experiences and observations of farming communities, agricultural data, and empirical data on precipitation and temperature trends, all of which demonstrate changes in climate.

Box 2

Climate projections in Chiredzi District

Probability estimates show that moderate, severe and extreme droughts are highly likely in January to March in 2 out of every 10 years. Droughts extending for 3, 6, 12 and 24 months tend to re-occur at 2 to 4 year intervals, whereas 48 month long droughts recur in intervals of 8 to 16 years.

Downscaled future climate change projections show an increase in surface annual temperatures of 1.5 to 3.5 C by 2046-2065 across the District. Rainfall models are less certain, with 7 models suggesting rainfall increases during the first part of the season followed with decreases, and three models suggesting drier conditions (GoZ-UNDP,GEF, 2009). Under the worst case scenario, temperature increases significantly and rainfall declines by 50 per cent by 2020. For the best case scenario, temperature increases slightly and rainfall increases.

Box 3

Climate impacts in Wedza District

Mapfumo *et al*., (2010) conducted a three-year case study on climate change impacts in Wedza District. Wedza Districted is located in agro-ecological region II. Wedza is regarded as having reasonable agricultural potential due to favourable precipitation patterns (800 mm of annual rainfall). Rainfall is unimodal occurring typically between November and March, punctuated by mid-season (January) dry spells resulting in a growing season of approximately 120 days. Livelihoods are mainly crop production based, with mixed crop- livestock systems hinged on maize production, as well as groundnut, soya bean and cowpea. The majority of maize cultivars are susceptible to soil moistures stress and are therefore vulnerable to frequent droughts and prolonged mid-season dry spells, which are increasingly coming to characterise Zimbabwe's rainfall. Lack of access to agro-inputs, poor soil fertility and increasing climate variability are major challenges to combating food insecurity. Table 2 highlights the perceptions of smallholder farmer's on the impact of climate change on agriculture.

Most farmers were aware that climate was changing in their localities. Almost all observed changing trends in weather patterns, notably changing rainfall distributions, increased drought incidences and unpredictable wind movements and cyclones. Among the indicators for climate variability were seasonal rainfall, indigenous fruit productivity, winter coldness and summer heat, the presence or absence of some insects, disease incidences and pest outbreaks. The Wedza case demonstrates that poor quality of rainfall seasons is the main constraint to achieving predictable agricultural outputs that ensure sustainable livelihoods.

Table 2

Smallholder farmer's perceptions of climate change in Wedza

Indicators	Causes
■ Increased drought incidences ■ Reduced rainfall and shortening of rainy seasons ■ Unpredictable wind movements resulting in 'cyclones' ■ Changes in seasonal temperature regimes (very hot summers and very cold winters) ■ Prolonged winter seasons ■ Marked delays in onset of rainy seasons ■ Alternating floods and droughts within same seasons ■ Disappearance of wetlands and declining water reservoirs	■ Deforestation ■ Poor farming practices destroying soil and water resources ■ The rise of industries, towns and cities ■ Increasing incidences of veld/wild fires ■ Lack of respect of traditional cultural and religious values (e.g. violation of sacred places, cutting down of sacred trees, non-performance of rain-making ceremonies) ■ Unexplained natural forces

Box 4

Climate impacts in Gokwe District

Gwimbi (2009) conducted a case study of Gokwe District to assess the impacts of climatic variability on cotton production, the vulnerability of cotton farmers to climatic variability and their adaptation strategies. Gokwe is Zimbabwe's largest district and is situated within agro-ecological zone III. Gokwe is one of Zimbabwe's most significant producers of cotton, which is a principal cash crop for the country and for local farmers. Climate change impacts in Gokwe are thus expected to have significant local and national economic impacts.

The study found that the majority of farmers observed increases in temperature, decreases in rainfall and more frequent drought events, which reflects trends in the statistical data over a 30 year period (See Figure 4). Correlation tests also demonstrated a significant relationship between increases in temperature, decreases in rainfall and declines in cotton outputs. All farmers pointed to the drought years of 1981-82 and 1991-92 as having severely reduced their cotton output. In addition, declining cotton outputs was also found to negatively impact social and human capital. This was demonstrated by incidences of parents pulling their children from school due to lost income, migration of productive age groups to urban areas in search of alternative livelihoods and increased antisocial behaviour in the town centre.

2 Aspects of vulnerability in Zimbabwe: sectoral issues and cross-cutting themes

At the macro level, the impacts of climate change in Zimbabwe, particularly rainfall variability and extreme events, are expected to adversely affect a variety of socio-economic sectors that are closely linked to the MDGs (revisit Table 1). A variety of interrelated vulnerability themes are identified by the background papers, including agriculture, water, health, infrastructure and energy, human settlements and gender, which are examined in detail below.

Although systematic research has been undertaken on key sectors through the United Nations Framework Convention on Climate Change (UNFCCC) planning process, less is known about micro-level vulnerability due to a lack of research (Chagutah, 2010). In general, the supplementary case studies for each theme demonstrate that vulnerability in Zimbabwe is closely related to existing development needs, especially among poor people who commonly lack the adaptive capacity to cope with the additional stresses posed by climate change. Adaptive capacity is typically limited by poverty, poor public and environmental health, weak institutions, lack of infrastructure and services, marginalisation from decision-making processes and planning procedures, gender inequality, lack of education and information, natural disasters, environmental degradation, reliance on rain-fed agriculture and climate-sensitive resources, and insecure tenure (UNFCCC, 2007).

While poor people generally possess the lowest levels of adaptive capacity, the IPCC (2012) emphasises the importance of recognizing the differences in vulnerability within groups and between communities (IPCC, 2012). Levy (2009) and Mary (1996) question the failure of development practice to consider diversity and difference by defining populations in categorical terms (e.g. the poor), which has led to the exclusion of vulnerable groups. In reality, vulnerability is a function of a variety of social, economic, and political factors that influence the distribution of risk across society (Action Aid International, 2005; Huq and Reid, 2007).

2.1 Agriculture

The economy and the livelihoods of the poor in Zimbabwe are highly vulnerable to climate change due to their heavy reliance on rain-fed agriculture (see Box 5, 6). Agriculture accounts for approximately 15-18 per cent of Zimbabwe's GDP and approximately 60 per cent of the raw materials required by the manufacturing industry and 40 per cent of total export earnings (GoZ, 2010). As demonstrated by Figure 6, rainfall variability is closely linked with economic growth, which reflects the dominance of the agricultural sector and its vulnerability to water stress.

Figure 5 also demonstrates substantial declines in agricultural production since 2000. Between 1993 and 2000, average annual maize production stood at 1.64 million tonnes before dropping to 1.08 million tonnes between 2001 and 2008. In addition, the average yield for maize during the 2009-2010 farming season was 0.7 tonnes per hectare, down from 0.85 tonnes per hectare in 2008-2009. In 2007, only 45 per cent of national cereal requirements were produced in the country, leaving a deficit of over 610,000 metric tonnes to be covered by imports (FEWSNET, 2007). Similarly, cattle population declined from approximately 6.1 million in 2000 to 5 million in 2011, while dairy production dropped from over 100,000 cows in 2000 to approximately 22,000 cows in 2010.

Rising temperatures and increasing rainfall variability, notably drought, are also expected to exacerbate declining agricultural outputs, further compromising economic growth and stability, employment levels, food insecurity, demand for other goods, and poverty reduction. In particular, climate change is expected to lead to the expansion of marginal lands (IPCC, 2007), which is already beginning to occur in Zimbabwe (see Section 1.2). If changing climatic conditions continue to expand these regions, traditional agricultural systems will become increasingly unsustainable.

Even diversified livelihood systems with a livestock component are expected to become more vulnerable. Mixed crop-livestock systems are a traditional livelihood strategy of smallholder farmers in semi-arid rural areas (Kahinda *et al*., 2007; Wani *et al*., 2009). These systems tend to be well adapted to climatic conditions characterised by erratic rainfall patterns. However, climatic variability in semi-arid areas poses major threats to natural processes that sustain fodder production for livestock and moisture for rain-fed crop production (Tadross *et al*., 2009). Pasture and crop production in the absence of appropriate management practices are at risk of frequent failure with predicted future rainfall expected to be reduced or punctuated by concentrated heavy events separated by prolonged dry spells.

Source: Zimbabwe Department of Meteorological Services

Figure 4.
Rainfall and cotton output scenarios in Gokwe District

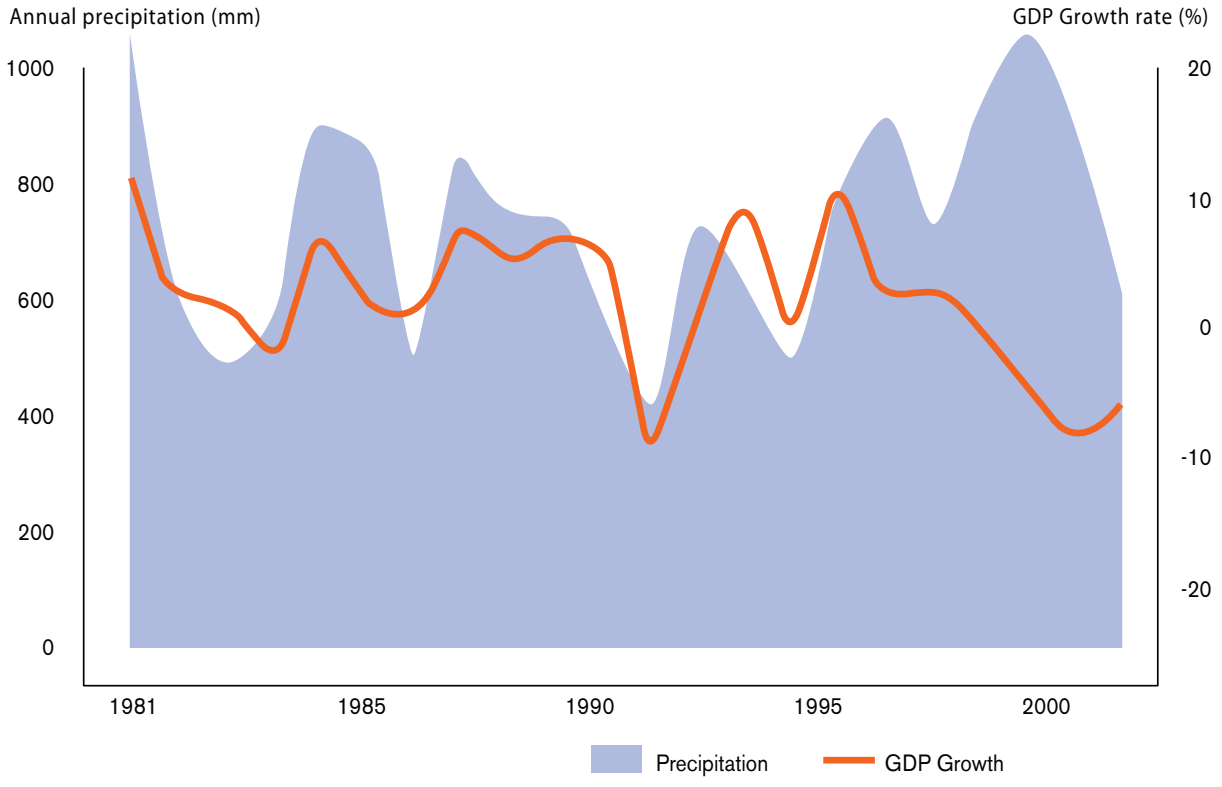

Figure 5.
Rainfall variability and economic growth in Zimbabwe

Box 5

Major crop varieties in Zimbabwe

Food crops: Maize (staple crop), small grains, wheat, ground nuts and beans.

Cash crops: Tobacco, cotton, sugar cane, soya bean and horticulture are the main cash crops.

Other crops: Coffee, tea and sunflower

Livestock: Beef and dairy cattle, goats, sheep, pigs and poultry.

Box 6

Agricultural vulnerability in Chiredzi District

Smallholder farmers in Chiredzi District are exposed to one of the harshest climates of Zimbabwe as a result of its location in Natural Region V. In this region, rainfall is too low (generally below 450 mm per season) and erratic for meaningful production of any crop under rain-fed conditions. During the 1991/92 rainfall season, Chiredzi District received a seasonal rainfall total of only 127 mm. Most crops were a complete failure and livestock perished in the thousands. Even drought tolerant crops such as sorghum and millet provide only marginal yields under existing climatic conditions. The region's meagre rainfall levels are also highly variable, which presents challenges for developing appropriate adaptation strategies by farmers. Temperatures in the district have warmed by up to 0.6^{0}C between 1966 and 2005, worsening water balance challenges associated with enhanced evaporative water loss (GoZ-UNDP/GEF, 2009).

Farmers in Chiredzi District face a number of additional challenges, including production, marketing, finance, policy and human vulnerability. However, inter-annual and intra-seasonal climate variability is by far the predominate risk factor for rain-fed agriculture production systems. The majority of crop failures are associated with either a lack of or excess rainfall. Climate variability is also greatly associated with marketing risks. Unanticipated forces, such as inclement weather, drought conditions, crop failure or bumper harvests, or pest or disease outbreak, can lead to dramatic changes in crop and livestock prices. Limited adaptive capacity was also found to significantly impact upon vulnerability.

If no adaptation measures are taken, yields from rain-fed agriculture are expected to decrease by up to 50 per cent by 2020. Maize, the country's staple crop, is particularly vulnerable due to its intolerance to drought. Consequently, climate change is likely to exacerbate food insecurity, especially during prolonged drought events, which are becoming more frequent and intense. According to the IPCC (2007), it is estimated that parts of sub-Saharan Africa will incur agricultural losses estimated to be between 2-7 per cent of GDP. Moreover, projected reductions in crop yields could amount to 50 per cent by 2020 and crop net revenues could decline by as much as 90 per cent by 2100, with small-scale farmers bearing disproportionate impacts (*ibid*).

2.2 Water

Persistent drought in Zimbabwe has severely strained surface and ground water systems, contributing to the country's deteriorating water supply. Surface water (mostly rivers and dams) is the major source of water in Zimbabwe accounting for 90 per cent of supply. There are no large floodplains and swamps because of the semi-arid climate and topography. The potential to use ground water has not yet been realised mainly due to the unaffordability of the required technology. There is also limited knowledge on how much ground water the country has. However, surface water is prone to high loses due to evaporation caused by high temperatures. In 2007, evaporation led to extremely low water levels in most of Zimbabwe's dams, causing many to be decommissioned (see Section 2.4.2). The situation becomes worse with climate change where evaporation is predicted to increase by between 4-25 per cent in the river basins. Runoff is also projected to decline by up to 40 per cent, with the Zambezi Basin worst affected. At the same time, annual rainfall levels based on the 1961–90 average are projected to decline between 5–20 per cent by 2080 in all of the country's major river basins. These projections will worsen the existing deficiency of water resources, particularly in the agro-ecological zones IV and V as described above.

At present, the vast majority of Zimbabwe's water (80 per cent) is used in the agricultural sector followed by the urban and industrial sector (15 per cent), rural authorities (2 per cent), conservation (2 per cent) and mining (1 per cent) (GoZ, 2010). Estimates by the International Union for Conservation of Nature and Natural Resources indicate that Zimbabwe's water demand far outstrips supply by 631 million m3. In urban areas, small towns and growth points, access to safe water and sanitation is approximately 90 per cent (GoZ, 2010). However, access to safe and reliable water and sanitation has fallen to approximately 40–60 per cent nationwide. Harare, the capital city, supplies only half of its daily water demand of approximately 1,200 mega litres per day. This situation is common in other towns, such as Bulawayo, Norton, Chitungiwa and Ruwa (Chagutah, 2010).

In rural areas, water coverage was 75 per cent in 1999, but by 2007, a third of the rural population was estimated to lack access to improved drinking water. Approximately 65 per cent of the water facilities in the rural areas are non-functional (GoZ, 2010). Zimbabwe's water and sanitation infrastructure

is generally aged and therefore more expensive to maintain, thereby compounding any challenges presented by reduced availability of rainwater.

2.3 Health

Growing evidence suggests that climate change will affect human health through increases in floods, storms, fires and droughts; changes to the range of infectious disease vectors, including the geographical range of malaria and other mosquito-borne diseases, such as dengue; increases in the burden of diarrhoeal diseases, and of water-borne pathogens such as cholera; and an increase in cardio-respiratory morbidity and mortality associated with ground level ozone. Climate change is also expected to exacerbate the effects of human-induced ozone depletion in the Southern hemisphere, further worsening this situation (Karoly, 2003).

The erratic water supply situation in Zimbabwe has already contributed to an increase in water-borne diseases. A nationwide cholera epidemic in 2008, one of the largest outbreaks in recorded history, affected over 100,000 people, killing over 4,000 (GoZ, 2010). Moreover, the potential for cross-contamination of water and sanitation systems make recurrent outbreaks of cholera during the rainy season a major risk factor during flood events, as experienced in Malawi (UNICEF, 2008). Zimbabwe is also vulnerable to having perennially high cases of malaria (Chigwada, 2009). According to the IPCC (2007), by 2100, changes in temperature and precipitation are likely to alter the geographic distribution of malaria in Zimbabwe, with previous unsuitable areas of dense human population becoming suitable for transmission. Disease epidemics in addition to food insecurity, chronic malnutrition and HIV/AIDS are eroding the resilience of households, rendering them less resilient and more vulnerable to hazard shocks.

The Zimbabwe National Network of People Living with HIV and AIDS (ZNNP+) is particularly concerned with how health crisis will affect the vulnerability of PLHIV groups. It is estimated that approximately 14.3 per cent of those aged 15 years and above were infected with HIV/AIDS as of 2010 (GoZ, 2009). PLHIV groups face multiple vulnerabilities, which climate change will intensity, particularly within low lying, food insecure areas. Cases of diarrhoea in some instances can be severe to the extent of weakening immune systems among infected people. Adequate water supply and sanitary facilities are of the utmost importance in reducing diarrhoea and other infectious diseases, but are severely lacking in both rural and urban areas.

Despite growing health concerns, government authorities and civil society are increasingly concerned with Zimbabwe's capacity to respond to humanitarian emergencies. In 2010, the Ministry of Agriculture, Mechanisation and Irrigation Development indicated that six provinces in Zimbabwe will become food insecure, and that recurrent malaria outbreaks and cholera epidemics will become more prevalent. These threats demonstrate Zimbabwe's fragility, calling into question its ability to cope with minor emergencies, which can easily turn into crises.

2.4 Infrastructure and energy

2.4.1 Infrastructure

The Fourth Assessment Report of the IPCC reports that Africa is one of the most vulnerable continents to climate change, a situation aggravated by the interaction of 'multiple stresses', including limited infrastructure (e.g. transport, energy, ICT, water, sanitation and irrigation). The African Development Bank (AfDB) (2011) estimates that Zimbabwe requires approximately $14.2 billion to rehabilitate existing infrastructure. Zimbabwe's roads, in particular, were once considered to be among the best in southern Africa, but are now in a state of disrepair due to years of neglect. Climate-related hazards, including extreme localised floods are worsening this situation. For example, the severe flooding in Domboshava during Cyclone Eline in 2000 caused substantial damage to infrastructure, including bridges and schools.

The rail and air transport system in Zimbabwe has also deteriorated significantly in the past ten years. Rail capacity utilisation has dropped from 53 per cent in 2000 to 15 per cent in 2009 (GoZ, 2011). The tonnage moved has also declined significantly from 9.5 to 2.7 tonnes during the same period. As a result, heavy vehicles are now responsible for moving the majority of heavy tonnage, which is contributing to road damage. Some of the infrastructural deterioration is, however, attributable to neglect, mismanagement and inefficiencies on the side of institutions involved. This has created a situation whereby infrastructure is both inadequate for current needs, and more likely to be adversely affected by climatic shocks and stresses.

The socio-economic costs of climate change to infrastructure will likely be high if no action is taken. Non-adaptations could lead to the damage and destruction of infrastructure, which will affect all sectors of the economy. As a result, the right policy choices are critical in ensuring that future infrastructure is climate resilient (i.e. able to withstand increases in climate variability and mean changes) and able to reduce risks among vulnerable groups (Corfee-Morlot and Cochran, 2011).

2.4.2 Energy

The literature on energy and climate change focuses largely on the potential of 'green' technology to contribute to a new low-carbon economy (de Gouvello *et al*., 2008; Never, 2011). While climate change mitigation is an important aspect of development, less than 10 per cent of the rural population in sub-Saharan Africa has access to modern energy services, with just over 20 per cent of the total population connected to electric power supply (AfDB, 2008). As a result, energy provision remains one of Africa's principal development challenges. However, climate change is likely to compromise energy development, especially hydropower, which represents 45 per cent of electric power generation in sub-Saharan Africa (*ibid*; Bates *et al*., 2008).

The commercial energy sector in Zimbabwe is dominated by electricity, while fuel wood provides the majority of energy for domestic use in rural areas. The majority of electricity is produced by the Kariba dam with a capacity to generate 750 MW (40 per cent of national supply), Hwange thermal power

station (46 per cent of national supply), Harare thermal power station (5 per cent of national supply), Bulawayo thermal power station (4.5 per cent of national supply) and Munyati thermal power station (5 per cent of national supply). However, energy output has been compromised by recurrent electricity shortages over the past ten years. While national electricity demand is about 2.200 MW, only about 1200 MW is generated in Zimbabwe. Low water supplies since 2007 has also meant that the Kariba hydro-power station is operating at only 87 per cent of its full capacity. Drought conditions created by climate change are expected to reduce run-off, further reducing the water levels required to support the operation of dams. The thermal powers station, especially in Hwange are also constantly failing due to outdated technology.

2.5 Human settlements

Urban populations in low-and-middle income nations are most vulnerable and therefore likely to be disproportionately affected by the direct and indirect impacts of climate change (Dodman and Satterthwaite, 2008; Satterthwaite *et al*., 2007). Almost all of the urban growth between 2010 and 2030 is expected to occur in low-and-middle income nations with the highest rates of growth occurring in Africa (Johnson, 2010; UNDESA, 2011). This means that urban areas are becoming increasingly important sites for combatting climate change (Romero-Lankao and Dodman, 2011).

Urban areas in Africa accommodate large proportions of their populations in hazard-prone areas, including coastal settlements, flood plains and steep slopes. As a result, climate impacts, notably the increased frequency and intensity of extreme weather events (e.g. floods and cyclones), are likely to intensify the existing natural hazard burdens for at-risk populations, particularly in informal settlements and slums (See Table 3) (Douglas *et al*., 2008; Pelling and Wiser, 2009). For example, the floods in the Zambezi and Limpopo valleys in 2000 destroyed substantial housing stocks. Further, the IPCC (2012) reports that disaster risk will continue to grow in many countries as more people and their assets concentrate in areas exposed to weather extremes. Dodman and Satterthwaite (2008) examine how the urban poor are likely to be disproportionately affected because they face multiple vulnerabilities, including higher exposure (e.g. living in hazard-prone areas); lack of protective infrastructure (e.g. drainage systems); lack of state planning and assistance (e.g. disaster preparedness, response and recovery); less adaptive capacity (e.g. limited assets to invest in resilience); and less financial and legal protection (e.g. lack of insurance and insecure tenure).

Table 3
Post-2000 cyclones in Zimbabwe and their impacts

Incident	Dates	Extent of damage	Affected areas
Eline	Mid Feb 2000	Widespread damage; 2.7 million people affected, 91 deaths, 357 injuries, 59,187 huts were destroyed	Manicaland, Matabeleland South, Midlands, Masvingo
Japhet	3 March 2003	6 deaths	Masvingo, Midlands South, Manicaland South and parts of Mashonaland East.

The effects of urbanisation and climate change are converging in Zimbabwe. The major cities of Harare, Bulawayo, Mutare and Gweru reached population growth rates of over 5 per cent per annum throughout the 1980s. However, overall urbanisation rates have remained relatively constant between 2-3 per cent since the 1970s with an estimated 38.1 per cent of the total population living in urban areas in 2010 (see Table 4).

Table 4
Level of urbanisation in Zimbabwe, 1950 to 2010

1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
10.6%	**11.6%**	**12.6%**	**14.6%**	**17.4%**	**19.9%**	**22.4%**	**25.4%**	**29.0%**	**31.7%**	**33.8%**	**35.9%**	**38.1%**

Source: United Nations, Department of Economic and Social Affairs, Population Division (2012). World Urbanisation Prospects: The 2011 Revision, CD-ROM Edition.
Data drawn from Censuses of 1951, 1962, 1969, 1982, 1992 and 2002; Estimate for 1974.
Definition of urban areas: Designated urban areas, as well as places with at least 2,500 inhabitants, whose population residents in a compact settlement pattern and where more than 50 per cent of the employed persons are engaged in non-agricultural occupations (UNDESA, 2011).

Over the past decade, urbanisation has become synonymous with the rapid growth of informal settlements and slums in peri-urban areas. Zimbabwe's slum prevalence, which was lowest in sub-Saharan Africa at 3.4 per cent of the urban population in 2001, has risen dramatically to 18% in 2006 (UN-Habitat, 2008). Much of this growth has been attributed to overcrowding. Notable examples include sections of Dzivarasekwa Extension, Caledonia and Hatcliffe in Harare where people have squatted on state-owned land. Such areas typically lack municipal trunk sewers, basic water and sanitation, roads and other forms of municipal infrastructure and services, which all play important roles in mediating disaster risks, especially in hazard-prone areas.

emperature increases are also likely to be intensified by the urban heat island effect, which will further degrade air quality and increase energy demand for cooling. Moreover, increasing water stress will worsen declining energy outputs due to Zimbabwe's dependence on hydro-electric power (see section 2.4.2) and contribute to existing water shortages in cities (as experienced in Harare) and food insecurity during drought episodes. Increased mobility, including rural-urban migration, could also become more prevalent if autonomous adaptation strategies fail to cope with future climate variability. Mobility has increased in many countries in southern Africa where climatic variability and declining agricultural productivity, among other stresses, have jeopardised rural livelihoods (Potts, 2006; Sall *et al*., 2011; Simon and Leck, 2010; Stringer *et al*., 2010). The migration of younger more economically active people to urban areas and abroad has often intensified the vulnerability of young and old people who may not be able to maximise the productivity of land (JIMAT Development Consultants, 2008).

Despite growing vulnerability in human settlements, urban policy in Zimbabwe does not explicitly address climate change. Outdated master plans have also failed to effectively regulate development, as demonstrated by the rapid growth of slums. Experts point to the lack of a national climate change framework as a primary reason for why climate change has not been properly integrated into policy (see Section 4.0 - Legislative Frameworks and Climate Governance). In addition, since informal settlements are widely regarded as 'illegal', they are under constant threat of eviction. For example, the Zimbabwean government introduced Operation Murambatsvina, a slum-clearance campaign, in 2005 that affected nearly 700,000 people (see Kamete, 2008; Musemwa, 2010). However, recent urban development projects are demonstrating a paradigmatic shift towards pro-poor policy. For example, the Zimbabwe Homeless People's Federation, Dialogue on Shelter and the City of Harare are implementing a five-year slum upgrading programme in Harare. Slum upgrading can reduce the impacts of climate change on the urban poor by planning vulnerability out of and by building resilience into communities through the redevelopment process.

2.6 Gender

Climate change presents a significant threat to human security, especially for women who represent 70 per cent of the world's poor. It is widely recognised that climate change will exacerbate the gender dimensions of vulnerability, which arise from existing social inequalities and gendered divisions of labour (see Table 5) (Alber, 2009; Brody *et al*., 2008; Dodman, 2010; WEDO, 2008). In addition to the disproportionate effects of disasters on women's mortality and morbidity, climate change is expected to jeopardise women's livelihoods by reducing economic opportunities, especially for female headed households (Dodman, 2010).

In Zimbabwe, 70 per cent of women are smallholder farmers dependent on rain-fed agriculture and climate-sensitive resources (Madzwamuse, 2010). Women are therefore particularly vulnerable to the knock-on effects of climate change. For example, women in some areas of Shurugwi reported a shift in livelihood strategies to beer brewing, which led to higher alcoholism and an increase in domestic violence and abuse against women. In other cases, the impacts of drought and extreme weather have resulted in changes to gender ascribed roles regarding water collection, which have led to additional responsibilities (see Box 8).

Box 7
MDG 7 status conditions in Zimbabwe

- Water shortages persistent in urban areas.
- 65% rural water points non-functional.
- Access to water dropped from 70% in 1999 to 61% in 2009. It is estimated that it will take five years to increase water access levels.
- Rural sanitation coverage dropped from 60% in 1999 to 30.5% in 2006.

Source: GoZ and UNDP(2011)

Although women (and children) are expected to be disproportionately affected by climate change, they remain largely absent from decision-making processes on climate change adaptation and disaster risk reduction. This is demonstrated by the absence of gender in policy frameworks involving the management and protection of environment and natural resources in Zimbabwe (Chagutah, 2010). This is ultimately counter-productive, considering that women often play central roles in adaptation and post-disaster recovery. Accordingly, the United Nations International Strategy for Disaster Reduction (UNISDR) Hyogo Framework for Action states that "a gender perspective should be integrated into all disaster risk management policies, plans and decision-making processes, including those related to risk assessment, early warning, information management, and education and training" (UNISDR, 2009, pp. 4). Future planning must incorporate a gender-sensitive perspective, which requires an understanding of the ways in which climate change can intensify pre-existing inequalities between men and women (Chagutah, 2010).

2.7 Costs of impacts and adaptations

The case studies above clearly demonstrate the need for adaptation. According to the IPCC (2007), the benefits of strong and early action on adaptation far outweigh the economic costs of inaction. The estimated cost of inaction is equivalent to between 5 per cent and 20 per cent of global gross domestic product (GDP) per year, whilst the costs of adapting to the worst impacts are around 1 per cent of global GDP per year. According to the World Bank (2010), during the period 1999-2000, natural disasters resulted in damages constituting between 2-5 per cent of an exposed countries GDP. These figures are consistent with the findings of the Economics of Climate Change (ECA) Working Group, which found that current climate related losses in developing countries are between 1-2 per cent of annual GDP. This figure is expected to increase markedly by 2030 under a scenario of high climate change (ECA, 2009).

Adaptation costs as a percentage of GDP could be considerably higher in sub-Saharan Africa than in any other region, largely due to lower GDPs and the higher cost of adapting water resources. Since 2000, Zimbabwe has

Table 5
Vulnerability of women to climate change

Climate Impact	Underlying socio-economic risk factors	Vulnerability of women
Crop failure	■ 70% of women in Zimbabwe are smallholder farmers	■ Strain on food provision ■ Increased agricultural workload
Shortage of safe, clean drinking water	■ Gendered division of household labour	■ Additional time required to travel greater distances to collect water from alternative sources, which may not be clean/ safe ■ Exposure to violence / sexual abuse when travelling to and from water sources
Disease	■ Gender division of reproductive labour/ care giving ■ Cultural restrictions on mobility	■ Additional time required to care for young, sick and elderly ■ Women of all ages lack access to health care services
Migration	■ Males may contribute little to household income (e.g. remittances) ■ Women who become de facto household heads may face difficulties in retaining control over land and other productive assets due to unequal property and land rights	■ Increased domestic / agricultural workload ■ Decreased coping capacity and insecure tenure
Disaster	■ Women and children often lack skills, knowledge and resources	■ Women and children are more likely to die than men during disaster events
Displacement	■ Particular problems in temporary housing / relocation sites	■ Women and young girls face higher rates of sexual abuse and violence
Resource scarcity	■ 70% of the world's poor are women ■ Women have lower levels of educational attainment ■ Women are over-represented in the informal sector ■ Women earn lower wages and have limited access to markets	■ Limited time and resources to invest in more resilient land and shelter ■ Limited resources to invest in alternative livelihoods

Source: Compiled from Brody et al., (2008); Dodman (2010); WEDO (2008)

Box 8
Chirume Village

Although cyclone Japhet occurred ten years ago, the Chirume community in Shurugwi District is still experiencing its impacts. Heavy rainfall during the cyclone destroyed a nearby dam, which served as the community's central water source. The dam also provided water for a one hectare communal garden plot, which supported the majority of the community's income and protected its food security. With the dam gone, the garden's alternative water source became a small seasonal stream that dried in August during peak crop demand. The second alternative stream was located one kilometre away, requiring farmers to walk considerable distances to collect water, which resulted in the greater involvement of men and young males. This in turn freed more time for women to tend to crops threatened by drought. During the 2008 and 2010 season, the village experienced a prolonged mid-season drought in January that destroyed most crops in the absence of an accessible and reliable water source. This increased the burden among women to maintain agricultural productivity and food security.

The case of the Chirume community demonstrates how an extreme weather event can have lasting repercussions for vulnerable farming communities who live in drought-prone areas. This case also demonstrates how climatic variability can result in changes to gender ascribed roles as a form of coping mechanism.

The case of the Chirume community demonstrates how an extreme weather event can have lasting repercussions for vulnerable farming communities who live in drought-prone areas without irrigation systems. The cyclone exposed the community's sensitivity to drought, resulting in women and children bearing the additional responsibility of water collection.

experienced notable economic challenges. Between 2000 and 2007, the GDP fell by a cumulative 40 per cent due to reduced agricultural outputs caused by rainfall variability, drought and the farm disturbances caused by land reform (World Bank, 2010). The GDP further plunged by 14 per cent in 2008. The World Bank estimated that inflation reached an all-time high of 500 billion per cent in September 2008, while unemployment rates declined to approximately 90 per cent. Consequently, the costs of adaptation are likely to be especially high in Zimbabwe due to its macro-economic problems. Based on existing trends and climate projections, it is highly likely that the agricultural sector will be most affected, with significant implications for the economy.

3 Responding to climate change: lessons from practice

THE PREVIOUS SECTION DEMONSTRATES THAT A variety of socio-economic sectors in Zimbabwe are likely to be adversely affected by climate change, with potentially significant costs. In response, a growing number of NGOs and research organisations, including UN agencies, are engaging in a variety of development projects, many of which have strong adaptation components. The UNFCCC (2007) defines adaptation as the process through which societies increase their ability to cope with an uncertain future, which involves taking appropriate action and making the adjustments and changes to reduce the negative impacts of climate change (UNFCCC, 2007). The two main types of adaptation are autonomous (indigenous responses) and planned (conscious policy options or response strategies). Whilst adaptation can focus on changes to infrastructure or behaviour, the majority of the case studies support behavioural changes related to agricultural livelihoods.

The background papers examine a number of case studies that employ a variety of approaches to climate change adaptation and disaster risk reduction, notably community-based adaptation (CBA) (see Box 9).The following case studies feature examples of these approaches, which predominately focus on agricultural livelihoods.

3.1 Case studies

3.1.1 Coping with drought and climate change in Chiredzi District

The Coping with Drought and Climate Change Project led by the Government of Zimbabwe (GoZ), United Nations Development Programme (UNDP) and Global Environmental Facility (GEF) (2009) used CBA to assess vulnerability and to develop adaptation strategies for smallholder farmers in Chiredzi District (see also Box 2). The project followed a five step approach:

1. *Assessment of the current and future climate risks and identification of those considered most important by smallholder farmers.*
2. *Assessment of the vulnerability of livelihood systems.*
3. *Identification and assessment of locations of vulnerable communities ('hot-spots').*
4. *Participatory identification of priority adaptation strategies.*
5. *Implementation of pilot projects in 'hot spots'.*

The project identified five types of drought of concern to farmers, including: early season, mid-season, terminal, seasonal and extreme drought. This method coupled with a participatory root-cause analysis of livelihood vulnerability informed the identification of priority adaptation strategies by the farmers in response to drought impacts, including: crop failure; lack of water for irrigation; livestock deaths; lack of fodder; loss of income; food shortages; loss of biodiversity; and stress. The results were used to inform the development of planned adaptations (see Table 6).

Box 9
CBA characteristics

Purpose: To develop community-based adaptation strategies aimed at enhancing adaptive capacity (i.e. the ability to anticipate, cope with, respond to and recover from climatic variability and extremes)

Approach: Adaptation as development (i.e. addressing the underlying socio-economic risk factors that exacerbate vulnerability)

Geographic focus: Contextually grounded at the community level in low-and-middle income countries

Methods: Participatory processes in decision-making, planning and implementation

Knowledge: Knowledge co-production between development/ climate change/ disaster risk reduction practitioners and communities

Source: Adapted from Ayers and Forsyth (2009) and Dodman and Mitlin (2011)

Table 6
Estimated costs of selected adaptation strategies

Area of intervention	Adaptive strategy	Cost (USD$)
Improvements in water availability for agriculture	■ Large scale irrigation	$6000/ha
	■ Rehabilitation of irrigation scheme	$3500/ha
	■ Community garden	
	■ Bucket drip irrigation	
	■ Drum kit irrigation	$3000/ha
	■ Treadle pump	$2200/ha
	■ In-field rainwater conservation technologies	$308/ha
		$100/ha
Improvements in rainfed crop production	■ Optimizing crop mixes	$160/household
Improvements in livestock production	■ Optimizing breed mix	$765/household
	■ Management and conservation of locally available fodder for the dry season and drought periods	$108/household
Nature conservation as an alternative source of livelihood	■ Nature conservation (Natural Resources Management)	$550/ household
	■ Captive crocodile breeding	$1250/household
	■ Aquaculture	$250/household
Climate information	■ Local level climate monitoring for decision support	$30/household
	■ Application of medium to long range forecasts	

3.1.2 Managing climate vulnerability in Makuwerere Ward

Lutheran Development Services (LDS) undertook a CBA project in the Makuwerere Ward of Mberengwa District in response to the impacts of climate variability on people's livelihoods related to perennial food shortages, high levels of environmental degradation, and reduction in the productive capacity of agricultural land.

LDS utilised a participatory approach to empower beneficiaries to take the leading role in planning, monitoring and evaluation of their own projects and encouraged the community to make their own decisions, consulting with LDS and other experts for technical advice when desired. Through dialogue meetings, LDS cross-checked community perceptions with climate trends and introduced concepts related to climate change. The core aim of the project is to enhance community livelihoods and promote more sustainable natural resource management practices. The objectives were three-fold:

1 *Promote the sustainable utilisation of the community's woodlands through renewable energy.*

2 *Raise awareness of climate change and to build the community's coping capacity to cope through the installation of fuel saving stoves.*

3 *Contribute towards policy review at national level.*

The main project activities included: woodlot establishment; construction and use of wood saving stoves; gulley reclamation conservation farming; and, documentation of climate change initiatives and policy recommendations related to climate change. Although these activities are principally focused on emissions reduction, they also have positive impacts on building adaptive capacity and sustainable livelihoods.

3.1.3 Mainstreaming climate change adaptation and disaster risk reduction at the district, provincial and national levels

Since January 2006, Practical Action has been implementing an action learning research and development project on mainstreaming livelihood centred approaches to disaster risk reduction in Bulilima, Mangwe and Gwanda Districts. The project aims to establish models where livelihood-centred approaches to disaster management are linked with wider institutional structures involved in disaster and development planning. The project is also designed to learn lessons from experiences in implementing this approach, including an analysis of best practice in building consensus amongst stakeholders on how to link most effectively with and support communities' own disaster planning in a sustainable way. It also aims to influence policy makers at all levels involved in disaster management and development planning to adopt a livelihood-centred approach to disaster risk management.

The project is placing growing emphasis on working with communities through local partner NGOs in order to develop locally-based disaster preparedness and reduction strategies using the livelihood-centred approach to resilience. The evidence produced from the case study areas has provided the basis for advocacy strategies to influence policymakers at district, provincial and national levels resulting in the official adoption of a livelihoods centred approach to disaster risk

reduction, which marked a policy departure away from post-disaster emergency response.

3.1.4 Increasing food and livelihood security in Matabeleland South Province

Practical Action undertook a CBA project between August 2006 and February 2010 in 15 rural wards in Bulilima, Mangwe, Gwanda and Matobo Districts in Matabeleland South Province. The project sought to increase food and livelihoods security among vulnerable communities in drought prone environments. The overall project objective was to strengthen community capacities to integrate the food security needs of vulnerable socio-economic groups into local development plans. Specifically the project sought to increase uptake by vulnerable households of improved technologies for food production and diversification. The principal implementing agency was Practical Action in partnership with Organisation for Rural Associations of Progress (ORAP) and Hlekweni Friends Rural Services Centre.

The key project components and elements with emphasis on their relationship to climate change issues were:

1. *Soil and water conservation techniques namely dead level contours, planting basins, infiltration pits, low cost water storage facilities.*
2. *Climate resilient open pollinated seed varieties through seed multiplication of drought, disease and pest tolerant crops.*
3. *Adapted goat breeds and breeding schemes through local management through community based animal health workers (paravets).*
4. *Integration of livelihood centred disaster risk reduction.*

Progress made in meeting project objectives: 65 per cent of households have reduced food gaps from 6 months to 2 months from their own production and reduced goat kid mortality rates from 65 per cent at the start of the project to 18 per cent.

3.1.5 Adaptation among PLHIV groups led by ZNNP+

ZNNP+ piloted projects using the community systems strengthening (CSS) approach in Mutoko, Mashonaland Central and Muzarabani Mashonland West. The goal of CSS is to develop the capacity of key affected populations and communities, community organisations and networks, and public or private sector actors that work in partnership with civil society at community level in the design, delivery, monitoring and evaluation of health services and activities. CSS initiatives aim to improve the outcomes of interventions that target major health challenges such as HIV, tuberculosis, malaria, among others.

ZNNP+ trained its members in strategic alliances and collaboration in times of need. The project involved various partners, including United Nations Children's Fund (UNICEF) and local NGOs, such as Cluster Agriculture and Development Service (CADS) and Development Reality Institute (DRI). CADS in partnership with ZNNP+ undertook a needs assessment to establish the impact of the changes to food security and nutrition needs of the support group members and their families. The needs assessment identified the local resources available and the support systems PLHIV were accessing in times of emergency. The assessment enabled CADS to strengthen the adaptive capacity of PLHIV groups through innovative agriculture practices that enhance food security for vulnerable households headed by PLHIV. This included the provision of seeds and technical support to vulnerable families in climate proofed farming practices.

DRI, which provides climate change intelligence, supplied technical support to the partners and communities. DRI also partnered with UNICEF to raise awareness on the importance of good sanitation systems for PLHIV in the framework of a changing climate. The overall goal was to prevent recurrent cholera outbreaks among at risk populations, including PLHIV groups. Activities involved the provision of buckets, soap and information, education and communication (IEC) materials for home use and training on safe hygiene and sanitation practices.

3.2 Adapting key sectors

A number of the adaptations presented by the case studies above reflect many of the sectoral adaptation recommendations outlined by Table 6. These recommendations correspond with Table 1, which synthesises the downscaled climate projections developed by Murwira (unpublished) and Murwira, *et al*. (unpublished). The majority of the case studies and recommendations are aimed at building coping capacity through behavioural change rather than infrastructure development, which reflects the shift towards CBA (as discussed by section 3.0) (Dodman and Mitlin, 2011). A common finding from the case studies is that current climatic change and variability is already threatening to impede or reverse development, particularly related to poverty reduction, agricultural livelihoods and human health, which are also addressed by the recommendations.

3.3 CBA as an approach to adaptation

The case studies also demonstrate the important role that civil society has played in climate change adaptation and disaster risk reduction in Zimbabwe. The case studies also demonstrate the popularity of CBA, which has become a mainstream practice among development agencies working in vulnerable regions of the South (Dodman and Mitlin, 2011).

CBA is based on the recognition that climate impacts will be experienced by vulnerable people least able to cope, which will require local adaptation planning and a greater focus on building adaptive capacity (Action Aid International, 2005; Ayers, 2011; Ayers and Forsyth, 2009; Huq and Reid, 2007; Moser and Stein, 2011). CBA is widely regarded as a significant improvement over top-down 'impacts-based' approaches to adaptation, which typically entailed the provision of infrastructure (e.g. sea walls) to reduce exposure to climate impacts (e.g. sea-level rise) (Ayers, 2011; Van

Aalst *et al*., 2008). Critics highlight a number of limitations of this approach, notably its failure to consider the underlying socio-economic factors that cause vulnerability (Ayers and Forsyth, 2009). In contrast, the case studies demonstrate how CBA has enabled poor people to assess their vulnerability, to identify the degree to which climatic change and variability affects their communities and livelihoods, and to identify locally-relevant adaptation strategies that build on indigenous knowledge and cultural practices (e.g. the Chiredzi case study presented by section 3.1.1) (*ibid*).

However, Dodman and Mitlin (2011) urge practitioners to consider the limitations of CBA as a form of participatory development. In particular, Dodman and Mitlin argue that "CBA projects are located at a level at which they cannot contest significant and substantive issues including the role of the state in supporting community adaptation priorities, and the required distribution of resources" (pp. 10). Whilst CBA empowers local communities to tackle adaptation themselves, it is not able to address the structural inequalities that perpetuate vulnerability and underdevelopment (Mohan, 2002).

In addition, according to Chagutah (2010), many of the adaptation activities undertaken by NGOs and international organisations tend to be uncoordinated, leading to potential challenges in targeting beneficiaries and duplication of roles. Thus, a key challenge for scaling-up is to move beyond individualised project-based approaches to adaptation towards multilevel policy-making and investment. Policy-making and investment at all levels must fundamentally support participatory and inclusive decision-making processes in order to ensure that adaptation strategies address the needs of poor women and men. As argued by Dodman and Mitlin (2011), "[s]trengthening the ability of local groups to negotiate to get more, rather than less, from local (and national) political processes requires making a more substantive institutional investment…" (pp. 11). The case study on 'Mainstreaming Climate Change Adaptation and Disaster Risk Reduction at the District, Provincial and National Levels' (see section 3.1.3) provides a good example of how community-based approaches can empower local communities in decision-making processes at all levels. These cases should be considered by policymakers as Zimbabwe continues to develop its national climate change framework.

4 Legislative framework and climate governance

THIS SECTION EXAMINES THE NEED TO DEVELOP A dedicated national climate change framework that is able to address the scale and scope of vulnerability in Zimbabwe and coordinate policy-making, investment and implementation, particularly at the local level. The section also examines the potential of climate governance to support these objectives.

4.1 Legislative framework

The UNFCCC requires the world's 49 least developed countries (LDCs) (33 are in Africa) to undertake National Adaptation Programmes of Action (NAPAs), which are policy frameworks dedicated to the identification and prioritisation of critically important adaptation activities for which further delay might increase vulnerability or lead to higher adaptation costs over the long term (Stringer *et al*., 2009).[1] Although not an LDC, Zimbabwe ratified the UNFCCC in 1992 as well as the Kyoto Protocol in 2009. However, the 2011 Human Development Index (HDI) (UNDP, 2011) ranks Zimbabwe 173 out of 187 countries, just after Malawi and Afghanistan (both LDCs). Zimbabwe's extremely low HDI, which measures life expectancy, literacy, school enrolment and gross national income per capita (GNI), suggests that the country actually satisfies many of the LDC criteria, which also measures health, education, literacy and GNI, among others. Some commentators suggest that Zimbabwe has neglected LDC status because the government is unwilling to be associated with the world's poorest countries. In the case of climate change, this unwillingness could be counter-productive considering the UNFCCC's commitment to LDCs. For example, the LDC Work Programme supports technical assistance, capacity building, and information/ technology exchange activities in the development of national climate change frameworks.[2]

On the other hand, Zimbabwe has provided national communications to the UNFCCC detailing activities that have been undertaken to implement climate change activities. In 1998, Zimbabwe submitted its Initial National Communication, which detailed climate impacts and adaptation options in the following agriculture, forestry, water resources and human

Table 7
Vulnerable sectors and adaptation recommendations

Sector	Adaptation recommendations
Agriculture	■ Optimising rain fed crop production ■ Improved short-season seed varieties especially for maize, and drought resistant small grains ■ Efficient use of available moisture ■ Irrigation
Water	■ Water harvesting ■ Mechanisms for improved utilisation in water impoundments, increase the network of water storage facilities ■ Improved water use efficiency in agriculture
Health	■ Enhanced health delivery strategies
Forestry and biodiversity	■ Minimise human disturbances, in particular, uncontrolled fires
Rangelands	■ Drought resistant agroforestry practices for fodder production
Human settlement	■ Design of climate-proof settlements
Tourism	■ Reducing the current pressures on biodiversity

Source: Murwira (unpublished); Murwira, et al., (unpublished)

health sectors (Chagutah, 2010). In 2009, Zimbabwe began to prepare its Second National Communication (SNC) report, which is now complete. The report included vulnerability and adaptation assessments on the following sectors: ecosystems, human settlements, public health, water resources and wildlife (Madzwamuse, 2010). This will then form the basis on which more specific action plans can be developed. Many other LDCs are developing National Adaptation Plans (NAPs), which are the UNFCCC's most recent attempt to build on the experience in preparing and implementing NAPAs with the goal of identifying medium- and long-term adaptation priorities and developing and implementing strategies that respond to those priorities (UNFCCC, 2012b). Zimbabwe has not been following this process, but the Climate Change Office within the Ministry of Environment and Natural Resources Management has begun formal consultations to develop a 'Climate Change Response Strategy', involving other government ministries, civil society organisations (including those involved in the 'Meeting Information and Advocacy needs for Climate Change Adaptation in Zimbabwe' project which informs this paper), academic institutions and the private sector.

Currently, climate change is addressed by environmental legislation (mainly through the Environmental Management Act). However, it is widely recognised that such policies are insufficient in light of the projected impacts of climate change and the scale and scope of vulnerability. Climate change is widely treated as a secondary issue in policy and therefore does not receive adequate emphasis in terms of policy direction or resource allocation. This is consistent with many other developing countries, which tend to address climate change through a variety of fragmented sectoral policies, including those related to agriculture and food security, water resources management, natural resources management and disaster risk management (Chagutah, 2010). According to a study on climate governance by Heinrich Böll Stiftung in Botswana, Kenya, Nigeria, Tanzania, Uganda, South Africa and Zimbabwe (Madzwamuse, 2010), a lack of appropriate legislative and policy frameworks inhibits the implementation of adaptation and constrains adaptive capacity in Zimbabwe (Chagutah, 2010).

Moreover, current policy is heavily influenced by a strong rural-bias, which ignores longstanding urbanisation trends (revisit Table 4). According to United Nations Department for Economic and Social Affairs (UNDESA) (2011), Zimbabwe's urban population is 38 per cent, whilst current population estimates suggest that the country is now more than 50 per urban (Chatiza *et al.,* forthcoming). Nevertheless, policy-makers and researchers widely cite 70-80 per cent as the rural population statistic. Chatiza *et al*. criticises this discourse as a 'street narrative' that prioritises rural development issues at the expense of urban areas. This narrative reflects the prevailing governmental attitude that African urbanisation is a negative process that is to be avoided through effective rural climate and development policy (Pieterse, 2010). In response, Parnell and Simon (2010) argue that "… demographic transitions in Africa now mean that the embedded urban policy positions of governments… are among the most important in determining the well-being of the population and also the continent's economic and ecological resilience." (pp. 47). For Parnell and Simon, embracing cities does not imply discarding the rural policy agenda, but implies that national climate and development policy frameworks should be developed to hinge on "complementary and differentiated urban and rural strategies" (pp. 47).

The research and case studies presented in this paper all emphasise the need for a national climate change framework, with some also highlighting the need for a human rights approach to the development of future legislation. Resolution 10/4 of the United Nations Human Rights Council (UNHRC) (2009) recognises that climate change jeopardises the full spectrum of human rights, notably the right to life, adequate food, adequate housing and the right to the highest standard of health. The adoption of a human rights approach to climate change would bolster Zimbabwe's commitment towards the fulfilment of international human rights conventions and treaties, including the Universal Declaration of Human Rights, the International Covenant on Economic, Social and Cultural Rights and the International Covenant on Civil and Political Rights.

The Zimbabwe Environmental Law Association (ZELA) also emphasises the fundamental importance of public participation and stakeholder involvement in the development of future climate change legislation. The Environmental Management Act states that every person "has a right to access environmental information and right to participate in promulgation and implementation of legislative, policy and other measures that prevent pollution and environmental degradation" (Mtisi, 2010). However, Zimbabwe's environmental policy-making process has involved minimal engagement between civil society, policy-makers and the public (*ibid*). Although the SNC process has been described as highly participatory, no record of public engagement exists (Chagutah, 2010). As argued by McDevitt (2009), there is a danger that national adaptation strategies formulated without the participation of those intended to adopt the practices will limit rather than facilitate adaptation and potentially cause maladaptation.

The vulnerability and adaptation assessments carried out as part of the SNC process also took a strong sectoral approach, which is consistent with the fragmented way in which policies currently address climate change in Zimbabwe. Consequently, cross-cutting themes run the risk of not being appropriately mainstreamed into the policy framework. In particular, Chagutah (2010) identified gender mainstreaming as imperative for the country's sustainable development. In addition, there is a growing body of literature on the importance of integrating climate change adaptation with disaster risk reduction and sustainable development (e.g. Birkmann and Teichman, 2010; McBean, 2012; Schipper and Pelling, 2006; Solecki *et al*., 2011).

4.2 Climate governance

Climate governance is particularly relevant for integrated planning and policy-making across a variety of sectors. Climate governance has become an increasingly investigated

1 LDCs are a group of 49 countries which have been identified as 'least developed' in terms of their low GDP per capita, their weak human assets and their high degree of economic vulnerability." (UNCTAD, 2011).

2 http://unfccc.int/cooperation_support/least_developed_countries_portal/ldc_work_programme_and_napa/items/4722.php

subject across the social sciences, notably within the urban planning literature in response to the growing recognition that the uncertainty of climatic variability and weather extremes will require more flexible governance structures that are able to manage multiple risks (e.g. Anguelovski and Carmin, 2011; Bulkeley and Broto, 2012; Birkmann *et al*., 2010; Corfee-Morlot *et al*., 2009; Corfee-Morlot and Cochran, 2011; Dodman and Carmin, 2011).

Climate governance recognises that national policy frameworks (as supported by the UNFCCC) facilitate a strong top-down approach that requires coordinated governance institutions that are able to translate higher-level policy into local action plans (Corfee-Morlot *et al*., 2009). From this perspective, Corfee-Morlot and Cochran (2011) have developed the concept of multilevel risk governance, which focuses on how cross-scale linkages between national and local governments can empower local authorities to support 'linked-up' action with other governance actors. According to Corfee-Morlot *et al*., (2009, pp. 3), "vertical and horizontal integration allows two-way benefits: locally-led or bottom-up where local initiatives influence national action and nationally-led or top-down where enabling frameworks empower local players." It is argued that such integration benefits all stages of the policy-making process, including agenda setting and strategic planning; policy formulation; local implementation; monitoring and evaluation; and information sharing, which is particularly important for promoting cross-scale learning (*ibid*).

Civil society is a key governance actor that has an important role to play in climate policy –making (Reid *et al*., 2011), particularly in building effective communication channels that support the meaningful participation of vulnerable communities (Corfee-Morlot *et al*., 2009). For example, the Zimbabwe climate change youth network coalition was formed in 2009 "as a platform for sharing climate change information (views, ideas and experiences) with a view to raising youth awareness on climate change and enhancing their participation in national, regional and international climate change agendas" (Reid *et al*., 2011, pp. 18). The youth network demonstrates how civil society can build the social and political capital of marginalised groups so that they can access and influence decision-making processes that they have traditionally been excluded from. Empowerment is highly relevant where liberal democracies are weak, which is particularly the case in Zimbabwe.

Conclusion: the way forward

THIS SECTION BEGINS BY ANALYSING THE challenges facing adaptation practice, the lessons learnt from the case studies and the obstacles for developing an effective national climate change framework in Zimbabwe. The section then provides recommendations for future research and policy, followed by a conclusion that emphasises the important role that applied research must play in planning and policy-making.

5.1 Challenges

A principal challenge facing adaptation projects in Zimbabwe is the uncertainty associated with climatic variability. Most farmers in dry lands such as Chiredzi District have experienced multiple climate risks and have confronted them with a diverse range of coping mechanisms (see Box 6). Rural communities in particular already possess good understandings of local climate patterns, including inter-/ intra-annual rainfall variability, and are accustomed to coping with them. However, an important consequence of climate change is that future climate will be less familiar, more uncertain and, possibly, more extreme (Kurukulasuriya and Rosenthal, 2003). The implication is that current local practices, processes, systems and infrastructure, which have been more or less adapted to current climate conditions, could become increasingly unsuitable as the climate changes. This situation is aggravated by varying local perceptions and interpretations of climate variability, which can be broad and diverse within different social groups and between communities, as demonstrated by Wedza District (see Box 3).

The Zimbabwean experience reflects a growing recognition in many parts of the developing world that autonomous adaptation strategies that were effective in the past are increasingly ineffective for coping with emergent climate change. Climatic variability and the increasing frequency and magnitude of extreme events means that past climate conditions will become decreasingly useful for predicting future climate (Solecki *et al*., 2011). In addition, despite Africa's vulnerability, few regional and sub-regional climate change scenarios based on regional climate models or empirical downscaling exist to inform local action (Parnell and Walawege, 2011).The lack of downscaled climate data is particularly problematic in countries like Zimbabwe where climate impacts and vulnerability are highly regionally differentiated. As a result, strengthening national and local capacities to manage climate risks, as they are currently understood, is imperative for dealing with climate risk in the future (Hellmuth *et al*., 2007).

However, specialist skills and knowledge in climate change across key sectors, including health, water and natural resources management, are lacking, which is compounded by the limited capacity of Zimbabwe's tertiary education system (Chagutah, 2010). Similarly, the media's poor coverage of climate change reinforces limited awareness and knowledge across society (Reid *et al*.,2011). Government institutions also lack capacity to engage in policy implementation related to adaptation. Skills migration combined with limited financial resources in government departments (including the Climate Change Office within the Ministry of Environment and Natural Resources Management) and research organisations further constrains research and development on climate change (Chagutah, 2010). Consequently, capacity development remains a significant institutional challenge. However, civil society groups have been actively engaged in networking around climate change issues, for example through a 'working group' on climate change (Reid *et al*., 2011). This group has facilitated the sharing of information about activities and techniques for supporting adaptation and developing better 'climate journalism' (*ibid*).

However, effective climate governance faces numerous institutional challenges. According to Chagutah (2010), relations between civil society and government have been strained. The government imposed a ban on NGO field activity between June and August 2008 in reaction to the controversy surrounding the country's presidential elections. There is also an emergent coalition of environmental NGOs pressuring the government for a more inclusive and participatory approach to climate change policy-making (*ibid*). This situation reflects the important role that civil society plays in raising climate awareness at the local and national levels and in helping governance actors to plan adaptation policies, projects and programmes (Reid *et al*., 2011).

5.2 Lessons learnt

A common lesson learnt was the importance of local context in developing adaptation strategies that build on local knowledge and cultural norms, practices and value systems. For example, Shangani inhabitants in Chiredzi District require permission from ancestral guides before they can till the land. As a result, many adaptation strategies (e.g. soil moisture management) are not appropriate during specific times of the year. Thus, on the one hand, indigenous knowledge offers a rich resource to draw on to informal local responses. On the other hand, local cultural norms mean that acting externally to impose

adaptations may be discarded or ignored by communities. The Chiredzi case (see section 3.1.1) provides a particularly good example of how local knowledge and cultural norms can be drawn upon to inform effective adaptations.

Participatory methods were also successful in three main respects: 1) engaging traditionally marginalised groups (particularly women); 2) identifying the diverse needs of farmers and exposing them to as many adaptation options as possible; and 3) instilling a sense of ownership in the project among participants, which was found to markedly increase the chances of project success.

Communities also identified the potential for greater knowledge and information sharing between stakeholders, especially to strengthen early warning systems. Similarly, it was suggested that future projects focus on coordination and facilitation roles among farmers so they can engage in dialogue with surrounding communities on climate related issues. The use of the media for disseminating climate information was also identified by Chagutah (2010) and Reid *et al*., (2011) as an essential tool for effective climate risk management (see also Hellmuth *et al*., 2007). The ability of the media to reach the community level presents an opportunity to disseminate accurate and useful climate information, including weather forecasts, early warning and medium-to-long term-trends / projections.

5.3 Recommendations

Based on the analysis above, the case studies presented and the literature cited, the following recommendations offer a way forward for addressing the challenges identified and for taking advantage of the opportunities supported by the UNFCCC. The recommendations and the general lessons arising from this paper are relevant for a broader set of countries that are dealing with similar environmental, demographic and institutional challenges, particularly in sub-Saharan Africa.

Recommendations for Adaptation Projects and Programmes:

- Reconceptualise participation in CBA projects as an instrument for empowering communities to influence policy-making at all levels.
- Consider climate information in CBA projects, including scientific data and local knowledge about trends and changes.
- Undertake participatory vulnerability and adaptation assessments at-scale and across a variety of sectors in both rural and urban areas. Share the results openly to foster cross-scale learning between the public, government and civil society.

Recommendations for Adaptation Policy-Making and Climate Governance:

- Reconsider whether Zimbabwe meets LDC status and contemplate the benefits that LDC status offers for developing a national climate change framework.
- Explore the potential of new adaptation funds (e.g. the UNFCCC Adaptation Fund) to support innovative projects and programmes, including capacity development.
- Use the most current statistics that most accurately represent the urban and rural population distribution.
- Develop policy frameworks that hinge on complementary and differentiated urban and rural development and adaptation policies.
- Examine the potential of multi-level risk governance to support 'linked-up' action between communities, civil society, the private sector and government at all levels.
- Actively seek out and include marginalised groups in more participatory and inclusive decision-making processes and planning procedures to ensure that future climate policy responds to the vulnerabilities of women and men living in climate sensitive regions of the country.
- Incorporate a gender equality perspective into policy-making to ensure that the vulnerabilities of women are accounted for. Planning should consider disaggregated data in order to highlight inequalities among women as well as other marginalised groups, including children, elderly, disabled, PLHIV groups, etc. The recent Draft Guidelines to Mainstreaming Gender in the Development of NAPs by the IUCN (2011) provides a useful framework for guiding this process.
- Develop climate awareness raising campaigns aimed at government (especially legislators), civil society and the general public (especially farmers).

Moving forward, applied research is of fundamental importance in informing the development of adaptation strategies that respond directly to the vulnerabilities of poor women and men in both rural and urban areas, in raising climate change as a policy priority at all levels and in informing an integrated approach to climate policy across a variety of sectors. However, despite growing emphasis on adaptation, there remains a dearth of research relative to the scale and scope of vulnerability at the household and community levels in Zimbabwe (Chagutah, 2010). In particular, the lack of empirical evidence on urban vulnerability highlights a considerable gap in the research, which should be addressed in response to urbanisation and climate trends. These gaps are common to other countries in sub-Saharan Africa (e.g. Malawi) where the majority of research has been characterised by ad-hoc rural appraisals of poverty and vulnerability to climate-related hazards (Brown, 2011).

Overall, Zimbabwe requires a national climate change framework to guide coordinated action and investment. Zimbabwe has undertaken the SNC planning process, which could potentially yield a NAP. If so, a growing number of climate funds are coming on stream, which presents opportunities to engage in innovative projects and programmes. This includes the new UNFCCC Adaptation Fund that has been established to finance adaptation projects and programmes, including grants for human settlements, in developing countries party to the Kyoto Protocol (UNFCCC, 2012a). As argued by Boyd *et al*., (2009, pp. 660), "with the money potentially on the table, now is the time for policy-makers and planners to build on their years of experience in both failures and success in development initiatives, to tailor climate change activities in support of positive development outcomes." More attention must therefore be paid to the institutional challenges facing effective climate governance to ensure that future policy will be planned and implemented successfully.

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Annex 1 - Summary of background papers

Climate Change and Housing in Zimbabwe: An Exploratory Study

By: Dr. Kudzai Chatiza & Davison Muchadenyika, CASS Trust

Summary:

This paper utilises current literature and key informants interviews to explore the relationship between housing and climate change in Zimbabwe from an adaptation and mitigation perspective. The paper examines housing in relation to urban growth, development and disaster trends, particularly within the rapidly expanding peri-urban areas surrounding Zimbabwe's major cities. The paper presents the key institutions relevant to housing and climate change, and reflects on national and local preparedness to deal with housing and urban development within a changing climate. The paper concludes with policy recommendations and presents potential opportunities for strengthening adaptation and mitigation in the housing sector.

Meeting Information and Advocacy Needs for Adaptation to Climate Change in Zimbabwe: Research on Local Climate Change Impacts.

By: Dr. Prisca Mugabe, University of Zimbabwe

Summary:

This paper draws on current literature and key informant interviews to examine the projected impacts of climate change in Zimbabwe and community based adaptation projects. Two cases studies on Wedza and Gokwe Districts are presented in order to gain a better understanding of how agricultural communities are coping with climatic variability under different environmental conditions. Six case studies on community-based adaptation projects are also presented, all of which highlight the importance of local context. The paper concludes with policy recommendations regarding the need to mainstream climate change adaptation into policy and development programmes, to take advantage of community experiences and knowledge of climatic variability, to build capacity and awareness and to develop more concerted efforts at empirical documentation of climate impacts and responses.

Meeting the Health Needs of People Living with HIV and AIDS (PLHIV) in the Framework of Climate Change in Zimbabwe: Case of Support Groups of PLHIV in Mashonaland.

By: Verengai Mabika, Development Reality Institute

Summary:

This paper examines how climate change is expected to compound Zimbabwe's existing humanitarian crisis related to public health, with a focus on PLHIV groups. The paper presents the findings of a project involving a partnership between the ZNNP+, CADS and DRI, which investigated the impacts of climate change on PLHIV groups living in remote and geographically vulnerable communities. The paper emphasises the advantages of the CSS approach, which develops the roles of key affected populations and communities, community organisations and networks, and public or private sector actors that work in partnership with civil society at community level, in the design, delivery, monitoring and evaluation of services and activities aimed at improving health outcomes. The paper examines the adaptation strategies that were developed by the project and reflects upon lessons learnt.

Climate Change and Gender.

By: Rabecca Rance Chanakira

Summary:

This paper utilises a literature review to examine how the projected impacts of climate change in Zimbabwe will compound existing development challenges, with a focus on gender inequality. The paper provides a detailed overview of policies related to climate change in Zimbabwe and draws on international case studies where climate change has been addressed from a gender sensitive perspective. The conclusion presents research gaps and policy recommendations for Zimbabwe.

Climate Change Impact on Water Resources in Zimbabwe.

By: ZIMNET

Summary:

This paper presents the findings of the Meeting Information and Advocacy Needs for Adaptation to Climate Change project, which was carried out by ZIMNET in Nyanga District. The project emerged in response to the impacts of water scarcity on livelihoods supported by rain-fed agricultural, focusing on problems related to food production and the growing practice of stream-bank cultivation. The paper examines awareness workshops hosted by ZIMNET, which focused on sustainable environmental management practices, including water conservation, wetlands protection and prevention of biodiversity loss. The workshops also focused on good farming practices, including organic and conservation methods, all of which were themed around the cross-cutting issues of gender and development, conflict resolution and management, and HIV/ AIDS. The paper examines the adaptation strategies employed by the communities, including their impact on people's lives, and concludes with lessons learnt.

Economics of Climate Change Adaptation in Zimbabwe

By: Dr. Medicine Masiiwa, University of Zimbabwe

Summary:

This paper utilises a literature review and key informant interviews to analyse the potential social and economic costs of climate change adaptation in Zimbabwe. The paper provides an overview of current trends in climatic variability in addition to future projections and their expected impacts on key economic sectors, notably agriculture. Autonomous and planned adaptations are examined for each sector in relation to their ability to curb future costs. The paper concludes that future development in Zimbabwe must be climate resilient in all sectors of the economy, with a focus on poverty reduction and the needs of vulnerable groups, including women, children and small-scale farmers.

Draft Report on the Legal Framework on Climate Change.

By: Mutuso Dhliwayo, ZELA

Summary:

This paper makes the case for the development of a dedicated national legislative and policy framework on climate change in Zimbabwe. The paper argues that climate change is largely treated as a secondary issue in policy and therefore does not receive adequate emphasis in terms of policy direction or resource allocation relative to the severity of the projected impacts. ZELA advocates for a human rights based approach to climate change and supports public participation, awareness raising and access to information as key ingredients for the development of future legislation. The paper concludes by examining the key barriers that inhibit the effective implementation of climate change projects, including low priority awarded to sustainable development, limited capacity and resources, high poverty rates, among others.

Impacts of Climate Change on Agriculture in Zimbabwe.

By: Dr L. Unganai, UNDP

Summary:

This case study provides an analysis of the impacts of climate change on agriculture and examines possible adaptation strategies based on the experiences of the GoZ-UNDP/GEF: Coping with Drought and Climate Change project in Chiredzi District. The case study examines the sensitivity of rain-fed maize, sorghum and cotton production to climate change using downscaled best case and worst case climate change scenarios. For livestock, cattle and goats are considered. Main drivers of vulnerability and possible adaptation strategies are identified through participatory techniques involving the vulnerable men and women of the District. The case study highlights adaptation strategies implemented on a pilot scale in sections of Chiredzi District to reduce small-holder farmers' vulnerability to impacts of drought and climate change, whilst maximising on opportunities that might arise. The impacts of the interventions are evaluated in the context of vulnerability reduction. The case study also presents the estimated costs associated with various adaptation strategies implemented by the Coping with Drought and Climate Change project. Finally, the paper presents challenges encountered and lessons drawn from the implementation of the pilot projects in Chiredzi District.

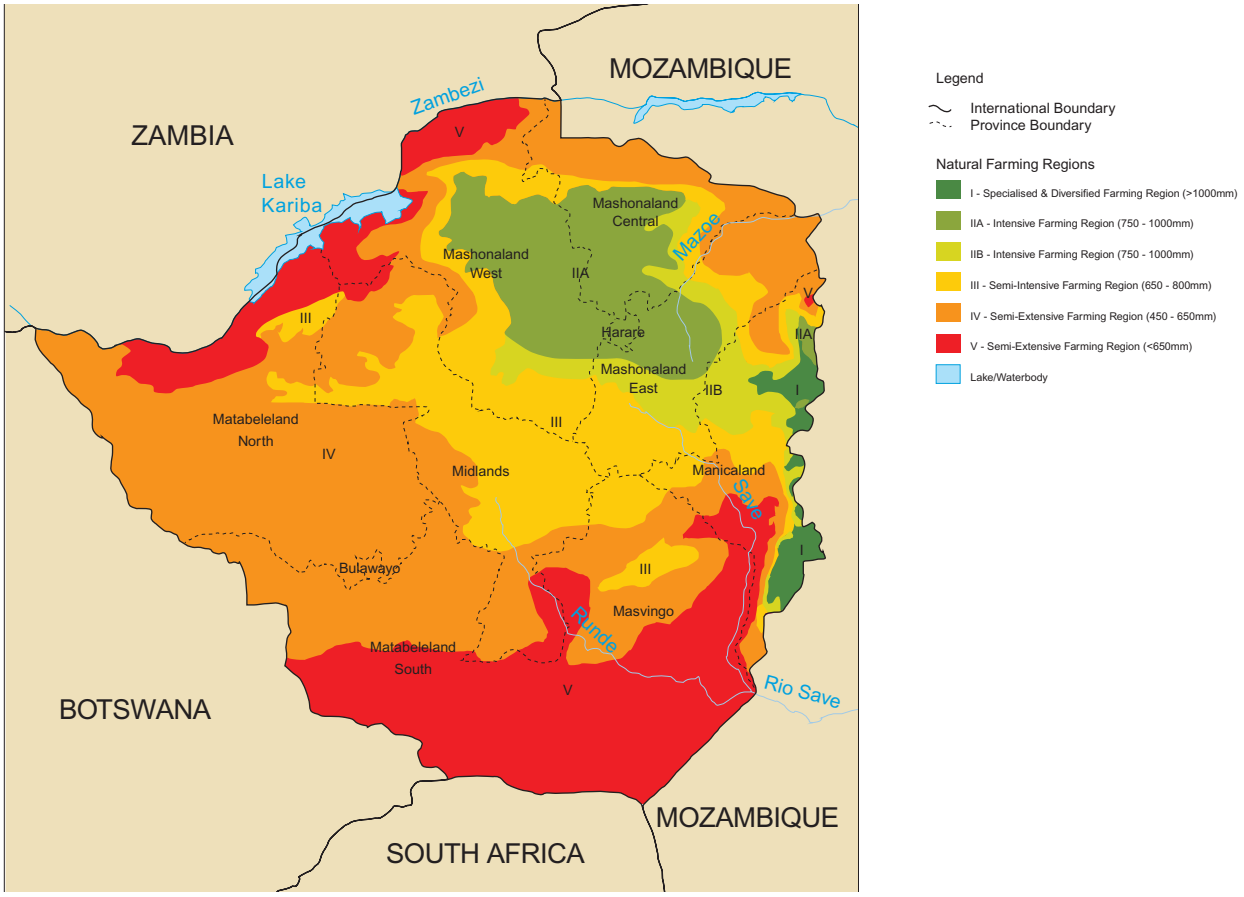
Climate Change and Gender Impacts in Zimbabwe

By: Swedish Cooperative Centre

Summary:

This paper features a case study on the impacts of climate change on water and gender roles undertaken by the Swedish Cooperative Centre in Shurugwi, Lupane and Chikomba Districts. The case study focuses on the impacts of Cyclone Japhet on the Chirume community. The effects of the cyclone, which destroyed a nearby damn, forced households to travel longer distances to collect water, which resulted in changes in gender roles as men became involved in addition to women. The paper examines the adaptation measures introduced, including the introduction of a nearby alternative water source, the use of infield moisture conservation techniques and linking farmers to better formal markets outside the village. The paper concludes by examining the impacts that the adaptations had on people's lives followed by challenges and lessons learnt.

Annex 2 – Zimbabwe's agro-ecological zones



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IIED is an independent, non-profit organisation promoting sustainable patterns of world development through collaborative research, policy studies, networking and knowledge dissemination.

The Climate Change Group works with partners to help secure fair and equitable solutions to climate change by combining appropriate support for adaptation by the poor in low and middle income countries, with ambitious and practical mitigation targets.

The work of the Climate Change Group includes:

- Supporting public planning processes in delivering climate resilient development outcomes for the poorest.
- Supporting climate change negotiators from poor and vulnerable countries for equitable, balanced and multilateral solutions to climate change.
- Building capacity to act on the implications of changing ecology and economics for equitable and climate resilient development in the drylands.

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