**CLIMATE CHANGE ADAPTATION FOR RURAL COMMUNITIES IN SEMI-ARID REGIONS OF ZIMBABWE: CRITICAL ISSUES FOR POLICY MAKERS**

A policy Brief

Developed for the Coping with Drought and Climate Change Project

December 2012

**1.0 Executive Summary**

Climate change, including variability is already affecting many livelihoods in Zimbabwe. It is undermining the nation’s socio-economic development through compromised livelihood outcomes. This results from gradual and insidious changes in temperature and rainfall patterns including the increasing frequency and intensity of extreme events such as floods and droughts. The poorest communities in Zimbabwe are being hardest hit as they are largely dependent on climate-sensitive natural resources and ecosystems, such as agriculture. Most vulnerable communities also live in areas that have greater exposure to climate hazards and are less able to respond to climate change because of limited human, financial, and institutional capacity.

This policy brief has been produced through a collaborative initiative involving the Government of Zimbabwe through the Environmental Management Agency (EMA) and the United Nations Development Programme (UNDP). The support for the programme comes from the Global Environment Facility (GEF) under the five year project “Coping with Drought and Climate Change” (CwDCC) in Zimbabwe. Policy issues presented in this brief are drawn from lessons from the project, related initiatives and stakeholder inputs.

This brief recognizes that policy makers in Zimbabwe and elsewhere in the world seldom have the time to read through all the complex literature for such related topical issues like climate change. However decision making processes of national policy significance requires a credible basis often science and evidence based. Therefore the policy brief attempts to balance these two critical aspects drawing on the evidence from the CwDCC project to enable policy makers make well-informed decisions regarding climate change adaptation in Zimbabwe.

This policy brief calls for the recognition of climate change adaptation as a key development issue in Zimbabwe given the crosscutting nature of climate change impacts across all key sectors. Simply put without addressing current and future climate changes in Zimbabwe and integrating climate change in development planning climate change threatens to stall and then reverse progress of current development gains and further compromise future developments prospects. The policy brief lays out seven main policy recommendations are as follows:

1. ***Increase Conceptual Awareness for Climate Change***: the success of any meaningful adaptation programming in Zimbabwe largely hinges on wide stakeholder understanding of climate variability and change. This includes understanding the causes, impacts, vulnerability and adaptation strategies.
2. ***Strengthen Policy and Institutional Frameworks for Climate Change:*** addressing, responding to and managing climate variability and change require a strong and dynamic policy and institutional framework for better coordination and responsive continuous capacity building.
3. ***Promote Climate Change Mainstreaming across all sectors:*** Although climate impacts are more pronounced in sectors like agriculture, just like poverty, climate change is not limited to a particular sector. There is need to facilitate wide sector and integrated approaches to managing climate change and variability through mainstreaming adaptation at all levels across all the sectors.
4. ***Increase Research, Innovation and Investment towards Supporting Livelihood Diversification*:** Prevailing livelihood strategies have been defined and shaped by a multiplicity of factors among them ethnicity, cultural history and other socioeconomic factors. Managing climate change especially with access to emerging and future climate trends requires adjustment in existing livelihood strategies embracing less of the business as usual livelihood strategies.
5. ***Encourage Climate Financing through Domestic Sources:*** Contrary to the prevailing and ever increasing scientific and political attention accorded to climate change as an issue of global concern, the corresponding financial commitments at global and national level are still inadequate. Although a number of financial channels have opened up including the UNFCCC Special Climate Change Fund managed by the GEF which funded the CwDCC project, most are less inaccessible. Domestic climate change funding mechanisms remain a grey area not only for Zimbabwe but most developing countries.
6. ***Enhance Climate Change Human Capital Development and Infrastructure Improvements:*** Government of Zimbabwe and development stakeholders have to invest towards developing relevant human capital with appropriate skills and capability in adaptation programming. Such investments especially for field level extension personnel have potential to foster meaningful adaptation. However this can only work favorably if coupled with corresponding investments in infrastructure relevant for adaptation particularly meteorology infrastructure.
7. ***Support Learning, Knowledge Management and Impact Measurement for Adaptation:*** As national climate change adaptation efforts are not entirely new there are a number of adaptation initiatives that have been done and some ongoing. Most of such initiatives have been on pilot basis and/or with limited geographical coverage just like the CwDCC project. Stakeholder efforts with Government leadership in the consolidation of adaptation project experiences and lessons needs to be formalized and institutionalized. Beyond measuring success of project delivery there is need to develop a compressive national framework for measuring vulnerability, adaptation processes, adaptation outcomes and impact.

**2.0 Introduction and Background Information**

Climate change is an additional constraint to sustainable socio-economic development in Zimbabwe. The increasing frequency and severity of droughts and floods, the shift in onset of the rains, and increasing intensity of mid-season dry spells in the last 50 years have been identified in both the Initial and the Second[[1]](#footnote-1) National Communications reports to the United Nations Framework Convention on Climate Change (UNFCCC). The Inter-Governmental Panel on Climate Change (IPCC) Third Assessment Report (2001) also noted that the major consequence of climate impacts livelihoods of the poor, particularly women who are highly dependent on climate-sensitive sectors like agriculture.

**2.1 Climate Change in the context of Zimbabwe’s development**

For Africa and Zimbabwe in particular Climate Change is critical in that not only does it erode the development gains achieved so far in terms of Human Development but it threatens the future development reality. According to the IPCC there is an acute decrease in freshwater availability, compounded pressures on natural resources and the environment associated with rapid urbanisation, industrialisation and economic development and endemic morbidity and mortality due to diarrhoeal disease primarily associated with floods and droughts due to changes in the hydrological cycle.

Climate Change is critical for Zimbabwe given that it is an agricultural based economy with the agriculture sector contributing about 15% each year to the GDP. The Zimbabwe Medium Term Plan (MTP) 2011-2015 targets productivity increase in agriculture, among others, as a cornerstone of the development model. The country relies on surface water resources for 90% of its requirements while groundwater supplies the remaining 10% with agriculture utilising 60% of all the water in dams[[2]](#footnote-2). Zimbabwe generates about 1200MW of electricity from thermal and hydro-power plants, the hydroelectricity aspect entails a link and interdependence to rainfall and climate change. Climate Change cannot be divorced from Tourism which is one of the leading foreign exchange earner contributing about 16,3 % of the country’s GDP[[3]](#footnote-3) given that it is dominated by mountain ecosystems, wildlife, waterfalls and forests.

According to the Inter-Governmental Panel on Climate Change (IPCC) Fourth Assessment Report: Climate Change (2007)7Climate change refers to 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. Climate change Adaptation can further be simply defined as actions and decisions that people and institutions make in response to or in anticipation of actual and expected changes in the climate.

Zimbabwe has abundant natural resources which are critical for livelihood security. Climate change makes the wise management of natural resources even more important as a way of supporting communities to adapt to climate change. Climate change has contributed to increased resource scarcity, particularly water for household and productive use for most rural communities in semi-arid regions of Zimbabwe. On the other hand natural resources also play a role in buffering communities against extreme climate events such as droughts and floods.

**2.2 Coping with Drought and Climate Change Project and its contribution to adaptation efforts**

The Government of Zimbabwe (GoZ) through the Environmental Management Agency (EMA) with support from the United Nations Development Programme (UNDP) and the Global Environment Facility (GEF) have been implementing a Medium Size five year project “Coping with Drought and Climate Change” (CwDCC) within the agriculture sector and focusing on Chiredzi District as a pilot site. The primary goal of the project is to contribute in enhancing the capacity of agriculture based livelihood systems in Zimbabwe to adapt to climate variability and change. The project was implemented with financial support from the Global Environmental Facility (GEF) Special Climate Change Fund over the period 2008-2012. The CwDCC among others is intended to demonstrate and promote adoption of a range of gender sensitive approaches for adaptation to climate change among rural communities currently engaged in agriculture in vulnerable areas of Chiredzi District as a national model for climate change adaptation. To achieve this aim the project identified four outcomes which were jointly expected to develop a cohesive approach to drought management in the district as follows:

Developing the capacity of National institutions to improve knowledge base to facilitate climate change adaptation;

Pilot demonstration of policy oriented climate change adaptation practices;

Building small-holder farmers’ capacity to effectively use climate early warning systems;

Adaptive learning and replication; and

The project developed and piloted a limited range of coping mechanisms and adaptation measures that effectively reduce vulnerability to drought for crop and livestock production at the project sites in four Wards. The approach in Chiredzi is a very significant contribution to national strategies and programmes on climate change adaptation. It was noted that at the beginning of the project about 25-44% of the farmers depended on one or two crops (sorghum and maize) while a subsequent survey in 2011 determined that a significant number of farmers have now adopted a diversified crop mix including drought tolerant varieties of maize, sorghum, pearl millet, groundnuts and cowpeas integrated with soil moisture management.[[4]](#footnote-4)

***National institutions have capacity to improve knowledge*:** The project completed a series of technical studies and reports that identified the particular climate change risks and vulnerabilities to crop and livestock production systems in Chiredzi District, along with the possible adaptation measures. It has emerged based on the project experiences that departmental budgets are a key aspect of capacity to deliver climate change adaptation, so far relatively limited support was provided by and to the line agencies expected to implement field activities at the community and household level.

***Adaptation practices and livelihoods:*** The project used the Community Based Adaptation approach to pilot a range of household level tailored technologies for reducing vulnerability to drought and building resilience to climate change impacts in crop and livestock production systems. Farmers who adopted crop diversification as an adaptation strategy increased by 40% within a period of two years. The adopted crop mix included improved varieties of sorghum, pearl millet, cowpeas, drought tolerant maize varieties, cassava and groundnuts. About 30% of farmers implemented infield rainwater harvesting and soil moisture conservation (although the labour requirements and availability of draught livestock power are a constraint) and dependence on rain fed agriculture as the sole source of livelihood decreased by more than 20%, and traditional crops are now complemented by small gardens, livestock production, nature conservation and trading. However among other issues farmers were constrained in the adoption of labour intensive practices such as chopping of stover[[5]](#footnote-5) in the urea treatment demonstrations, construction of “Zai” pits and addition of mulching. Where farmers adopted soil moisture conservation techniques such as deep plough furrowa or tied ridges, sorghum yield levels of 0.4 to 1.15 t/ha were achieved for total seasonal rainfall amounts ranging from 242 to 468 mm in three successive seasons. Pearl millet achieved yield levels ranging from 0.75 to 1.2 t/ha for the same rainfall range. Although cassava was part of the demonstrations, adoption was limited to only those farmers that could afford fencing to protect the crop against livestock damage during the dry season.

In livestock production, simple technologies such as urea treatment of crop-stover to improve nutritional value, molasses supplements, fodder banks and the production of browse trees made a huge difference in saving livestock during periods of drought for as long as water was not a constraint.

Replication of readily available technologies for reducing impacts of drought is not always easy. Farmers cited constraints such as: post-harvest storage challenges (particularly for white sorghum), poor access to technology, poor access to markets, quelea birds and lack of finance.

***Early warning systems:*** This component developed a new, reportedly more accurate and effective system of providing seasonal climate forecasts and crop planting advice to farmers. The developed forecast system is binary in nature and puts an emphasis of advising farmers whether or not to expect a drought in a given season. This is a significant contribution since the current Met Office forecasts have been shown to be largely unreliable, tending to over-forecast near normal rainfall and usually failing to predict below normal events including droughts.[[6]](#footnote-6) The new method involving locally generated forecasts is an important contribution to agricultural climate change adaptation in southern Africa. The anecdotal information on the pilot testing indicates positive results from these forecasts, but comparative data with the traditional system were not available. “Although the project managed to generate interest in a range of climate forecast products among extension workers and farmers’ consistent dissemination and uptake have been constrained by poor communication infrastructure and limited decentralised services from the National Weather Service.”[[7]](#footnote-7)

*Adaptive learning and replication:* A variety of knowledge products, experiences-sharing and learning events have been produced by the project in support of climate change adaptation in Zimbabwe. Awareness raising at both the district and national level was provided through the project. Among other a website for the project was created alongside, flyers, posters and technical reports that enhance public and farmer understanding of climate change risks and adaptation opportunities. However household replication of emerging adaptation technologies is still limited due to the cost of technology and lack of availability of technical backstopping through extension services.

**3.0 Policy Recommendations**

***3.1 Increase Conceptual Awareness for Climate Change***

A clear and shared cross-stakeholder understanding on what climate change adaptation means in practice is critical for successful adaptation. This goes beyond technical knowledge for experts but the ability to simplify climate change for purposes of enabling all stakeholders at different level to appreciate their role in contributing to national adaptation efforts.

More important in the conceptual understanding for climate change adaptation is the ability to have shared understanding regarding climate scenarios (past, current and future), risks and vulnerabilities to inform actions and decisions. The case of CwDCC project in Chiredzi District which is largely applicable nationwide is that rural farmers faced the difficulty to arrive at management decisions on how to allocate limited resources among crop production, livestock production, and off-farm employment. The main barrier to overall productivity and adaptive capacity has been how effectively farmers can make use of *limited amounts of water and available climate information*. The use of formal climate information for decision-making is virtually non-existent among most smallholder farmers because of a lack of access to information and national scale of the forecasts.

According to Kalonga (2011[[8]](#footnote-8)) conceptual understanding of Climate Change Adaptation (CCA) has to be centered on the three elements as explained below

**Actions and decisions:**CCA should lead to action and decision making addressing climate impacts and peoples development needs. This includes influencing changes in the nature of actions, approach to the actions at different levels and also influencing changes in decision making due to climate change.

**Changing climate:** CCA should be built around evidence of changes in the climate system. These can be past, current and future changes and trends (anticipation). This also includes climate variability[[9]](#footnote-9) and uncertainty. This is to contrast business as usual approach to CCA that ignores an understanding or analysis of climate change information.

**People and institutions***:* People are affected, at risk or vulnerable to climate change and its impacts. Adaptation should have a people focus which links to addressing people’s rights based on the understanding their *vulnerability[[10]](#footnote-10)* and their and capacities (i.e. women, agriculturists, fisher folks etc.). **Institutions** are crucial because human beings live within social structures and systems. Considering institutions helps to understand wider processes that can enable or prohibit adaptation to take place at different levels beyond the level of an individual and/or a household. CCA Actions and decisions can be enhanced or limited by different institutions at community, sub national, national and international levels.

***3.2 Strengthen Policy and Institutional Frameworks for Climate Change***

Climate change requires a strong policy and institutional coordination mechanisms for effective planning, resourcing and implementation of relevant programmes. The country is in the process of developing a clear national policy on climate change which is a huge opportunity as far as defining policy, legislative and institutional framework is concerned.

Lessons from the CwDCC project indicated challenges associated with institutional capacity development for the rural district council. Notably a clear climate change institutional coordination framework particularly at provincial, district and local levels was non-existent. However at national level the designation of a focal point for climate change in the president’s office is a key positive step.

Further departmental budgets are a key aspect of capacity to deliver climate change adaptation. In the CwDCC project, relatively small support was provided to the line agencies expected to implement field activities at the community and household level. However it is expected that such agencies should internally define and earmark resources for supporting adaptation programing once a clear policy and institutional framework is in place.

Among other approaches a well-defined policy and institutional framework will define roles and responsibilities of various players around risk and vulnerability assessments, adaptation planning, resource mobilization, technical programme support and impact measurement at different levels among others. Building on the national capacity needs assessment already carried out, a clear capacity building plan supporting the new policy and institutional framework can be developed and resourced.

***3.3 Promote Climate Change Mainstreaming across all sectors:***

Given the fact that climate change impacts have wide sector impacts there is need to ensure climate change is mainstreamed across all development sectors. At a policy level it is important for Government to emphasize that climate change is not an environmental issue as has been considered by many. However mainstreaming should not also be a way of shelving climate change.

Emerging lessons so far indicate that climate change mainstreaming is being affected by the fact that development plans have not clearly integrated climate change. The CwDCC and potentially many similar initiatives being implemented expected that the District Development Plans will have clear strategies on how to address climatic hazards such as drought and how to integrate climate change adaptation within the wider development planning, resourcing and delivery.

Currently there is no basis and as a result it is been difficult for Ward or District level plans to integrate climate change. To this effect it is recommended the template for development planning at all levels should be revised to include climate change including variability. Meaningful adaptation mainstreaming is demonstrated by a clear supporting monitoring and impact evaluation framework that will be able to demonstrate sectoral and national performance against set bench marks.

More importantly, adaptation mainstreaming has to be fully aligned with national development goals and strategies linked to poverty alleviation, food security, promotion of gender equality and economic development among others.

***3.4 Increase Research, Innovation and Investment towards Supporting Livelihood***

Given the current climate change impacts and worse still the unpredictable future impacts which are projected to be worse households in Zimbabwe cannot afford to continue with the business as usual rainfall dependent maize mono-cropping.

Policy measures need to support new and emerging known and experimented household and community livelihood diversification approaches. These can include optimizing crop mixes (i.e.maize, sorghum, pearl millet, groundnut, cowpea etc.), efficient soil and water management, rainwater harvesting and sustainable livestock production, introducing fodder production and storage, urea treatment of stover (chopped up crop residue) and improved veterinary services among others. Further options include community natural resources management and sustainable utilisation with a focus on wildlife farming (crocodiles), private-public-community partnership of ecotourism sites and safari hunting, wildlife cropping and other measures to promote wildlife and fisheries livelihoods development.

Policy measures should be upfront to support and promote practical livelihood strategies even if such do include agricultural livelihood strategies for households and communities living in extreme climate hot spots informed by credible climate change risk and vulnerability assessments. Emerging lessons indicate higher adoption for low cost innovative research based technologies. Scalability of pilot adaptation technologies remain constrained by lack of meaningful investment as such policy instrument need to create an enabling environment to encourage non state actors’ involvement on the same.

Livelihoods development outside of the agricultural sector is still a major challenge in Zimbabwe. It requires greater technical expertise and a full examination of livelihoods options, capabilities and key enablers such as markets and policies. Policy makers at various levels have to embrace and promote the notion of flexible climate sensitive livelihood strategies.

***3.5 Encourage Climate Financing through Domestic Sources:***

There is a cost to adaptation either internally factored within development initiatives or externally factored by climate proofing livelihoods and infrastructure. Both drought management structures such as ground water supply for irrigation or drought response through food distribution as a drought relief measure involve the much needed national resources. Currently most of the adaptation financing especially for pilot project is through donors a best example being the CwDCC project. This will continue to be a key source of climate finance given the historical responsibility for global greenhouse emissions by developed countries.

There is need to critically analyse and provide guidance for potential institutions in Zimbabwe on how they access international climate finance. Zimbabwe just like most African countries is yet to institutionalise national and domestic climate financing. There are a lot of opportunities through existing traditional and new funding mechanisms. Climate change adaptation should be provided resources with the national budget. Government should facilitate and encourage private sector to equally play a critical role in climate finance. This can either be through cooperate social responsibility or via community share ownership schemes.

***3.6 Enhance Climate Change Human Capital Development and Infrastructure Improvements***

The issues of adaptation are broad requiring a variety of complementary skill and competencies for a wide range of stakeholders and players. Policy considerations should encourage a combination application of existing and emerging capabilities towards implementing adaptation initiatives. A number of capacity gaps that are critical for adaptation were identified in the National Capacity Needs Assessment for the climate change convention but most of these are yet to be addressed. Provincial, district, local level and sectoral specific adaptation capacity gap identification needs to be sharpened.

Priority capacity building for climate change adaptation is required for extension personnel. Further there is need to institutionalize teaching of climate change adaptation and related courses within the formal and informal education sectors. For new adaptation technologies there is constant need for providing technical backstopping for households and this in some instances has not provided adequately for pilot adaptation initiatives owing to limited capacity.

Successful adaptation further requires viable and functional supporting infrastructure including for transport, communications and meteorological services just to mention the critical ones. Government should institutionalize local weather forecasting system to support effective decision making for agricultural livelihoods. This enables development of downscaled climate change scenarios, impact assessments, farm enterprise determination and vulnerability mapping for communities. This is only possible with functional weather monitoring stations across the country most of which either do not exist and are not functional.

Where weather information flow system exists it is poorly coordinated and not constantly monitored. Often weather forecast information products do not get to the targeted smallholder farmers. In addition, the products do not always carry the relevant content to enable farmer decision making. However, opportunities for improving the situation do exist if regular forecasts are generated regularly and disseminated through the media or AGRITEX personnel to the farming communities.

***3.7 Support Learning, Knowledge Management and Impact Measurement for Adaptation***

There are a lot of climate change adaptation initiatives and other development initiatives that have mainstreamed adaptation mostly related to food security and livelihood where important lessons have been developed. Such learning is critical for households, community institutions, district planners, provincial development coordination and national development. Currently such learning is often localized but there is room to have it institutionalized and diversified in terms of channels and platforms used.

Effective learning mechanisms within and across adaptation initiatives is a key driver for replication. Adaptation knowledge gathering and management is very critical since adaptation is not all about new technologies and knowledge but also preservation of proven past and existing strategies including those linked to indigenous knowledge systems. When addressing CCA in Zimbabwe, it will be important to identify critical regions in terms of climate vulnerability or hot spots. As demonstrated by the CwDCC project for Chiredzi District, knowledge of current and future exposure to climate risk as well as adaptive capacity needs to be mapped out before adaptation programming commences. Developing a climate vulnerability index for the country will therefore be just as important as having a framework for measuring adaptation.

Measuring adaptation is not an easy process given the dynamic nature of climate impacts and responses. This is compounded by the fact that there is no agreed international stakeholder-wide framework for measuring CCA as is the case with DRR’s Hyogo Framework for Action or other similar frameworks in livelihoods, gender and other related development thematic areas or approaches. However there is literary and expert consensus that CCA initiatives seek to achieve reduction of vulnerability to climate change and variability and to enhance adaptive capacity of communities under consideration. Both are measurable through a variety of development indicators covering livelihood security, environment, economic, social etc.

The CwDCC focused on house hold income, food security, adoption of adaptation measures by vulnerable rural communities, level of agricultural productivity, climate change risk awareness among farmers and service providers etc. A clear national climate change adaptation monitoring and impact evaluation framework should be developed towards a more consolidated and integrated approach to measuring adaptations across sectors.

**4.0 Conclusion**

In summary climate change adaptation has critical policy relevance in the context of rural communities in semi-arid regions and the wider national development in Zimbabwe. Urgent policy actions are required across the key seven issues identified in this policy brief namely (1) Increase Conceptual Awareness for Climate Change; (2) Strengthen Policy and Institutional Frameworks for Climate Change; (3) Promote Climate Change Mainstreaming across all sectors (4) Increase Research, Innovation and Investment towards Supporting Livelihood Diversification; (5) Encourage Climate Financing through Domestic Sources; (6) Enhance Climate Change Human Capital Development and Infrastructure Improvements; (7) Support Learning, Knowledge Management and Impact Measurement for Adaptation.

The above seven core issues should be key pillars of the policy framework under development which will followed by a clearly articulated strategy, action plan and resource mobilisation plan. Given the critical significance of climate change in Zimbabwe policy makers at various levels should ensure development strategies and plans at all levels clearly integrate climate change adaptation. Institutional coordination reforms are likely to be the most important driver for positive change, effective mainstreaming, resource mobilisation and impact measurement for Climate Change Adaptation in Zimbabwe.

**5.0 References**

Chenje, M., Sola, L. & Palency, D. (eds.) (1998). The State of Zimbabwe‘s Environment. Ministry of Mines, Environment and Tourism, Government of the Republic of Zimbabwe, Harare

Desmond Manatsa, Leonard Unganai, Christopher Gadzirai & Swadhin K. Behera (2012). *An innovative tailored seasonal rainfall forecasting production in Zimbabwe.*

Government of Zimbabwe (2012).Zimbabwe Second National Communication to the United Nations Framework Convention on Climate Change Ministry of Environment and Natural Resources Management

Government of Zimbabwe (2009). Coping with Drought and Climate Change Project, Coping with Drought, Vulnerability and Adaptation to Climate Change: A focus on Chiredzi District, Zimbabwe, Synthesis Report.

Government of Zimbabwe (2011). Coping with Drought and Climate Change Project Quarterly Progress Report, 2011.

Kalonga (2011) Monitoring, Evaluation and Learning for Climate Change Adaptation Programming

A Learning Companion for Oxfam Disaster Risk Reduction and Climate Change Adaptation Resources. Oxford, England.

Leonard S. Unganai, Jessica Troni, Desmond Manatsa and Daisy Mukarakate (2012).*Tailoring seasonal climate forecasts for climate risk management in rain fed farming systems of southeast Zimbabwe*

Coping with Drought and Climate Change Project, Environmental Management Agency, Harare, Zimbabwe.

UNDP (2011) Zimbabwe Case Study, Adaptation Learning Mechanism, Oct 2011.

UNDP/GEF (2008). Coping with Drought and Climate Change Project Document. Harare, Zimbabwe

UNDP/GEF (2011) Coping with Drought and Climate Change Project: Project Implementation Review 2010 and 2011.

UNDP/GEF-GoZ: Coping with Drought and Climate Change Project, Report: Training provided on Downscaling Climate Change Scenarios for Save and Runde River Basins (Zimbabwe) by the Climate Systems Analysis Group (CSAG), University of Cape Town, December 2008

UNDP (2012) Terminal Evaluation of Coping with Drought and Climate Change in Zimbabwe

Unganai Leonard S. and Amon Murwira*, Optimising rain fed agriculture as a climate change adaptation strategy in southeast Zimbabwe.*

1. A final draft ready but not yet formally launched [↑](#footnote-ref-1)
2. Chenje, M., Sola, L. & Palency, D. (eds.) (1998). The State of Zimbabwe‘s Environment. Ministry of Mines, Environment and Tourism, Government of the Republic of Zimbabwe, Harare [↑](#footnote-ref-2)
3. Reserve Bank of Zimbabwe [↑](#footnote-ref-3)
4. UNDP/GEF Project Implementation Review 2011. [↑](#footnote-ref-4)
5. *Stover* is the leaves and stalks of maize, sorghum or soybean plants that are left in a field after harvest, which can be directly grazed by cattle or dried for use as fodder, including through ‘urea treatment’. [↑](#footnote-ref-5)
6. Desmond Manatsa, Leonard Unganai, Christopher Gadzirai & Swadhin K. Behera, *An innovative tailored seasonal rainfallforecasting production in Zimbabwe,* Natural Hazards, July 2012; and Leonard S. Unganai, Jessica Troni, Desmond Manatsa and Daisy Mukarakate,*Tailoring seasonal climate forecasts for climate risk management in rainfed farming systems of southeast Zimbabwe,* Coping with Drought and Climate Change Project, Environmental Management Agency, Harare, Zimbabwe, 2012. [↑](#footnote-ref-6)
7. Quarterly Progress Report, 2011. [↑](#footnote-ref-7)
8. Kalonga (2011) Monitoring, Evaluation and Learning for Climate Change Adaptation Programming

A Learning Companion for Oxfam Disaster Risk Reduction and Climate Change Adaptation Resources [↑](#footnote-ref-8)
9. According to the IPCC, Climate variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all spatial and temporal scales beyond that of individual weather events. Variability may be due to natural internal processes within theclimate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability). [↑](#footnote-ref-9)
10. Based on IPCC definition, 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*. [↑](#footnote-ref-10)