

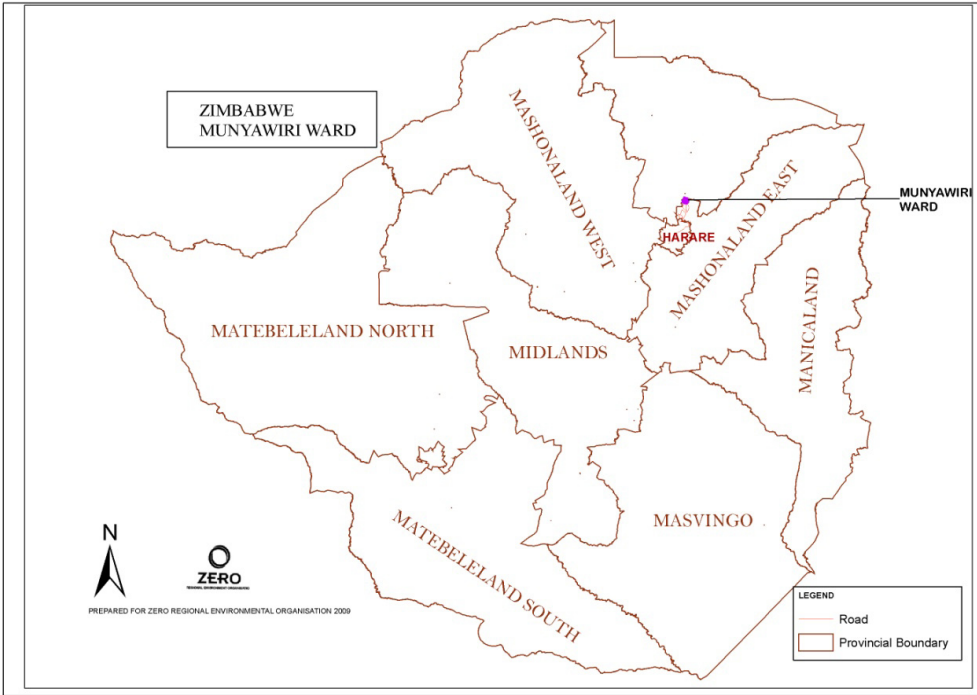
Community Based Adaptation to Climate Change in Africa (CBAA)

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COMMUNITIES AND CLIMATE CHANGE: BUILDING LOCAL CAPACITY FOR ADAPTATION IN GOROMONZI DISTRICT, MUNYAWIRI WARD, ZIMBABWE

SHERPARD ZVIGADZA, GODFREY MHARADZE AND SIMON NGENA



Series editors:

Judi W. Wakhungu, Joan Kariuki Kung'u and Charles Tonui

Background to the study

Warming through the 20th Century in Africa has been estimated at between 0.26 and 0.5°C per decade (Hulme *et al.*, 2001; Malhi and Wright, 2004). This trend is expected to continue and even to increase significantly, with attendant negative effects on livelihoods. According to the Intergovernmental Panel on Climate Change (IPCC, 2007), a medium-high emission scenario would see an increase in annual mean surface air temperatures of between 3° and 4°C by 2080. This implies difficult times ahead for local people that depend directly on natural resources for their livelihoods and have few assets or technologies to cope with the changes to come.

In Zimbabwe, recorded temperatures rose about 1°C over the last 40 years of the twentieth century, while rainfall and runoff decreased by approximately 20 and 30 percent, respectively (Zimbabwe First National Communications Report, 1998). As a country that depends mainly on rainfed agriculture, Zimbabwe is extremely vulnerable to climate variability and change.

Vulnerability and community adaptation

The impacts of climate vulnerability, manifested in floods, droughts, unseasonal rains and extreme events, create enormous developmental challenges for developing countries and the poorest communities due to their dependence on climate-sensitive economic sectors, such as rainfed agriculture, and their limited economic, technological and human capacities (IPCC, 2001a). As a result, developing countries and poor communities experience disproportionately high levels of death, social disruption and economic damage. Climate change will multiply these burdens (Sperling and Szekely, 2005).

Because the magnitude of current variability and additional climate risks on development is so large and pervasive, mainstreaming current and future climate vulnerabilities into development is an urgent prerequisite for sustainable development for developed and developing countries alike (Huq *et al.* 2003; UNDP 2005; Yamin 2005). This can be done by reducing emissions of GHG thus lessening the chances of climate change occurring (mitigation of climate change). It can also be done through enhancing mechanisms that promote planned and unplanned actions to resist, cope and take advantage of unavoidable changes (adaptation to climate change).

Community-led adaptation

Adaptation to climate change includes all adjustments in behaviour or economic structure

that reduce the vulnerability of society to changes in the climate system (Smith, Ragland and Pitts, 1996). Whether people can adapt, and for how long, depends on the resources available. Africa is the region most vulnerable to the negative impacts of climate change and at the same time has low adaptive capacity. But the people, particularly at the local level, are making efforts to adjust to the changes they observe.

The CBAA project, which is the subject of this case study, focuses on the second strategy --- adaptation--- with the focus on adaptation efforts led by communities affected by climate impacts.

Defining vulnerability and adaptation: Munyawiri

As the CBAA project is concerned with adaptation to climate change impacts by *vulnerable* communities, a key conceptual issue was what we mean by vulnerability and how this is linked to poverty and coping strategies.

Writing in an IDS Bulletin on vulnerability and how the poor cope, Robert Chambers (1989) noted that “vulnerable” and “vulnerability” “are common terms in the lexicon of development, but their use is often vague”, pointing out that often these terms simply serve as convenient substitutes for “poor” and “poverty”. He sought to distinguish poverty which he defined as “deprivation, lack or want” from vulnerability, described as “defenceless, insecurity, and exposure to risk, shocks and stress”. The distinction between poverty and vulnerability highlighted by Chambers is an important one. Vulnerability is not poverty: vulnerability is shorthand for factors that drive people into poverty, keep them in poverty and block their exit routes from poverty (ActionAid 2005).

In light of the above, ZERO is conducting a three-year community-based adaptation project under the Community Based Adaptation in Africa (CBAA), funded by the International Development Research Institute (IDRC) and coordinated by the African Centre for Technological Studies (ACTS) with technical support from the International Institute for Environment and Development (IIED) and Stockholm Environment Institute (SEI).

The main purpose of the project is to develop a range of coping mechanisms for reducing the vulnerability of peri-urban households to future climate change shocks. Munyawiri Ward, Domboshava area of Goromonzi district, is the project site.

Located in a semi-arid area on the edges of Domboshava, Munyawiri truly depicts the climatic changes taking place in various



parts of Zimbabwe, which often manifest themselves in period droughts and floods.

In general, the ward receives scanty rainfall, making the people living in this area extremely vulnerable because of non-availability of water for both domestic use and livestock watering.

Farming activities in Munyawiri are inextricably linked to rainfall patterns. Changes in the amount, distribution and onset of rainfall beyond the conventional range of variability hold serious implications for food production and thus the livelihoods of small-scale farming communities in the area.

Below are some of the direct and indirect impacts of climate change in Munyawiri as identified by the local people:

- Increasing variability in the onset and duration of summer rainfall
- A notable decrease in average annual rainfall.
- Drying up of perennial and other important water sources.
- Increases in the numbers of new pests and pathogens and changes in their timing affecting crops and livestock.
- Increased risk of veld fires.
- Increases in livestock deaths
- Declining yields of the staple maize crop.
- Women walking longer distances to fetch water
- Extinction of wetlands
- Decrease in vegetation cover

The CBAA project began in Munyawiri Ward in late 2008 under the aegis of ZERO, its partner Zimbabwe Women’s Bureau and a community-based organisation Wadzana. The project has been titled “Communities and Climate: Building Local Capacity for Adaptation in Munyawiri Ward, Domboshava”.

The project faced several difficulties, some natural and some man-made. Among the man-made challenges was the political stalemate, arising from the March 29 general elections which produced a “hung parliament”. A blanket ban was imposed on all NGO field operations in the run-up to the June 27 Presidential run-off election. Although partial lifting of the ban was announced in August, most NGOs --- ZERO included --- struggled to access the rural areas due to the volatile political situation.

Over and above that, poverty, the hyperinflationary environment and widespread food shortages made community mobilisation extremely difficult, particularly where no immediate tangible benefits were evident.

This paper begins with a background to the study area in Domboshava. This is followed by an examination of the climate change -related problems experienced by poor and vulnerable communities in Munyawiri Ward, their adaptive responses to these challenges and their associated needs to support these responses. It concludes with recommendations for next steps to help support communities in their efforts to adapt to their changing climatic circumstances. Policy and institutional frameworks relating to water management and climate change are also considered

Overview of study area

Domboshava is located within Goromonzi District which is found in longitude 17°S and latitude 31°E in Mashonaland East Province’s to the northeastern part of Harare as shown on Figure 1 below.

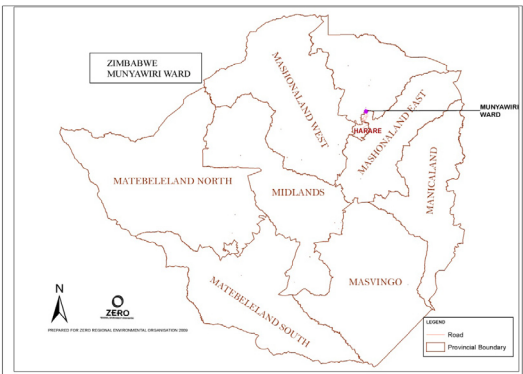


Figure 1: Location of Domboshava

The study area, Munyawiri Ward, comprises 51 villages spread over 200km². It is bounded by Mawanga Ward to the east, Mazoe Citrus to the west, Mashonaland Central to the north and Pote Ward 3 to the south. The area lies about 50km north-west of the capital Harare and has an estimated population density of about 26 people per/km².

Relief and Drainage

The area is largely rugged terrain especially in remote parts like Govera and Mazhero.

Drainage is dominated by the exogenous Masikandoro River which is seasonal and the intermittent Karoi stream including tributaries such as Munwahuku. Pote River also contributes to the drainage though to a lesser extent.

Rainfall and Temperature

Munyawiri lies within Zimbabwe’s agro-ecological region 2b which receives good rains but is subject

to frequent droughts, dry summer spells and short rainy seasons. Generally, the area is suitable for intensive crop and livestock production. Rainfall is unreliable and averages 650-800mm per annum with temperatures hovering around 26-29 degrees Celsius in summer. In winter temperatures drop to even 10-15 degrees Celsius with very little or no rainfall. Frequent mid-season dry spells and other unusual variations such as droughts are characteristic of marginal areas like Mutonda.

Vegetation

Most of the area is sparsely vegetated with shrubs. Common tree species are *Julbernardia globiflora* (munondo) and *Eupaca kirkiana* (muzhanje) and *Parinari curatelifolia* (muhacha).

Soils

The soils are derived from the same parent material but differ in properties because they occupy different topographical positions.

- Sandveld soil -- Widespread in the southern parts around Mutonda. The soils are, however, susceptible to leaching and soil loss under heavy rains.
- Red clay soils -- Found in areas like Kachuta, Manzungu, Mazhero, Chidombwe and Govera. The soils are very rich in soil nutrients and support a wide range of crops like maize, soyabeans, etc.
- Black turf soils --- Fertile but very tough to work since they become hard when dry and sticky when wet. Common in Mukote.
- Sandy soils --- Prone to leaching and erosion, these soils are found mostly in Mutonda and Govera.

Objectives of the study

The study's objectives were two-fold:

- To seek an understanding of the livelihoods, perceptions and socio-economic problems faced by communities in Munyawiri in relation to impacts of climate-related changes using the LOCATE methodology.

- Rank intervention priority mechanisms that can be put in place to alleviate problems and enhance the adaptive capacity of communities.

Methodology

The methodology consisted of a strong research component comprising focus group discussions, interviews and semi-structured questionnaires and field observations in village clusters. The methodology is called Local Options for Communities to Adapt and Technologies to Enhance Capacity (LOCATE). The first step involved organising reconnaissance meetings with the traditional leadership, local council officials, extension agents and other civil society organisations already working in the area to explain the projects objectives as well as ensure buy-in. Mapping was also key during this stage.

This was followed by a community workshop at Munyawiri Primary School attended by representatives of the five most vulnerable villages as well as traditional leaders, climate specialists, local government and specialist departments (AGRITEX and Veterinary Services), faith representatives, schoolteachers and community health workers.

A total 100 households participated in the study which was conducted during the month of December 2008. Various Participatory Rural Appraisal (PRA) techniques were used; key informant interviews were conducted with local administrative officials, elected officials, opinion leaders and technical services.

Only community members 40 years and above were questioned, on the assumption that younger people would have less experience of climate changes and fewer relevant observations. At most 20 questionnaires were administered per village.

On the basis of the FGD, key informant interviews and household questionnaire, five villages -- Mukote, Savanhu, Senzere, Chaonza and Govera --- emerged as the most vulnerable.

Of these, Mukote and Savanhu (see Figure 2 below) were deemed the most vulnerable and subsequently became the focus of this study.



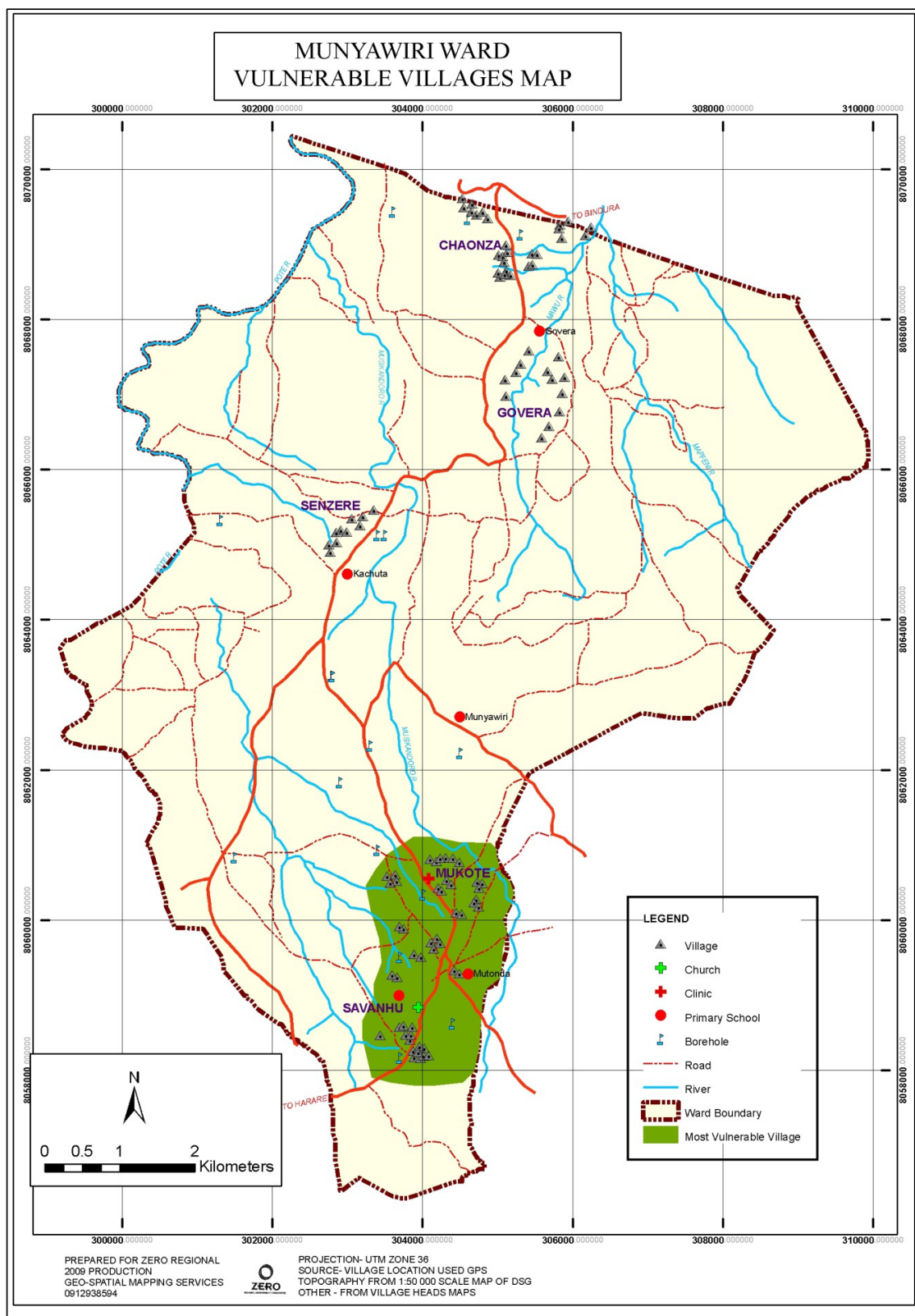


Figure 2: Map Showing the Five Most Vulnerable Villages in Munyawiri Ward

Key Challenges in Using the LOCATE Methodology

A number of potential barriers in implementing the LOCATE methodology exist. Some of the more obvious obstacles include low institutional capacity to undertake the necessary mapping, and limited knowledge and understanding of climate issues at local and national levels, in light of the brain drain driven by political uncertainty and the deepening social and economic crisis.

The LOCATE methodology is still fairly new to all the stakeholders. As a result, the project team had to learn by doing. A further problem was that Zimbabwe's poverty data is outdated. The national survey was carried out from November 2003 to March 2004 and published some two years later in 2006, making the data obsolete.

Similarly, climate data collected by the Meteorological Services Department for the years 2002 to the present is not available, except in its raw form, rendering it difficult to use.

Summary of Findings

This section describes the findings of the community-based research. Current problems, the associated responses by communities, and their additional needs and desires are presented below.

During field research and at the community workshop, villagers and leaders from the five village clusters spoke of a growing sense of uncertainty and confusion that had crept into their lives as a result of unexpected weather events and their impacts.

The majority expressed concern about increasing climate dynamics and all were anxious to move beyond the talking stage. This confusion was expressed through discussion of lives and livelihoods. It centred on immediate concerns regarding planting, loss of crops, and damage to infrastructure, people injured or dying due to extremes of weather or other indirect impacts.

In terms of contributing to vulnerability, of particular significance was the realisation of certain unsustainable practices, for example sand excavation for building purposes, gold panning cutting of timber for sale and burning and how these activities have been invaded and distorted by outsiders who are not aware of traditional practices.

People spoke also of how some organisations came to carry out research among the people but offered nothing in return.

Another significant theme at the workshop was that changes in the weather and climate were a clear sign that God was “angry” with the people, citing the biblical case of Noah. What these discussions may have pointed to was the idea that, in the past, the people of Domboshava and nature had existed largely in harmony except when humans did something to upset God or ancestral spirits, as a result of which, retribution would be exacted with penalties that were ecological in nature.

A further issue for discussion was that of lack of information on the weather and climate. Thus there exists in the contemporary era, a communications deficit because, to date, globalising modes of communication have not permeated much of Domboshava, despite its proximity to Harare. Community members receive information in the villages more by accident than design. Zimbabwe has four radio stations which broadcast in both English and the main vernacular languages, but most households do not have electricity to power the radios. Although batteries are readily available, most households cannot afford them on a regular basis. Thus, this became a key demand of local villagers, the need to receive information, whether it is news of a likely change in weather patterns (early warning) or information about issues concerning political and socio-economic developments.

An important outcome of the consultative workshop was the appreciation of local people for knowledge on issues such as climate change. Familiar refrains throughout the workshop were, “we did not know about this” or “nobody has ever discussed these things with us before” and “we want to know more”.

Community Perceptions on Climate Change

Most farmers in Munyawiri confirmed that climate is not as it was in the past. Up to 80 per cent and 76 per cent of the respondents indicated that rains are starting late and ending prematurely, respectively. Eighteen per cent had observed an increase in the frequency of mid-season dry spells while 28 per cent and 10 per cent observed an increase in flood and rains coming earlier than normal respectively. A



few of the respondents have observed seasons starting earlier than they normally should.

During focus group discussions with the elderly, changes noted were the absence of off-season rainfall events like winter rain (*Mavhurachando*), August rain (*Gukurahundi*) and September rain

(*Bumharutsva*) (see Box 1). These rainfall events were last experienced in the 1980s and their disappearance was attributed to both natural- and human-induced factors. The human factors included violation of cultural norms.

Box 1: Changing Rainfall Patterns

| Rainfall type | Time of year | Description | Uses |
|-------------------------------|----------------|---|---|
| Gukurahundi (washer of chaff) | August | Rains started after people had finished harvesting and threshing crops. The rains would wash away the chaff. | Rains were used for planting of rice in the dambos. Wild roots (tsenza) would be obtained from the mountains and planted in ridges at the same time. These roots were an important food source for households as they could be consumed at any time. Now the roots do not thrive as much and are scarce probably because the dambos are slowly losing their water retention capacities because of changing rainfall patterns. Gukurahundi used to be punctual but of late it has disappeared, .e.g. it was not experienced last season. It started disappearing around the 1980s. |
| Bumharutsva | October | The rains would cleanse the veld of the burnt grass and soot. | Farmers would start sowing rapoko which they would broadcast before turning down the soil and planting maize. Farmers would effectively use these rains to plant rice in the dambos. Rice (sadza remupunga) is maize substitute in lean times. The areas that were used for this have all been turned into gardens and horticulture practised instead. |
| Munhuruka | November | These were the important rains that would mark the season in terms of rainfall intensity and frequency. Abundant rainfall would be received around this time of the year. “Yaiita yokugoverwa iye zvino yavakunyimwa.” It was well distributed and would give farmers time to plant and weed their fields. Last season the farmers failed to weed their fields because of floods. | All the important crops would be sown. These included groundnuts, groundnuts, cowpeas and others. Intercropping was the mostly used farming system as the farmers diversified for food security. |
| Mubvumbi | February-April | The rains would last for days but with reduced intensity. It would drizzle for days. Rivers would full and flowing. The dambos would be soggy. Springs would be flowing. | These rains were important for keeping the crops watered and ensuring that all crops reached maturity. |
| Mavhura chando | June | These rains marked the beginning of the cold season. | - |

Other observed climate impacts on livelihoods include poverty, food insecurity and general water scarcity for household economic activities like horticulture, which is a major coping strategy in the study area.

Livelihoods in Munyawiri

Rainfall in Domboshava, like in the rest of the country, is unpredictable, which means that it is difficult to survive on agricultural livelihoods alone, and most people engage in multiple activities, including cattle rearing, as a way of reducing risk. Economic success in the area involves making the most of horticulture while owning substantial numbers of livestock as both a form of capital and insurance.

In general, the people of Munyawiri are subsistence farmers who grow maize, groundnuts, etc as food crops. Ninety-six percent of the interviewees in Senzere and 100 percent in Mukote villages named agriculture as their

primary economic activity, while one farmer in Savanhu and four in Chaonza cited livestock.

Market gardening is an important source for the modal (55-65 per cent) and well-to-do households (80-90 per cent of income); while the poor derive a larger portion of their income from employment/remittances (40-50 per cent), followed by non-food production (25-30 per cent), cash crop sales (10-20 per cent) and livestock sales.

Livestock sales account for between 5 and 10 per cent of annual income for the well-to-do, while the share of income from such sales for the poor varies between 0 and 10 per cent. Cattle sales are rare, except in cases of emergency and during droughts. In Chaonza and Senzere, small livestock and chicken sales are an important source of income for many households, as is the sale of vegetables for many women.

In all focus villages there are a number of small income-generating projects, but few in the

Table 1: Challenges Faced by Communities in Munyawiri

| Problem (rank) | Govera | Savanhu | Mukote | Senzere | Chaonza (participants from village not present on the first day) |
|----------------|-------------------------------|----------------------------|----------------------------|----------------------------|---|
| 1. | Water | Water | Water | Water | |
| 2. | Farm implements | Electricity | Farm implements and inputs | Food insecurity | |
| 3. | Irrigation equipment | Self help projects | Food insecurity | Farm implements and inputs | |
| 4. | Sanitation(toilets) | Food insecurity | Poverty | Road networks | |
| 5. | Inadequate self help projects | Farm implements and inputs | Sanitation (toilets) | Grinding mills | |
| 6. | Orphans | Road networks | orphans | Sanitation(toilets) | |
| 7. | Transport | Unemployment | widows | Electricity | |
| 8. | Widows | Dipping chemicals | deforestation | Orphans | |
| 9. | Road networks | Entertainment for youths | disabled | transport | |
| 10. | The disabled | | gullies | | |
| 11. | | | | | |

surrounding villages. There is, for example, a carpentry, peanut butter and oil processing group at Chengura Business Centre, established by Wadzanai Community-Based Organization.

Cross-border trading --- with Zambia, South Africa and Botswana the major destinations -- is undertaken by both men and women in the project sites. Other sources of income include the sale of wild fruits (particularly mazhanje, tsubvu) in season and beer brewing.

Impacts of Climate Change

The people in the study area may not understand the concept of global warming or climate change, but they observe and feel the effects of decreasing rainfall, increasing air temperature, increasing sunshine intensity and seasonal changes in rainfall patterns.

Partly as a result of reduced rainfall – compounded by deforestation and unsustainable land use practices – discharges in all the water

bodies in the ward have been low, and some streams have completely dried up. In the dry seasons the flow is so low that the river beds are exposed, and some of the boreholes dug by communities to ensure availability of water year round also dry up, indicating a possible reduction in groundwater. Water availability is decreasing at a time when demand is increasing because of an upsurge in population.

Not surprisingly, water is the most crucial problem the study area today, as reflected in the table below derived from pairwise ranking by the communities:

Apart from water shortages, drought and floods were singled out by both villagers

and community leaders as the major climate-related challenges in the study area.

Droughts

The most significant droughts in Zimbabwe in recent years are reported by the Meteorological Services as occurring in the mid-1980s and early 1990s. The increased frequency of droughts since 1990 (90/91, 91/92, 92/93, 93/94, 94/95, 97/98, 01/02, 02/03, 04/05, 06/07) has caused catastrophic losses in livestock. This, combined with the failure of agricultural crops, severely increased vulnerability, particularly in Munyawiri, where 24 percent of households were identified as food insecure (GoZ, UNDP, 2005).

Table 2 below looks at past drought periods and the local-level and national-level responses.

Table 2: Drought in Munyawiri -- A Historical Perspective

| Year | Description | Responses | Agents |
|-------------------------|--|--|--|
| 1942 World War 2 | <ul style="list-style-type: none"> Meteorological and agricultural drought Crops failed | <ul style="list-style-type: none"> People survived on Kenya (yellow maize). Children were given roots (madzungwa, hwenya) which they consumed as relish with the yellow sadza. They also ate wild fruits like matamba and tsombori. | <ul style="list-style-type: none"> Donated to them by white farmers. Parents sought roots and fruits in the forests. |
| 1947 | Agricultural Drought | People survived on the yellow sadza till 1948 | Donated by whites |
| 1962/63 | Agricultural drought | <ul style="list-style-type: none"> Begging from white farmers in the surrounding area. Buying food from workers on commercial farms. Gardens and dambos provided some food | <ul style="list-style-type: none"> White farmers Workers on commercial farms. Munyawiri farmers |
| 1992 | <ul style="list-style-type: none"> Agricultural drought Meteorological drought Livestock deaths Food insecurity /hunger Foot and mouth disease outbreaks Black leg | <ul style="list-style-type: none"> Begging was still possible People could still afford to buy food from commercial farms nearby Most villagers had been retrenched as a result of the Economic Structural Adjustment Programme (ESAP) and were now out of work. Food for work | Government |
| 1995 | Agricultural Drought | <ul style="list-style-type: none"> Drought relief - people were given maize Most people survived with help from a nearby commercial farmer (Bhokera) who sold them potatoes at affordable prices | <ul style="list-style-type: none"> Government Commercial farmer (Bhokera) |

Floods

Flooding in the ward is particularly associated with unusually heavy rainfall in the rainy season. Damaging rain and rain-induced flooding occur regularly, but comprehensive records of these events do not exist. The most serious floods in Domboshava occurred in 2000 during Cyclone Eline. Cash losses and damage to infrastructure, such as bridges, schools, etc, ran into thousands of dollars. Associated erosion causes siltation and damages the carrying capacity of the Masikandoro River.

Diseases

Although no specific mention was made of diseases related to climate change, there were reports of people risking malaria by sleeping with their windows open because of unusually high night temperatures. During prolonged rainfall shortages, water sources become scarce, stagnant and contaminated, raising the incidence of cholera.

Box 2 summarises some of the impacts of climate change in Munyawiri.

Gender and Climate Change

Women's responsibilities in the family make them more vulnerable to environmental change, which is exacerbated by the impacts of climate change. As access to basic needs and natural resources --- such as shelter, food, fertile land, water and fuel -- is hampered, women's workload increases.

Drought, deforestation and erratic rainfall mean women have to work harder to secure resources and livelihoods. In such situations, women have less time to earn income, get an education or training, or to participate in governing bodies. Girls regularly drop out of school to help their mothers to gather wood or water.

Our research findings indicate that in all five villages, women's educational levels were much lower than for men. About 18% of the women interviewed had never gone to school compared to 3% of men. Of those women that did go to school, approximately 80% dropped out at Grade 7 (the last primary school grade) against 44% of the men.

Box 2: Increasing Vulnerabilities

Weather Changes: All villages reported increasing evidence of weather changes since 1973, with the pace of change increasing. Rainfall is reduced, becoming irregular and unevenly distributed geographically. The rains come later and are shorter while temperatures are also rising.

Water-Related Issues: Surface water in Munyawiri consists primarily of seasonal rivers (Masikandoro) and two dams Mutonda and Mwayera. Water availability is diminishing while water needs are rising. Most villages mentioned the need to water animals more frequently. This is particularly the case in Savanhu and Mukote which have no communal boreholes. The result is an overall increase of the workload, as more trips to scarce water sources are required. The time spent on water collection, as well as the amount collected and the distances travelled, are all increasing. This causes further hardship for households in the study area, particularly for women and children. Women spend on average almost five hours a day collecting and transporting household water during the hot season.

Expenditure for Basic Commodities: Expenditure on cereals (especially maize) has risen, as yields decline. Before the advent of the multi-currency system now in use in Zimbabwe since January 2009, prices of basic commodities were rising on a daily basis. This forced many rural families to cut down on the number of meals per day. During drought years [such as 2005], prices soared beyond the average household's ability to pay.

The low levels of literacy among women pose a major challenge in implementing some adaptation and mitigation strategies specifically targeted at women, such as energy efficiency, the promotion of renewable energy technologies, etc. In addition, traditional made attitudes, epitomised in the saying “a woman’s place is in the home” force many women to keep quiet in the presence of men during workshops.

Our research also found that women are at a disadvantage during droughts and floods. For example, none of the women who took part in the survey knew how to swim while young girls pointed out that it was considered taboo for them to climb trees. Yet the ability to swim and/or climb trees can make the difference between life and death during floods.

In times of drought, women complained that they had no power to dispose of assets, such as cattle, without the permission of their husbands, who might be employed far away from home.

Despite this, women’s role in mitigating the impacts of climate change cannot be underestimated. For example, 61.8% of the women surveyed grow drought-resistant crops like rapoko and sorghum as well groundnuts, cowpeas, groundnuts, etc as a food security measure to cope with climate change.

Finally, women play a critical role in rain-making ceremonies either as beer brewers (restricted to those past child-bearing age) or as spirit mediums.

Traditional Coping Strategies and Challenges

The study revealed a variety of coping strategies applied with mixed success, which suggests that local traditional knowledge could provide the basis for development of more effective strategies.

The *people in the* surveyed communities realised that water shortages are a major threat to their survival and have developed several strategies to cope with this phenomenon. One is to reuse water, for example from washing clothes or utensils, to irrigate household gardens and nurseries. Households are also rationing water, trying to reduce the water use per person

per day. However, the practice is abandoned as soon as the rains begin. This strategy needs to be part of a behavioural change and not applied only during periods of water shortage.

Most communities are actively reviving rainwater harvesting, a traditional way of collecting and storing rainwater in drums placed under the roofs of houses. This practice had largely been abandoned when the communities dug wells and boreholes, but has attracted interest again as a result of their drying up. However most of the communities covered in the study reported that they are unable to harvest enough rainfall under the current climate, characterised as it is by diminishing rainfall.

The traditional and local authorities identified clearing of riparian vegetation as a major factor increasing soil erosion and siltation of rivers, which eventually reduces stream flow, and they are adopting measures to remedy the situation. The measures include creating awareness of the effects of deforestation around water bodies, sensitising the communities about prevention of bush fires, promoting community-based management of forests and imposing fines on those who indiscriminately set fire to the forests, clear riparian vegetation or violate other measures designed to protect the environment.

However, these efforts by the traditional authorities are not yielding notable results because the communities, although still rural in terms of development and infrastructure, have become more cosmopolitan or heterogeneous and no longer adhere as absolutely to traditional authority as they did in the past. The communal nature of the communities is breaking down; people now tend to be more concerned with individual than with collective well-being.

With the widespread adoption of Christianity, traditional spiritual practices, such rain-making ceremonies, are now seen as superstition. It is therefore not surprising to have “prayers for rain” and traditional rain-making ceremonies taking place within the same community simultaneously or just days apart.

Most sites reported that the changes in climate and rainfall have caused a decrease

in food security, so there has been a shift away from farming activities. For example, there is now increasingly regular recourse to various income-generating activities like small livestock sales (e.g. goats), beer brewing, brick making, selling forest products (e.g. firewood, wild fruit, thatching grass, etc).

In terms of income generation, most communities are diversifying. Women engage in a wider range of income generating activities than previously (handcrafts, carpentry, piece work) and often run flea markets selling a variety of commodities. Men have also diversified their activities, with many involved in “buying and selling” all manner of commodities.

There has been a noticeable rise, too, in levels of migration, with both men and women migrating to South Africa to find work.

In periods of drought, food relief is perceived as the most important coping mechanism in Munyawiri. Government assistance in terms of food relief was received by most people during the drought years of 1991/92, 2001/02 with many adults, and youths on behalf of adults, taking part in food-for-work programmes.

In recent years, the Government of Zimbabwe (GoZ) has assisted in the rehabilitation of cropping through the provision of free inputs, particularly maize seed and fertilizer. During the 2008/09 agricultural season, the inputs scheme was expanded to include small grains such as sorghum and millet, and open pollinated varieties (OPVs). Food relief is also given by humanitarian organizations, notably Christian Care.

Another frequently used coping mechanism in times of drought is casual work or odd jobs and gold panning. Remittances from relatives in urban areas are now less frequent, reflecting the hardships experienced by people in towns and even the Diaspora as a result of the global economic downturn.

Credit associations and savings clubs were mentioned by the women of Senzere as a reliable coping mechanism.

In addition, there are negative coping strategies, which include:

- Taking children out of school, either to herd cattle or to earn cash from wild fruits (mazhanje) or firewood by the roadside.
- Theft, particularly of livestock and garden produce
- Women resorting to commercial sex work to earn cash.
- Tree cutting for firewood selling.
- Forcing school-age girls into early marriages in return for food
- Reduction in the number of meals per day.

Indigenous Knowledge Systems

The term “indigenous knowledge” is used to describe the knowledge systems developed by a community as opposed to the scientific knowledge that is generally referred to as “modern” knowledge. Indigenous knowledge is the basis for local-level decision-making in many rural communities. It has value not only for the culture in which it evolves, but also for scientists and planners striving to improve conditions in rural localities. Incorporating indigenous knowledge into climate-change policies can lead to the development of effective adaptation strategies that are cost-effective, participatory and sustainable.

Our findings, for example, show that farmers are able to use knowledge of weather systems such as rainfall, thunderstorms, windstorms and sunshine to prepare for future weather. Elderly male farmers formulate hypotheses about seasonal rainfall by observing natural phenomena, such as the appearance of certain birds, mating of certain animals and flowering of certain plants, while cultural and ritual specialists draw predictions from divination, visions or dreams (Roncoli et al., 2001).

The most widely relied-upon indicators are the timing, intensity and duration of cold temperatures during the winter season (May to July). Other forecasting indicators include the



timing of fruiting by certain local trees, the water level in streams and ponds, the nesting behaviour of birds, and insect behaviour in rubbish heaps.

As the heat rises during October, conversations in Munyawiri usually begin to revolve around the coming of the rains. The waiting game is loaded with expectation, speculation and concern. Everyone has a theory about the likelihood of a good or bad year, but no one knows quite what will happen.

Some farmers carefully observe the changing patterns of the winds and the movement of the clouds, developing specialisations in local meteorological patterns. Others observe the signs, waiting for the cuckoo bird (*hwaya* in the local language) to start calling, or particular hills to catch fire in the intense heat. Others speculate on the past cold season and the relationship between cold winters and good rainfall or the patterns of good and bad seasons over the years.

A sample of some of the traditional weather forecasting techniques is given below:

- Wild fruits --- An abundance of fruits like *hacha*, *mazhanje*, *hute* and *nhunguru* indicates a good rainfall season.
- When birds (*majesa*) build their nests in the dry season near the river bed it means they are anticipating low rainfall and therefore confident that their nests will not be swept away by heavy rains. But when they build their nests high up farmers know for sure heavy rains will fall that season.
- Hasty spiders struggling to get indoors or into hiding places were an indication of the starting of *Munhuruka* rains.
- When a black crow builds a nest in an area it is an indication that that area would not receive rains because the crow would not risk its eggs going bad. When farmers find these nests they destroy them.

Conclusion

Global climate change will result in rising temperatures and increased water evaporation from soils, resulting in further land

degradation. Climate change is likely to be a continuing driver for the fundamental changes already found in the study area, including:

- reductions in the quantity and quality of grazing land due to desiccation, vegetation change and species loss
- worsening access to water supplies as water table falls.
- Increased surface run-off which makes capture and storage more difficult and causes erosion
- rising levels of conflict over natural resources and water supply

In addition climate change is likely to bring new challenges:

- temperature rises could threaten animal health
- Increasing variability and new climate extremes could result in more extreme droughts and, at times, floods.

The following areas of action could strengthen existing household adaptive capacity and community solidarity, in order to avoid strategies that further increase vulnerability:

- *Raising awareness on climate change:* Since community awareness (including that of other NGOs working in the area) on climate change and its impacts are very low, raising awareness is critical. Current and projected climate change trends and impacts will need be shared with school students, teachers, the community, policymakers and other stakeholders. This should go a long way in improving the community's preparedness for climate change.
- *Improving water availability and irrigation systems:* Because of erratic rainfall, droughts have been more frequent and of larger magnitude in recent years. Water availability has fallen because groundwater recharge is lower as a result of rainfall being confined to fewer days during the summer leaving the rest of the year bone dry. Possible interventions should include the introduction of drip irrigation systems, which maximise on scarce water resources.

- *Off-season cash crop planting*: Erratic rainfall has reduced maize crop production and threatens food security. To combat this, off-season horticultural crops grown under irrigation are highly recommended. Income generated will allow farmers to purchase grain and/or maize meal, and farming inputs as well as create employment for men, women and school-leavers.
- *Improved land management and forest conservation*: Tree felling, both for domestic and commercial purposes, is widespread in Munyawiri. Project interventions, therefore, should be targeted at improving the state of natural resources, particularly forests. Orientation training, exposure visits, workshops and meetings should be organized. Support for woodlot and tree nurseries and restoring degraded land should also be provided while controlled grazing and browsing should be encouraged to promote natural forest regeneration.
- *Integrated crop production*: Long rotation crops, like fruits, that are more resilient to erratic rainfall are recommended. It is envisaged that planting both long and short rotation crops will help farmers fulfill long- and short-term needs. Ideally, farmers should also be trained to use marginal land and temporal gaps through intercropping and agroforestry. Increasing agricultural biodiversity has proved to be a key livelihood strategy for coping with changing and more challenging environmental conditions in other drought-prone parts of Zimbabwe, such as Chivi (Masvingo Province) and Gwanda (Matabeleland South), and can be replicated in Munyawiri.
- *Community-based weather monitoring*: To understand changes in local weather patterns, a simple weather station could be established, preferably at one of the local secondary schools. This will provide information on daily minimum and maximum temperatures, rainfall and humidity. The data will help the community understand how local weather patterns are changing over time. In a few years, communities will be able to draw concrete conclusions regarding the changing climate.

Other proposed interventions include: Livestock keeping education, extension and marketing development, grazing management, production of small grains (sorghum and millet), conservation farming, environmental education, community-based seed banks, entrepreneurship development (targeting especially women), post-harvest storage and processing development, water harvesting and management (consolidated gardens), sustainable use of wetlands and social networks (safety nets).

The implementation phase of the project proposes to take the adaptation measures recommended by the village clusters and try to turn these into a reality by attracting funding and interest from the donor community. Key to this process is the enthusiasm and positive emphasis attached by local people to the CBAA project which is seen as the people's own project helped from outside but designed and implemented by local people themselves. Experience shows that the sense of ownership responsibility for outcomes in such situations is quite high.

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For more information on the project, please contact:

Eastern Africa:

| | Country | Contact Person | Organization | Email address |
|---|----------|----------------------------|--|-----------------------|
| 1 | Kenya | Prof. Judi W. Wakhugu | African Centre for Technology Studies | j.wakhungu@acts.or.ke |
| 2 | Sudan | Dr. Sumaya Zaki- Eldeen | Sudanese Environment Conservation Society | zakiields@yahoo.com |
| 3 | Tanzania | Ms. Euster Kibona | Environmental Protection Management Services | epms@bol.co.tz |
| 4 | Uganda | Ms. Susan Nanduddu | Development Network for Indigenous Voluntary Association | pna@deniva.or.ug |

Southern Africa:

| | | | | |
|---|--------------|-------------------------|---|--------------------------|
| 5 | Malawi | Mr. Khumbo Kamanga | Coordination Unit for the Rehabilitation of the Environment | kjkamanga@yahoo.co.uk |
| 6 | South Africa | Ms. Bettina Koelle | Indigo development and change | bettina@indigo-dc.org |
| 7 | Zambia | Dr. George Kasali | Energy and Environmental Concerns Zambia | kasaligeorge@yahoo.com |
| 8 | Zimbabwe | Mr. Shepard Zvigadza | ZERO Regional Environment Organization | shepard@zeroregional.com |

Non-African Partners:

| | | | | |
|----|---------------|-------------------|---|------------------------|
| 9 | Great Britain | Dr. Saleemul Huq | International Institute for Environment and Development | Saleemul.huq@iied.org |
| 10 | Bangladesh | Golam Rabbani | Bangladesh Centre for Advanced Studies | golam.rabbani@bcas.net |
| 11 | Sweden | Dr. Richard Klein | Stokholm Environmental Institute | richard.klein@sei.se |



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For more information, please visit: www.cbaaafrica.org; www.clacc.net; www.acts.or.ke; Contact Email: info@acts.or.ke