



DISPATCHES ON ADAPTATION



A light brown outline map of the African continent is centered on the page. A horizontal band of solid light brown color runs across the middle of the page, overlapping the map's outline. The text of the index is positioned on the left side of this band.

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CLIMATE CHANGE, LOCAL ADAPTATION AND RESOURCE TENURE IN RURAL AFRICA

Prepared by Fred Nelson

A changing climate is increasingly becoming a reality for rural communities living across sub-Saharan Africa. While the precise local impacts of climate change remain difficult to predict, it is clear that climate change will result in manifold shifts in the availability of environmental resources, livelihood options, and disease burdens. While the developed nations debate ways to reduce their greenhouse gas emissions, for African countries the central climate change issue is how to adapt to reduce the vulnerability of local and national economies to increased variability and unpredictability in climatic and environmental conditions. In rural Africa's socioeconomic context, where the majority of people continue to live in rural areas and depend on small-scale agriculture, pastoralism, and other natural resource-based livelihoods, the environment and human well-being are inextricably linked.

Patterns of rainfall are a particularly important environmental parameter across sub-Saharan Africa, which is largely made up of semi-arid landscapes, from the Sahel that runs from West Africa to Sudan, to the vast savannahs, grasslands and woodlands of East and Southern Africa. With the potential for substantial changes in the levels and distribution of rainfall, farmers may have to shift their crop production strategies, while pastoralists re-visit their ways of accessing seasonal pastures and water sources. At the national level, resource-based activities such as wildlife-based tourism will likely be affected and species' ranges change according to similar shifts in resource availability. At both local and national levels, societies will be forced to adapt to climatic changes which are not of their making, but which have been shaped by global economic and environmental dynamics.

Fortunately, rural communities across Africa have long coped with environmental variability and often harsh conditions including drought, disease outbreaks affecting people and livestock, changing watercourses, and the challenge of co-existing with dangerous large mammals. Many rural communities have fashioned adaptive institutions for managing natural resources which are designed to increase resilience to shocks and changes. For example, pastoralists across East Africa have long-established rules governing access to communal pasture, forests, and water sources which are designed to provide refuges during times of drought and crisis. For African farmers, diversified multi-cropping systems are prevalent as a way of reducing vulnerability and insuring against unpredictable annual conditions. Traditional knowledge about accessing wild foods and medicines from forests and woodlands remains central to people's livelihoods across the continent, and also helps to reduce vulnerability through diversification.

While African communities are thus particularly vulnerable to climate change as a result of existing environmental conditions, poverty, poor infrastructure, and other factors, rural Africans also possess many forms of knowledge and social institutions that can provide the 'adaptive capacity' to help people respond effectively to climate change.

A key element of this ability to adapt effectively to climate change in rural African landscapes is local rights and authority to make and enforce rules governing resources. In other words, local resource tenure over lands and natural resources is a critical element of

'adaptive capacity' in relation to climate change. Just as natural resources are often managed most sustainably through locally devised and enforced rules, which presupposes a degree of formal or informal local authority (e.g. property rights) over those resources, adaptation to climate change is a process that will depend extensively on decisions that are made at the local level. Adaptation cannot be designed and imposed in a top-down manner, although adaptation will require effective links across different scales, from local to national to global.

Local resource tenure and institutional capacity are therefore a fundamental components of the climate change adaptation agenda in rural Africa. If rural communities cannot make collective decisions about how the resources that their livelihoods depend on are used and governed, then adaptation will be difficult or impossible. Reforms that decentralize or devolve more secure rights over lands and resources to local communities are consequently a critical element in promoting more resilient local livelihoods in the face of climate change.

A major challenge, in this context, is the reality that most lands and resources that local groups of people depend upon remain under central government control. Across sub-Saharan Africa, decentralization reforms often seem to have stalled in the face of political resistance. In many countries all lands or forests continue to be state-owned, making appropriation of local resources in favour of external interests relatively easy. In the last several years, concern has grown over large-scale allocation of land across sub-Saharan Africa for agricultural or biofuels investments, wildlife-based tourism or state protected areas, and other uses oriented towards promoting commercial investments.

The existing trends in relation to natural resource governance, local rights and tenure, and decentralization across Africa are determined both by historical legacies and contemporary politics. Historically, colonial regimes imposed centralized systems of land tenure and natural resource management in order to further external interests and exploitative interests. Post-colonial governments have maintained, or often increased, centralized political control in order to pursue both transformative developmental policies and private political-economic interests. In Africa's agrarian societies, land and natural resources are the basic determinants of wealth, and thus of political power, and in many cases governing elites in undemocratic states seek to maintain control over resources in order to maintain power and privileges. Just as land tenure was a key issue in African independence struggles against European colonial regimes, struggles over democratic rights, participation in policy making, and economic opportunities in the post-colonial era often focus on rights to access and benefit from valuable natural resources.

In these ways, democratization, local land and natural resource tenure, and adaptive capacity in relation to climate change are fundamentally interconnected. Prevailing political-economic trends favouring central discretionary authority over lands and natural resource management are incompatible with promoting local adaptive capacity. Democratizing natural resource governance in African societies thus stands as a central issue in facing the growing challenge of climate change in coming years.

WILD RESOURCES AND DROUGHT INSURANCE STRATEGIES – A CASE STUDY FROM ZIMBABWE¹

Prepared by Marshall Murphree

Subsistence farmers in rural sub-Saharan Africa have for centuries relied on wild resources such as fruits, berries, tubers and undomesticated animals as a source of sustenance in times of drought and the failure of cultivated crops. The harvesting of such resources is usually done on a household or on individual basis. In the last two decades the commercialised use of wildlife and other wild resources by local communities has been promoted, often under the name of Community-Based Natural Resource Management, or CBNRM. This collectivised and commoditised mode of wild resource usage has, when the relevant resources are available, considerable potential for revenue generation but also carries with it the dangers of bureaucratic and private sector exploitation which minimises any significant improvement in local rural livelihoods. In practice the record of such enterprises is mixed, with success only being found where communal regimes have achieved either de facto or de jure ownership over their

land and resources and developed management systems which have both external and internal legitimacy.

Zimbabwe was one of the first countries in southern Africa to initiate a CBNRM-type scheme in the late 1980's, styled CAMPFIRE (Communal Areas Management Programme for Indigenous Resources). One successful CAMPFIRE community in Masoka, a wildlife-rich village in the Zambesi Valley which by 1990 had secured de facto rights to retain a approximately 60 per cent of the revenues from professional hunting operations on its land and had developed transparent and inclusive decision-making procedures for the use of these revenues. The resultant budgets are highly revealing. Table A below aggregates the various annual allocations (usually 12-15 line items) into three categories for the five year period 1990-1995, a period when the value of the Zimbabwean dollar was relatively stable.

Table A. Masoka Wildlife Revenues and Budget Allocations, 1990-1995 (in Z\$)

Year	Revenues (After deduction of council levies)	Budget Allocations		
		Resource management	Household dividends/ drought relief	Community projects
1990	78,170	10,260 (13%)	25,200 (32%)	42,710 (55%)
1991	89,293	7,798 (8%)	69,677 (78%)	11,818 (13%)
1992	276,745	44,279 (16%)	10,640 (4%)	221,826 (80%)
1993	459,891	65,599 (14%)	127,000 (28%)	267,292 (59%)
1994	639,290 ¹¹	138,290 (22%)	165,000 (26%)	336,000 (52%)
1995	526,593	115,200 (22%)	140,000 (26%)	271,393 (53%)

Note: ¹¹. Includes \$120,000 from one-off live sale of twelve roan antelope. Sources: Masoka Wildlife Committee and Guruve District Council records.

Table A underscores the value of Masoka's off-farm wildlife resource. Per household cash revenues from wildlife by 1995 were more than double the average household income from the community's other cash crop, cotton.

There was also an impact on equity. Cotton production by household is highly uneven in Masoka and ranged, in 1995, from zero to forty thousand Zimbabwe dollars in value while wildlife dividends were distributed equally to all households. For the purposes of this case study, however, the most interesting thing about the Table is its indication that the community was using its wildlife income as a buffer against negative growing conditions. Note that 78 percent of all 1991 revenues were allocated to household dividends and drought relief because of an almost complete crop failure in the 1991-1992 growing

season while 80 percent of the 1992 revenues were spent on community infrastructure because of good 1992-1993 growing season. Clearly the community was using its wildlife revenues flexibly, in good agricultural years for collective development and in bad years as a food security mechanism.

Climate change resulting in an uninterrupted series of drought years would of course diminish the value of this tactic, as wildlife populations would themselves decline. The people of Masoka recognise this but remain convinced that their strategy of prioritising wildlife production in the semi-arid conditions of their part of the Zambesi Valley will be more ecologically robust in a future of declining rainfall than that of their agro-pastoralist neighbours.

¹ Adapted from: M.W.Murphree (2005) *Congruent Objectives, Competing Interests, and Strategic Compromise: Concept and Process in the Evolution of Zimbabwe's CAMPFIRE, 1984-1996.*, in P.Brosius, A.L.Tsing and C. Zerner (eds.) *Communities an Conservation. Histories and Politics of Community-Based Natural Resource Management.* Walnut Creek: Altamira Press. Pp. 105-147.

DROUGHT, ADAPTATION, AND LAND RIGHTS IN EAST AFRICA

Prepared by Fred Nelson

East Africa, including most of Kenya, northern Uganda, northern Tanzania, and southern Ethiopia, is for the most part a semi-arid region inhabited predominately by a diverse range of pastoralist communities. Pastoralists in East Africa, including groups such as the Maasai, Barabaig, Borana, Samburu, and others, depend on natural resources such as water, rangelands, and forests to provide for their livelihoods. Pastoralists dominate the populations of large parts of East Africa, and produce most of the livestock across the region. The historic co-existence of pastoralists and wildlife in East African savannahs provides the basis of lucrative tourism industries in Kenya and Tanzania.

The central reality shaping pastoralist livelihoods is the variability of environmental conditions in East Africa's semi-arid savannahs. Rainfall across the region is distributed irregularly, with two annual but highly variable peaks in precipitation generally occurring in April (the 'long rains') and November (the 'short rains'). Annual variation around these 'normal' patterns of rainfall can be extreme; some years the short rains fail entirely, whereas in other years the short rains may be late and merge continuously with the long rains. The region often oscillates between drought and periods of heavy rain (such as the El Niño phenomena), which can lead to flooding, destruction of infrastructure such as rural roads, and surges in human and livestock diseases such as East Coast Fever.

Rainfall is the critical factor shaping pastoralists' livestock production systems. Even though annual levels of rainfall are limited and variable across much of the region, these semi-arid landscapes can be extremely productive because of the rich volcanic soils that blanket much of East Africa's Rift Valley and surrounding areas. Because of the mineral riches of these soils, when rain does fall, apparently barren lands can spring to life in only a few days.

Because of the variability of rainfall and the unpredictable location of grazing following localized rains, as well as the importance of certain seasonal sources of water, mobility has been a key aspect of pastoralist livelihoods and livestock production. East African pastoralists are not nomadic, as is sometimes asserted, but rather move between different seasonal grazing areas according to changing availability of water and pasture, as well as other factors such as livestock disease prevalence. This seasonal pattern of movement effectively mirrors the way wildlife in East Africa, such as the region's great migratory herds of wildebeest, zebra, and antelopes, move between wet season and dry season ranges.

Pastoralists are highly dependent on natural resource management, including traditional conservation practices which help them to sustain key resources such as water, pasture, and forests. Forests provide key refuge areas during droughts, as well as key water catchments as 'water towers' in semi-arid savannahs. Many forests in East Africa, such as Kenya's Loita Forest, have been protected through traditional pastoralist rules prohibiting tree felling in these important areas.

Another key aspect of pastoralist resource management systems are rules governing the use of different livestock pastures at different times of year. Many areas are designated as dry season grazing reserves, where access by livestock is not allowed until at some point towards the middle of the dry season. Strictly enforced local rules also prohibit agricultural cultivation or construction of permanent homesteads in these grazing reserves, which helps maintain natural vegetation and habitats for many species. These traditional pastoralist natural resource management systems have been critical to maintaining the resilience of community livelihoods in the face of an unpredictable and challenging environment.

The traditional adaptability of pastoralists to their environment is today increasingly threatened by the twin challenges to climatic changes and the loss of lands through external political-economic forces. Climate change may result in even greater inter-annual variability in rainfall and environmental conditions. In this context, pastoralists' locally adaptive management strategies, such as seasonal mobility and the ability to enforce rules protecting drought refuges such as forests, become even more critical to local human welfare and ecosystem sustainability.

In this context of environmental change, perhaps the greatest challenge to local adaptation and survival comes from changes in land use and land tenure which can undermine traditional management strategies. Since the colonial era began in East Africa in the late nineteenth century, pastoralists have increasingly been compressed into smaller and smaller areas of land. Policy makers during the colonial and post-colonial era have often misunderstood the logic of pastoralist production, accusing pastoralists of being inefficient, wasteful, and causing environmental degradation through over-grazing. Government policies generally have failed to recognize pastoralists' communal land tenure practices, often not recognizing or enforcing customary land rights or, as in Kenya, promoting individualization of communal lands. Pastoralists have lost large tracts of land through externally-promoted agricultural investment schemes, which took away many

Image from Dorobo Fund for Tanzania





What does the future hold for East Africa's pastoralist communities?



Photographer: David Peterson

of communities' most important dry season refuges, as well as the establishment of national parks for wildlife conservation and tourism.

Today the loss of land is intensifying across the region. New markets such as biofuels are leading to interest in large areas of pastoralist lands, such as in southern Ethiopia, for commercial investments.

East Africa's landscapes are also increasingly valuable through global commercial markets for their unique wildlife populations, the basis of tourism industries worth more than \$1 billion annually in both Kenya and Tanzania. Land is increasingly prized for tourism developments, which are often carried out through business partnerships between government elites and foreign investors. This creates a strong incentive for government policy makers, particularly in light of East Africa's weak democracies, to expropriate pastoralist lands for commercial purposes.

In Tanzania, for example, wildlife management interests have led to a range of recent conflicts over pastoralist lands. In the Loliondo area, adjacent to Serengeti National Park, thousands of pastoralists were affected when a government operation burned down homes located within traditional dry season grazing reserves, in an area which has also been allocated by the government to a foreign hunting

operation. This episode, revolving around competing interests over land and wildlife and occurring at the height of one of northern Tanzania's worst droughts to occur in recent years, highlights the tensions over increasingly valuable natural resources across much of East Africa. If government plans are implemented in the face of local resistance, communities in Loliondo will lose most of their key grazing areas and their ability to sustain livelihoods in the face of potential climatic changes will be devastated. Similar tensions between local land use interests and government wildlife management objectives are likely to spread throughout most of northern Tanzania in coming years, particularly in light of a new Wildlife Act passed by Parliament in early 2009 which greatly increases central control over pastoralist lands where wildlife occurs.

As environmental impacts from climate change intensify and global markets increase the value of East Africa's landscapes for activities ranging from tourism to biofuel production, conflicts over land use and land rights are likely to intensify. The outcomes of these conflicts, and the commitment of different parties to mediating them peacefully and effectively, will play a critical role in the ability of communities to adapt to climate change and sustain their livelihoods and indigenous conservation practices in the future.

CONFLICT AND WATER: NORTHERN KENYA

Prepared by Lucy K. Wambugu

Northern Kenya is one of the driest regions in the country. The general scarcity of water is caused mainly by the geographic location. It borders the dry zones that are adjacent to the horn of Africa with very little rainfall, less than 500mm per year, and no natural rivers. The only river of any mention is the River Tana which only traverses the southern part of the area on its way to the Indian ocean. Its volume is affected by both hydro electric and agricultural activities. These activities have reduced the water that finds its way to the region and also the quality due to contamination with agricultural and industrial chemicals and waste up stream.

The weather has become more unpredictable with time. Normally Northern Kenya expects two rain seasons per year. Lately the trend has become alarming since the rain seasons have become shorter and there have even been periods with no rains or very little rains for periods of up to three years. The region also experiences extreme temperatures up to 40 degrees Celsius. This makes it a very difficult area to live in and it also means that the vegetation cover is reduced to scrubland. Except for a few pockets like the area around Marsabit which has a relatively more normal weather conditions the rest of the region experiences very harsh climatic conditions and are getting worse as climate change is effecting the predictability and reliability of the rains.

The region, which stretches from the Somali border to the Uganda border to the west and to the Ethiopian border to the north is inhabited by several tribes, mainly pastoralists. These tribes include the Somali, the Turkana, the Borana, the Rendile, and the Samburu among others. Traditionally these tribes have very emotional attachment to their animals and migrate all over the region in search of water and pasture for their animals. Yet they have their traditionally recognized land of habitation. Consequently there are occasional incursions of one tribe into another tribe's territory in search of water and pasture. When that occurs there is conflict which arises due to competition over scarce supply of resources. These tribes have traditionally stolen cattle from each other and therefore such migration also results in heightened incidences of conflict.

Small tribal wars due to cattle rustling keep on recurring in the Turkana and West Pokot Districts and have resulted in the deaths of up to 50 people. Herd boys are killed and abducted together with their animals (up to 3000 animals could be driven away at one go). This is followed by retaliations and vengeance such as the event in 2008 in the Turbi village in Marsabit district where a whole village of 200 persons were wiped out. However, the most important source of conflict arises from the competition for scarce resources. There are major conflicts at the Mbalambala border between the Orma of Tana River and the Somali

of Garissa since the area has traditional water wells whose ownership keeps on changing hands between the Orma and the Somali depending on who wins the battle. Here there is competition for water and the pasture surrounding the wells. Now, due to the ever increasingly unpredictable weather conditions caused by climate change, water is becoming even more scarce and is causing even worse competition. It is expected that these conflicts will escalate and become more dangerous since the tribes have started to arm themselves with modern weapons.

The conflicts arising from climate change are not confined to the Northern region alone and are to be found elsewhere. In the Tana Delta district, where the Tana River meets the Indian Ocean there are wetlands which are very conducive for agriculture, inhabited by the Pokomo. Their neighbours to the north are the Orma who are pastoralists with large herds of cattle. Whenever there is a prolonged drought the Orma migrate with their animals towards the wetlands and graze on anything that is available. Crops are destroyed and the river is contaminated. The Pokomo whose crops and whose source of water is being destroyed have always reacted violently and there have been very serious battles.

The government has realized the issue of resource use and has embarked on a programme to manage the situation and minimize the occurrence of these conflicts. A Ministry of Northern Kenya has been established to oversee the implementation of water provision and the introduction of changes in land use and the use of natural resources. These changes together with mobilisation, education and awareness amongst the people in these areas are expected to reduce these conflicts and promote co-existence despite the negative effects of climate change.

The armed conflicts due to water shortage in Northern Kenya and in particular around the Tana River delta threaten the economic and political stability of Kenya. As long as the country has developed cold feet in addressing the causes of armed conflict, it will not escape the view that it is providing a safe haven for people with criminal intent who are using water scarcity as a reason for armed conflict. It has the legal and constitutional mandate to act decisively in order to protect the lives and property of its nationals. There is a need for the government to facilitate and support community driven initiatives for conflicts arising from water shortage especially those that have their roots in historical social issues. It needs to use the social, economic and political causes of conflict as pillars to drive and anchor reconciliation and stability. The government needs to rethink and redefine its development agenda for the country and its people.

RIGHTS AND REDD: COMMUNITY RESOURCE GOVERNANCE AND CLIMATE CHANGE MITIGATION IN SOUTHERN AFRICA¹

Prepared by Fred Nelson

Land use changes and processes, mainly deforestation and forest degradation, account for an estimated 17% of global greenhouse gas emissions. As a result, the development of policy frameworks and operational strategies for Reduced Emissions from Deforestation and Forest Degradation (REDD) aiming to promote sustainable forest use and conservation have moved to centre stage in the global climate policy debate.

Southern Africa possesses large areas of forested landscapes, particularly the Miombo (*Brachystegia* sp.) woodlands that cover most of the region from Zimbabwe and Mozambique north through southern and western Tanzania. The region also includes smaller, often isolated patches of broadleaf forest with exceptional biodiversity, such as Tanzania's Eastern Arc Mountain range and the coastal forests of Tanzania and Mozambique.



Photographer: Fred Nelson

The region's forests and woodlands are currently undergoing high rates of forest loss and degradation due to a range of factors. In Tanzania, for example, the government estimates forest loss at 450,000 hectares annually, which is one of the highest rates of deforestation in Africa.

Forests are being lost and degraded through local land use dynamics, which includes clearing of woodlands and forests for agriculture in relatively unproductive areas. Clearing woodlands for farming is driven by expanding human populations and both local and urban food demand. Demand for energy in the form of charcoal, which produces over 90% of household energy supplies in some countries, also drives unsustainable use of forests. Lastly, the region's forests, particularly in coastal countries such as Mozambique and Tanzania, are being subjected to rapidly increasing demand for timber, much of it being imported to China and other Asian countries.

REDD is premised on the use of global financial transfers from developed nations to developing countries, including those in southern Africa experiencing high rates of deforestation. Payments will aim at creating economic incentives for different actors who control forests, from local communities to state agencies, to take actions that improve forest conditions and carbon storage capacity.

It has become widely recognized that creating an effective framework for REDD requires placing forest governance and land tenure considerations front and centre. Much forest loss is linked to forests' status as 'open access' resources where rights over forests and lands are unclear, and forest users have few incentives to invest in enforcing rules that promote sustainable use. Clarifying and strengthening local users' rights over forests, and the land that forests are situated on, is critical to linking payments made under REDD to the incentives of the local communities which effectively control the fate of forests across many rural landscapes. In Tanzania, for example, the development of legal and policy mechanisms for promoting Participatory Forest Management since the 1990s has enabled over 4 million hectares of forests to be placed under village-level management institutions, or to be co-managed between local communities and state forest agencies. Many of these forests have shown marked improvements in ecological condition, including increasing carbon stocks, as a result of strengthened local incentives for protecting forests and regulating use. As a result, PFM has assumed a central place in Tanzania's emergent National Framework for REDD, which will provide the basis for a fuller REDD strategy.

A major challenge for REDD implementation in African countries lies in the institutional implications of creating a major new form of economic trade, in the form of carbon values, around forested landscapes. In many African countries, as the economic value of natural resources has increased, so have the political incentives for national governments and ruling groups of political elites to control those resources. These incentives may be manifest in both formal and informal ways. For example, as resource values increase, governments may pass laws ensuring centralized ownership or control over those resources. Such measures may be passed in the near future to ensure central control over carbon markets. Informal means of controlling resources may include illegal trade or resources extraction; such informal use is widespread, for example in Tanzania where a study carried out by TRAFFIC in 2007 estimated that over 95% of timber trade occurring in the country was illegal, causing a loss of government revenue of \$58 million annually.

The creation of global markets for African forests' carbon values under REDD is likely to create strong political incentives for central states to increase their control over forests and forested landscapes. A major concern of local groups is that, in the African governance context of weak democratic accountability, REDD may lead to dispossession of local communities as elites and private investors scramble to control forests' economic values. If this occurs, REDD may thus undermine its own objectives. REDD depends on strengthening local forest tenure if it is to function effectively, yet the financial transactions that REDD is premised on will themselves create incentives to weaken such local rights over forests. This governance dilemma is a critical challenge for efforts to link global climate change mitigation, conservation of Africa's forests, and local livelihoods in forested landscapes.

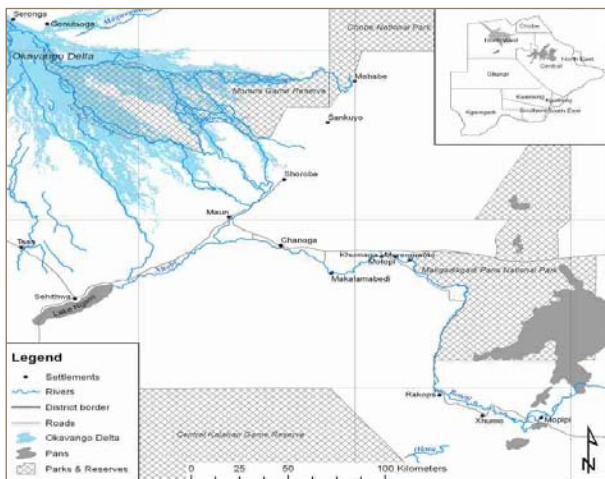
¹ This brief draws on the following forthcoming publication: Gomera, M., E. Rihoy and F. Nelson. In press. *A changing climate for community resource governance: Threats and opportunities from climate change and the emerging carbon market*. In F. Nelson (ed.), *Community Rights, Conservation, and Contested Lands: The Politics of Natural Resource Governance in Africa*. London: Earthscan.

WHEN CLIMATE CHANGE AND NATIONAL POLICIES COMBINE TO UNDERMINE LOCAL ADAPTATION

Prepared by Lapologang Magole & Masego Madzwamuse

Local Livelihoods in the Boteti River

A combination of Government policy and the drying up of the lower end of the Boteti river caused by climate and variability has affected land use and livelihood strategies of the riparian communities. Boteti river is at the distal end of the Okavango River system.



Map of Okavango Delta and Boteti River

Due to unfavourable climatic conditions, in particular low rainfall locally and in the highlands of Angola the annual Okavango flood regime has not reached the lower part of this river since 1990. Riparian communities report that the last floods to reach their part of the river were in 1989/90.



Pictures of Dry Boteteti River Bed

When the river was flowing communities had livelihood strategies which were largely based on the river resources and response to the flood regime. The strategy included a combination of fishing, flood recession agriculture, gathering of water and dry land veld products, as well as a pastoral system which was based on migration

Local Livelihoods in the Okavango Delta



Aerial View of the Okavango Delta

The results of an earlier study carried out in the Okavango Delta in 2000 and 2001 revealed similar challenges for local communities. The Okavango Delta is characterised by constant ecological change which requires continuous adaptation on the part of local communities.

Fire, flooding, drought, animal migration, and seasonal fluctuation in the abundance and availability of plant and animal products are typical of this dynamic ecosystem.



Fire and Flooding, part of the dynamic system

The people living in the Okavango Delta using local knowledge developed livelihood strategies in response to the constant climatic changes and resources. These included nomadism in response to changes in the Delta flooding patterns, the use of fire to open up river channels and allow for flows downstream, selective hunting and gathering methods and the use of various wetlands resources for food requirements such as fish and waterlilies.

between the river, water holding pans in the area and well fields away from the river. Diversified livelihoods and seasonal mobility were central to the coping strategies of these pastoralists in times of unfavourable weather conditions. Today a combination of the drying up of the river and conservation particularly the gazettement of protected areas, land policies and livestock disease control policies has caused changes to the livelihood strategy of the riparian communities. Part of the community land has been annexed for leasehold farms as well as extension of conservation areas. As a result livelihood options have narrowed down, dependence on government aid has increased as government, harvests are low, people own less livestock, and the environment has suffered severe degradation due to a combination of drought, stocking levels which are too high for the reduced grazing area.

Community Ranking of Source of Livelihood 1989 & 2007	
1989	2007
Flood recession farming	
Dry land arable farming	Dry land arable farming
Livestock	Livestock rearing
Formal employment	Government support
Casual employment	Casual employment
Parental support	Formal employment
Fishing	Gathering
Government support	
Hunting and Gathering	

Moreover a top down land management policy has diminished the decision making power of the people and rendered them more vulnerable and less able to adapt to unfavourable climatic conditions.



Water and dryland resources

Today the delta communities live a sedentary lifestyle due to government resettlement programmes, the demarcation and extension of the Moremi Game Reserve and private concessions to the tourism sector. The limited participation of communities in policy development and decision making about land and natural resource management has negatively impacted on local responses to climatic and resource variability. At present many of the communities have lost access to resources in the delta and the game reserve. Their livelihoods are now highly dependent on government handouts, an unstable tourism industry for employment and small scale farming in flood prone areas and areas that are highly vulnerable to wildlife crop damage.



Flooded maize crop

This situation is likely to get worse as the Government of Botswana suspends the community based natural resources management policy which was designed to provide communities with an increased role in the management and benefits from natural resources.

Key policy messages

- Government needs to consider enhancing the adaptation capacity of the people in Boteti and the Okavango Delta by supporting and facilitating a community based integrated land and water resource management system which promotes sustainable livelihoods.
- A stable and enabling policy environment is required for adaptation. The current status of the CBNRM policy in Botswana is threatening to make the use of natural resources redundant as a potential adaptation strategy.
- Diversity and flexibility in resource use are key to local adaptation strategies. In order to build resilience policy interventions need to support these strategies rather than undermine them i.e. allow for access to dry season resources within protected areas
- Access to a range of livelihood assets is fundamental to adaptation - an approach that emphasis single assets and one that hampers access to natural resources that are key to subsistence livelihoods weakens resilience of communities.
- Security of tenure and flexibility in policies is also critical
- Policies need to enhance local coping strategies
- Governments need to urgently lead the process of understanding climate change impacts and developing adaptation strategies for the sectors and resources that rural livelihoods are dependent on (Wetlands, Forestry, Fisheries, Rangelands and Wildlife)

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UNDERMINING COMMUNITY ADAPTATION CAPACITY

Factors affecting small-scale farmer communities' resilience to the impacts of climate change in South Africa

Prepared by Fonda Lewis, Brigid Letty, and David Cox – The Institute of Natural Resources

Introduction

Climate change in South Africa is likely to be experienced as increased temperatures and changes to rainfall patterns. This will result in the likelihood of greater dry-spell lengths interspersed with intensified heavy rainfall, resulting in a greater frequency of flood events (Hewitson, no date).

South Africa has approximately 4.8 million small-scale farmers operating on an area of about 17 million hectares (Gbetibouo and Ringler, 2009). The small-scale farmer communities in Limpopo, KwaZulu-Natal and Eastern Cape Provinces are largely dependent on rain-fed agriculture, which means that they are highly vulnerable to the anticipated variations in temperature and rainfall associated with climate change in this region (Gbetibouo and Ringler, 2009). Increased evaporation rates and the change in rainfall events will result in an increase in the numbers of days when topsoil is said to be at 'wilting point'. In some areas the number of such days currently experienced is expected to double (Shulze, 2007). If small-scale farmers do not find ways to adapt, these changes will result in reduced crop yields or even entire crop failure, which will threaten food security and livelihoods of the small-scale farmer communities.

The overall social impact of climate change is largely determined by the vulnerability of these communities. Vulnerability is a function of sensitivity, adaptability, preparedness and resilience. The most vulnerable livelihood systems display low resilience and high sensitivity (Ellis, 2003). Resilience, as applied to integrated systems of people and the natural environment, has three defining characteristics (<http://www.resalliance.org/576.php>):

- a) The amount of change the system can undergo and still retain the same controls on function and structure
- b) The degree to which the system is capable of self-organization
- c) The ability to build and increase the capacity for learning and adaptation

Adaptation is a broad category of actions that attempt to reduce vulnerability and refer to the degree to which adjustments are possible in practices, processes, or structures of systems (Kiker, no date). Maladaptation in contrast refers to actions that ultimately increase vulnerability and decrease resilience. These actions could represent the responses taken in the short term that satisfy an immediate need but are not productive in a longer term. Maladaptation may be initiated at government level as well as community and household level (Kiker, no date).

Small-scale farmers have generally demonstrated an inherent level of resilience. There is evidence of innovative small-scale farmers adapting local practices or experimenting with ways to improve their farming systems by increasing productivity, reducing labour or reducing environmental degradation. The sources of knowledge that serve as the basis for these processes of innovation usually include indigenous knowledge, traditional practices, introduced technologies or farmers' own ideas. However over time new constraints to the potential for adaptation, and maladaptations, are also introduced that decrease the resilience of these farmers to the impacts of climate change. These constraints and maladaptations can be attributed to a range of social, governance and economic factors. This paper aims to raise awareness about some of the factors that are undermining the ability

of small-scale farmer communities in South Africa to adapt to the impacts of climate change.

Tenure and land use rights

The majority of the small-scale farming communities in South Africa live under communal land tenure systems. Land use rights are allocated to individual households by local traditional authorities, and there is a common practice of "use it or lose it". Households who do not (or cannot) actively farm their land for about three consecutive years risk forfeiting their use right, which may be re-allocated to other households. Increasing scarcity of good quality agricultural land will increase land pressure and competition for productive land, further weakening the asset base of the vulnerable and disadvantaged households within small-scale farming communities. Households that do not have the capacity or ability to self-organise and adapt their farming systems in response to the impacts of climate change stand the risk of not being able to successfully farm their land. The weak tenure rights of these households may result in them forfeiting their land rights. They would then have no access to land for farming even when they do have access to resources to invest in a crop, or during favourable climatic cycles. Strategic interventions to strengthen tenure security in order to strengthen the resilience of vulnerable households within small-scale farming communities are therefore vital.

Gender

Rural women are particularly vulnerable and influenced by the adverse impacts of climate change. They have limited adaptive capacities arising from prevailing social inequalities that manifest themselves in differences in property rights, access to information, lack of employment and unequal access to resources (Mwebaza, 2009). These problems are exacerbated in many small-scale farmer communities in South Africa where migrant labour patterns result in absentee male heads of households, who hold decision-making authority regarding allocation of scarce household resources and changes in land use practices. This means that, in the absence of the male head of the household, the women who are traditionally responsible for food production and care of livestock are not free to re-organise their livelihood activities and adapt their farming systems, so as to maintain their functioning and contribution to household food security. This reduces the preparedness and resilience of these households and increases their vulnerability to the impacts of climate change. Addressing the social inequalities of women in adaptation strategies is therefore important for enhancing communities' resilience to climate change.

Culture and traditional beliefs

Culture plays an important role in mediating human responses to environmental change (Heyd and Brooks, no date). Individual and societal responses to environmental changes that are likely to arise from climate change are embedded in an ensemble of cultural patterns, encompassing belief systems, values, practices and habits, as well as technology and information (Heyd, 2009). The cultural context in which people are operating needs to be respected and carefully factored into adaptation strategies. In some contexts, cultural beliefs may complicate communities' understanding of signs and symptoms of climate change. For example in Zulu culture tornadoes or other extreme weather events involving fierce winds, rain and hail are

ascribed to the migration of a large snake (known as *inkanyamba*) that lives in deep water, rather than being recognised as climatic phenomena. Similarly, planting and harvesting cycles of crops are often linked to the phases of the moon rather than directly with rainfall and temperature cycles, which correlate with the phases of the moon. Since temperature and rainfall patterns are changing as a result of climate change, appropriate planting and harvesting times may now no longer accompany the traditionally associated phases of the moon. Some traditions or cultural beliefs may therefore constrain the amount of change social systems can undergo while still retaining their function and structure. However culture and tradition must be respected when adaptation strategies are brought in by outside agencies, to ensure that maladaptations are not introduced that might improve communities' resilience to the impacts of climate change on one hand but erode its social fabric on the other.

Indigenous knowledge and traditional practices

Traditional knowledge and practices developed over time have been useful in providing practical solutions for small-scale farmer communities to deal with environmental change. Climate variability is not new and many of the anticipated impacts (floods, droughts, etc), have been experienced and adapted to over the course of time. Traditional knowledge is however increasingly being lost because changing social systems and values are resulting in it not being transferred between generations (Hart and Vorster, 2006). Past South African government policies have also contributed to this by discouraging traditional practices and giving less recognition to the value of indigenous knowledge and the role it can play in improving livelihoods of small-scale farmers. These influences have resulted in an increasing trend of younger generations turning their backs on traditional practices in favour of what are perceived to be 'superior modern technologies'. Indigenous knowledge is not static and is improved and changed over time as people incorporate new tools, skills and knowledge. Individuals within communities who have the ability and interest to adapt and improve systems are said to be innovators. New knowledge that they develop, which is of value and relevant to other members of the community, is taken up by them and integrated into local practices that may become tradition. Indigenous knowledge therefore has the potential to enhance small-scale farmers' capacity to adapt to the impacts of climate change, and its value needs to be promoted especially among the younger generations. Encouraging local innovation and the dissemination and internalisation of indigenous knowledge would increase the farmers' capacity to themselves discover locally appropriate mitigation and adaptation responses to the impacts of climate change.

Local governance

In South Africa the mandate of local government (municipalities) includes land-use planning and stimulation of local economic development. In rural areas under communal land tenure systems, traditional governance systems also still exist. Traditional leadership is given both identity and authority through South African legislation. The National House of Traditional Leaders Act (1997) requires that "*Traditional leadership should have partnerships with municipalities based on the principles of mutual respect and recognition of the status and roles of the respective parties*". Nonetheless this is not always the case and the de facto authority of traditional leadership has widely been eroded and challenged by democratically elected local government structures. The effectiveness of local government structures themselves is however frequently challenged by a lack of capacity and resources. Experience has shown that the conflict and uncertainty between new political and traditional leadership systems undermines the ability of the local governance structures to achieve co-ordinated decision-making and effective leadership. This limits its

ability to develop policies and strategies to support the re-organisation and adaptation of small-scale farmers in response to the threat of climate change, thereby increasing their vulnerability rather than enhancing their resilience.

Poverty

Inadequate financial resources mean that households living in poverty are highly dependent on the provisioning services from the environment to meet their basic livelihood needs. This dependence often leads to maladaptations in order to meet immediate survival needs. Examples of these include unsustainable harvesting levels of wetland and fish resources, and destruction of natural habitats for unsustainable cropping on marginal and fragile areas. Poverty in South Africa, as in other parts of the World, is multifaceted and is linked to more than just financial deprivation. Poverty is also linked with characteristics such as poor health and disease, exploitation, and lack of access to services such as potable water, health care, information, skills development and education. An estimated 62.2% of the rural households in the Province of KwaZulu-Natal are living in poverty (KwaZulu-Natal Office of the Premier, 2004). Poverty undermines the resilience of households to self-organise and adapt in response to the impacts of climate change. It also limits the capacity and opportunity for learning about the impacts of climate change and appropriate adaptation strategies. Addressing the non-financial characteristics of poverty is therefore also essential for enhancing small-scale farmer communities' resilience to climate change.

Conclusions

Climate change adaptation initiatives aim to enable communities to understand and integrate the concept of climate risk into their livelihood activities, in order to increase their resilience to immediate climate variability and long-term climate change (Ensor and Berger, 2009). These initiatives must however recognise the heterogeneity of small-scale farmer communities and also address the needs of vulnerable and disadvantaged households within communities, to ensure that these households do not become further marginalised and vulnerable to the impacts of climate change. Furthermore there needs to be an understanding of potential barriers to the development and uptake of adaptation strategies by households or entire communities. The adoption of seemingly good and relevant adaptation strategies may be impeded by barriers such as local tenure rights, gender inequalities, poverty levels, or cultural beliefs. The unique circumstances and character of each community needs to be addressed to ensure that social, political and economic barriers do not undermine the community's adaptation capacity.

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