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Global warming is likely to lead to a variety of changes in local climatic conditions, including potential increases in the frequency and intensity of extreme climatic events such as drought, floods, and storms. Present capacity to respond to and manage climatic variability, including extreme events, is an important component of adjustments to climatic changes. In particular, identifying and addressing constraints on local adaptation mechanisms—whether political, economic or social in nature—is critical to developing effective adaptation policies. The drylands of Kenya present great survival challenges to the people living in these areas. The hilltops in the drylands provide favorable climate and resources for adapting to climate change. The present paper examines the role that one particular hilltop, Endau in Kitui District, eastern Kenya, plays in processes of local adaptation to climatic variability and drought. The project presented here investigated how conflict and exclusion from key hilltop resources constrain adaptation among the population groups living around the hilltop, and how these constraints are negotiated, addressed, or even exacerbated through institutional arrangements and development activities.

Endau: a fragile source of livelihood

Endau is one of several hilltops in Kitui District (Figure 1). It lies between the central highlands of Kenya and the coastal forests. From the dry plains at 500 m, the hill rises to several peaks, the highest of which is 1400 m. Practically all the forest from the foot of the hill to the peak has been gazetted as government forest. Akamba agropastoralists first started settling around the hill 130 years ago; in addition, various groups, including pastoral Akamba, Oroma and Kenyan Somali groups, seasonally migrate to the area to access water and pasture as well as to trade.

The area has a bimodal rainfall pattern. Rainfall levels are low and unreliable, leading to frequent crop failures. In recent studies, most members of the community indicated that temperatures have increased over the years, leading to more and prolonged drought. Due to these changes, farmers have had frequent crop failures and must rely on alternative sources of food and income. The resources on the hill are a critical factor in local adaptation to this situation. When crops fail, people buy food and resort to hunting animals in the hilltop forest and gathering various forest products (honey, herbal medicine, materials to make bows and arrows), or rely on

FIGURE 1 Farming at the foot of Endau hill. (Photo by Siri Eriksen)

FIGURE 2 Extraction of water from shallow well rented out to pastoralists. (Photo by Siri Eriksen)

government relief. The hill is the only source of water during drought. Water is accessed directly from springs, shallow wells (Figure 2), and piped supply. Oroma, Somali and Akamba groups rely on the shallow wells for watering their cattle during drought; in addition, the hill itself acts as an alternative watering and grazing site for the agropastoral Akamba. In the past, when people were allowed to live on the hill, it supported cultivation of diversified crops, owing to its cooler temperatures and relatively higher precipitation. The most vulnerable people in the society rely mainly on local casual employment, labor migration, and assistance from social networks as well as remittances to survive drought and other crises.

A social survey was carried out in 4 villages around the hill, including household interviews, group interviews, participant observations, farm visits, and market observations. The survey was complemented by a vegetation survey to understand the interactions between local populations surrounding the hill and the hilltop vegetation. In order to assess seasonal changes, data were collected both in August 2004, during the height of the 2004 drought, and in February 2005 after the rains.

Main barriers to adaptation

The study identified 3 main constraints to adaptation in the area.

Access to the forest is limited, leading to tension and conflict between the inhabitants and the government (Forest Department). Following evictions of farmers from the hill in 1948 by the colonial government, and in 1996 by the District Commissioner, local communities feel that they have been illegally denied access to grazing, water, and forest resources.

There is a lack of development of basic services and infrastructure. Marketing facilities are poorly developed, roads are impassable during the rainy season, there is a lack of telephone networks, and significantly, there has been little development of piped water from the hill to the villages, provision of which is critical for domestic use, survival during drought, and economic activity.

Between the 1970s and the 1990s, numerous families lost their means of production, including land, livestock, and businesses, due to eviction from the forest as well as raids and general insecurity. Such destitution is a major barrier to

enhancing longer-term livelihood security in the face of frequent drought, as illustrated by the story of one of the study informants (Box 1).

Landless in Ndetani

An informant explained how he and his family are landless. They have been living on the hill since the 1960s. When they were evicted from the northern side in 1996, they found that their original land at the foot of the hill had been taken over by others, while their clan was unable to allocate new land for them. As they were too poor to buy land, they emigrated to the southern side and are now cultivating a small plot borrowed from relatives in Ndetani-Kamusa. This piece of land is so small that they cannot harvest enough to sustain themselves. Therefore they rely on casual employment, and produce charcoal, cut posts, and make bows and arrows and walking sticks from forest resources, which they take to the market to sell for money to buy food. Gathering forest products is therefore important to their survival strategy. However, restrictions on access to the forest that require payment of levies to the Forest Department, make forest access unaffordable to the poor such as the informant, exacerbating their precarious predicament.

Institutions and negotiation

Development activities and access to resources are negotiated through institutional arrangements at different levels. The ways in which these institutions, both formal and informal, address but sometimes also exacerbate inequality, destitution, and conflicts have fundamental implications for the social distribution of vulnerability (and ways of strengthening adaptation to climatic and other changes).

Clans

The Akamba ethnic group lives in the vicinity of the Endau hilltop forest. The Akamba have clans which function as an informal institution, consisting of pronounced social networks based on marital linkages. The size of the clan affects its networking, power relation, and control of natural resources. Large clans often dominate development committees, sometimes leading to failure of these committees to deliver. Only in areas with fair representation for all groups were the committees found to be effective (Figures 3 and 4). Each clan has its own mechanism for regulating land acquisition, use, and disposal, and also resolves land disputes and conflicts.

Traditional resource governance

Dryland human populations had traditional resource governance structures. These were highly respected, with sanctions against those who broke societal norms and rules governing natural resources use, management and conservation. Among the Akamba was a group of elderly women known as *Mwamba*, who regulated use of and access to the hill, with the power to punish those who did not use the hill as per the informal rules set by the society. The power of the *Mwamba* has dwindled greatly, as the government has taken formal control of the hilltop forests. The spread of Christianity has also undermined the spiritual authority of the *Mwamba*, except in the southern part of the district.

Modernization of resource governance

In the colonial and post-colonial periods, traditional resource governance structures were dismantled and replaced with modern management systems that put the government in charge and prevented the people from gaining access to their resources, leading to alienation and conflicts. Modernization of resource management has greatly complicated access to, use of, and control over natural resources, and has led to greater marginalization of the poor and vulnerable members of the society who have the least access to formal institutional channels.

Council of Elders

Although formal mechanisms exist at the district and village levels, informal mechanisms are still most important in addressing various resource-related conflicts. During drought, the Akamba, Oroma and Somali groups converge at the foot of the hill to rent access to water and pastures (Figure 2). This sometimes leads to dis-

FIGURE 3 Piped water from the hill, managed by a water committee. (Photo by Siri Eriksen)

putes over rights between the settled agropastoralists and the pastoralist groups, between agro-pastoralist families, and between the different competing Akamba, Somali and Oroma pastoralist groups. The Councils of Elders in the 3 ethnic groups are responsible for the negotiation of access to resources and regulation of resource use, as well as for conflict resolution. They operate parallel to the official government machinery and are at times involved in resolving serious conflicts using traditional negotiating mechanisms. There are continuous negotiations on issues such as levies, access to the forest, the number of livestock to be allowed in the forest, renting of shallow wells, and security.

Resource politics

Local politicians and political parties represent another institution that affects conflict and vulnerability. Many local politicians have taken advantage of the expectations of the local population that they will one day be able to return to farm on the hill, as well as of the fears of pastoralist groups. These politicians have sought to rally support by inciting conflicts, for example by promising access to the forest and eviction of all pastoralists if elected. As a result, the political agenda has been diverted away from issues of landlessness, inequitable distribution of land and resources, and development of water supply and other basic infrastructure.

Strategies for addressing barriers to adaptation

An important aim of the project, in addition to enhancing scientific understanding of local adaptation, was to generate useful information on the basis of which practical interventions can be crafted, and to strengthen links with and between policy-makers and practitioners. Empirical evidence regarding adaptation and its constraints can inform measures taken by local and district administration regarding specific interventions and development projects, as well as adaptation strategies at the national level.

Platform for discussion

An additional aim was to create a platform and forum for discussion of constraints on adaptation, which would include different

FIGURE 4 Struggle for control over water sources hinders maintenance, leading to leaks and malfunctioning of the water supply. (Photo by Siri Eriksen)

FIGURE 5 An Akamba forest guard and a local Kamba herbalist at an important permanent water source in the forest. Other people may not enter the forest without a permit from the Forest Department. (Photo by Siri Eriksen)

"Unless there are strong links with national policy processes, there is a danger of developing climate change adaptation policies that promote large-scale technical measures far removed from local livelihood security needs, and which may actually aggravate vulnerability." (Saleem Huq, Coordinator of CLACC, in a recently conducted workshop on how climate change impacts on local populations)

stakeholder perceptions of the problem, including the most vulnerable, the local administration, and government institutions. Sharing research findings in a neutral environment is a good starting point in this regard, as the discussions are based on empirical findings and are ofen taken more seriously by those concerned. The project held two workshops, one at the national/regional level and one at the district level, to discuss the preliminary findings and solicit suggestions regarding practical measures to enhance local adaptation to drought.

The national-level workshop included participation from the Sudan and Tanzania Climate Change Convention Focal Points. Providing the story of a particular case, Endau, was critical in focusing discussion on local realities and the practical implications of adaptation to climate change. The workshop was undertaken jointly with a regional network, CLACC (Capacity Strengthening in Least Developed Countries on Adaptation to Climate Change), aimed at helping to formulate policies for adapting to national climate change. The workshop represented one of very few efforts so far to link local-level adaptation experiences with national policy processes.

The district-level workshop generated increased dialogue among different stakeholders, and research findings brought to the fore the concerns of vulnerable groups not normally heard (Figure 6). Empirical information can empower the most vulnerable groups and dispel myths regarding the main challenges during drought. Especially important in this regard was the emphasis on opportunities and unequal benefits, based on pastoralist contributions to the local economy, and the deconstruction of causes of conflicts. At the workshop, there were descriptions of how local power struggles and unequal resource access within the Akamba agropastoralist community were the main current source of conflict and vulnerability.

Improving local access, social equity, and livelihood security is critical to enhancing adaptation to climate change. It is important to understand the underlying causes of vulnerability, social differentiation, and conflicting interests between different groups in order to be able to target measures at the most vulnerable (Figure 5). The identification of local survival mechanisms for destitute groups is particularly important in this regard. Information regarding diverging perceptions and pastoralist interests is particularly important for the work of the district administration, whose main source of information may often be dominated by one interest group, the settled Akamba agropastoralists.

Measures for enhancing adaptive capacity

Through these fora, specific and targeted measures were identified that, if implemented, could enhance adaptive capacity. Enhancing flexibility critical to managing dryland livelihoods under climate change was at the heart of many of these measures. Mobility of people and livestock (access to grazing), diversification of crops and income sources, and flexible access to forests were all identified as important.

FIGURE 6 District-level workshop including village and district administration, villagers, researchers, and NGO representatives. (Photo by Siri Eriksen)

Box 2 summarizes the measures to be taken for enhancing adaptation.

Measures for enhancing adaptation

- Increased flexibility in access and use of natural resources
- Improved water supply downhill
- Creating alternative income opportunities
- Democratization of development and resource use committees
- Development of infrastructure
- Gender considerations (eg in composition of development committees)
- Collaborative management of hilltop forest resources
- Nature-based development of micro-enterprise
- Improvement of extension services

Challenges for adaptation research and development

The project revealed two main challenges in linking research and policy. While issues of resource access and livelihood security generated open discussion and practical suggestions, other issues of social and economic inequity and power struggles can only be touched upon indirectly in a workshop forum. Informal institutions such as *Mwamba* and clans are very sensitive. As a result, few measures were suggested that could address these issues, even though they are fundamental to local adaptation. It was also not possible at that stage to bring together pastoralist groups and agropastoralists in a formal workshop.

Second, an important challenge in creating adaptation measures at the village, district, and national levels is forging links with actual development interventions. Local institutions and leaders, government administration, NGOs, and development agencies—rather than research institutions—are the ones that can translate into action the recommendations and awareness generated by research–practitioner–stakeholder interaction. In order to address these two challenges, contact with the different interest groups needs to be continuous or regular over a longer time period—an activity outside the scope of a single research-based project.

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