

# HIV/AIDS, Climate Change and Disaster Management:

## Challenges for Institutions in Malawi

*Pablo Suarez*  
*Precious Givah*  
*Kelvin Storey*  
*Alexander Lotsch*

The World Bank  
Development Research Group  
Sustainable Rural and Urban Development Team  
May 2008



## Abstract

Southern African institutions involved in disaster management face two major new threats: the HIV/AIDS pandemic (eroding organizational capacity and increasing vulnerability of the population), and climate change (higher risk of extreme events and disasters). Analyzing the combined effects of these two threats on six disaster-related institutions in Malawi, the authors find evidence of a growing gap between demand for their services and capacity to satisfy that demand. HIV/AIDS leads to staff attrition, high vacancy rates, absenteeism,

increased workload and other negative effects enhanced by human resources policies and financial limitations. Many necessary tasks cannot be carried out adequately with constraints such as the 42 percent vacancy rate in the Department of Poverty and Disaster Management Affairs, or the reduction of rainfall stations operated by the Meteorological Service from over 800 in 1988 to just 135 in 2006. The authors highlight implications of declining organizational capacity for climate change adaptation, and formulate recommendations.

---

This paper—a product of the Sustainable Rural and Urban Development Team, Development Research Group—is part of a larger effort in the department to study the implications of climate change. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at [ALotsch@worldbank.org](mailto:ALotsch@worldbank.org).

*The Policy Research Working Paper Series disseminates the findings of work in progress to encourage the exchange of ideas about development issues. An objective of the series is to get the findings out quickly, even if the presentations are less than fully polished. The papers carry the names of the authors and should be cited accordingly. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.*

# **HIV/AIDS, climate change and disaster management:**

## **Challenges for institutions in Malawi**

Pablo Suarez

*Boston University Department of Geography and Environment and*

*Red Cross / Red Crescent Climate Centre*

56 Orchard Lane, Wayland MA 01778, USA. Email: suarez@climatecentre.org

Precious Givah

*Malawi Institute of Management*

Kelvin Storey

*Malawi Institute of Management*

Alexander Lotsch

*World Bank - Development Economics Research Group*

### **ACKNOWLEDGEMENTS**

This work was supported by the Bank Netherlands Partnership Program trust fund, through the project “Institutions for climate change adaptation” managed by the World Bank Development Economics Research Group. Christopher Banda, Achete Chizonda, Basileke Mwamlima, Lutamyo Mwamlima and McDonald Mwangamila provided research assistance. We are grateful to Robert Mtonga, George Kasali, Zmarak Shalizi, Maarten van Aalst and Madeleen Helmer for conversations that helped shape some of the ideas presented here. This study would not have been possible without the assistance and support provided by the management and staff of the six target institutions – we are particularly grateful to Ethel Kaimila, Donald Kamdonyo, Grace Malindi and Duncan Warren. Usual disclaimers apply.

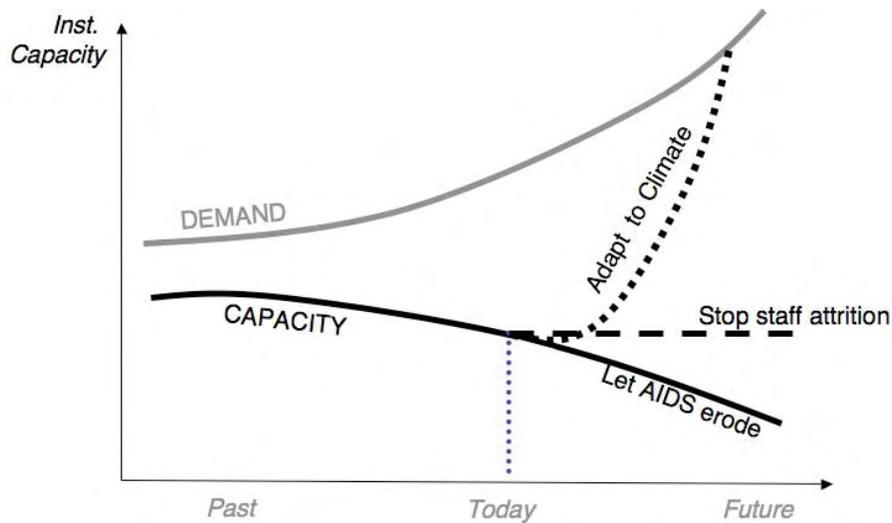
## **1. Introduction**

Institutions dealing with disaster preparedness and response in Southern Africa are facing two enormous challenges: Climate change (IPCC 2007), and HIV/AIDS (UNAIDS 2006). A changing climate is expected to increase the risk of disasters (van Aalst 2006) and consequently the demand for services that those institutions provide. Yet the HIV/AIDS pandemic may be profoundly eroding the ability of institutions to meet such demand. Indeed, the disease is having devastating effects on the social and institutional fabric of the region. From planning processes in central government to agricultural extension programs at the village level, a multiplicity of tasks may not be completed appropriately because of deaths, disease-related absenteeism, increases in workload, low morale, loss of institutional memory and other undesirable mechanisms that weaken institutional capacity.

The need to address institutional capacity for climate change adaptation in the region has been highlighted in numerous occasions. The African Union (2007), in its “Decision on Climate Change and Development in Africa”, committed to strengthen current African Regional and Sub-regional climate centers of excellence, as well as to develop and strengthen research and development to increase the continent’s resilience and adaptation to climate change. The Intergovernmental Panel on Climate Change (IPCC 2001) identifies the enhancement of institutional capacity as one of the key determinants for adaptation. The Poverty Reduction Strategy Papers of Malawi (Malawi Government 2002) and other countries in the region make a very strong case for articulating HIV with every factor affecting poverty reduction initiatives, including the ability to prepare for and cope with an increasingly variable climate. As Thomalla et al. (2006) point out, the disaster risk reduction community needs to play a substantial role in the institutional approach to climate adaptation.

The dominant discourse of climate change adaptation explicitly expects state-led promotion and implementation of adaptation initiatives in developing countries (Eakin and Lemos 2006). Substantial institutional transformations are needed to integrate climate change, disasters and development (Schipper

and Pelling 2006). In particular, a change in institutional structures and relations is needed for disaster policies and their implementing agencies to properly address climate change (O'Brien et al. 2006). This will require maximizing the potential for institutional change at different policy scales (Tompkins and Adger 2005). Yet these kinds of changes are not easy to implement in the developing world. A key task now is to progress from rhetoric to action (Ogunseitan 2003). It is indispensable to better understand the relationships between institutional change, adaptation needs and HIV/AIDS threats to organizations involved in disaster management.



**Figure 1:** Demand and organizational capacity for disaster management. Capacity is declining due to HIV/AIDS-related staff attrition, while demand is growing due to climate change, increasing the gap between what disaster-related institutions need to offer and what they can deliver. Decisions made today will define the future magnitude of that gap.

A basic framework for addressing this issue is presented in Figure 1. There is currently a gap between the capacity of disaster-related institutions and their capacity to meet such demand. For example, the Malawi Agricultural Extension Service has defined a standard ratio of 500 farmers per extension worker as the adequate level of workload for each worker to properly assist rural communities. Yet our study found that the number of extension workers has been declining (due to AIDS-related staff attrition and other causes)

and the current average ratio is 1,603 farmers per extension worker. For Lilongwe the ratio is 1 : 2,164, meaning less time spent with each farmer (see detail in section 6.4). On the other hand, changing rainfall patterns require farmers to modify their agricultural practices, and extension workers should be spending undergoing more training on climate change impacts on agriculture and adaptation options, and spending more time with each farmer to promote adequate adaptation measures. The ratio should probably be closer to 450 farmers per extension worker. The demand for services is growing with climate change, but the capacity is declining with the HIV/AIDS pandemic and other factors. At a minimum, it would be necessary to stop staff attrition. Ideally, there should be enough investments in human resources and other assets to ensure that capacity meets demand.

Little is known in southern African countries about how the disaster management sector is being affected by HIV/AIDS. Substantial research has been conducted on the impacts of the pandemic on a variety of other sectors, including primary education (Bennell 2005), health (McCourt and Awases 2007), communal fishing (Allison and Seeley 2004), the business sector (Guinness et al. 2003) and even police services (UNDP 2002). Many of these sectors are assessing institutional needs in the face of the pandemic (e.g. Piot and Peck 2001). For example, Malawi has launched a new initiative to revert the collapse in health services since 1990, particularly regarding staff levels (Palmer 2006). It is vital to know how disaster-related institutions are being impacted by the HIV/AIDS pandemic at a time when their roles in promoting climate adaptation become increasingly crucial.

This paper examines the combined effects of climate change and HIV/AIDS on disaster management in Malawi, a country where the majority of the population depends on rainfed agriculture (making it very vulnerable to climate change), and with one of the highest HIV prevalence rates in the world. The remainder of the paper is structured as follows: Section 2 offers background information about the magnitude of the pandemic in Malawi, and presents key concepts for analyzing the effects of HIV/AIDS on institutions. Section 3 provides an overview of observed and projected climate change and its implication for disaster management in the region. Section 4 highlights dreadful “synergistic”

mechanisms by which the combined effects of climate change and HIV/AIDS are greater than the sum of their separate effects. Section 5 introduces the six key Malawian institutions involved in disaster-related work selected as case study for this research: four government agencies and two NGOs. Section 6 describes the proposed approach to analyze the relationships between capacity and demand, and presents evidence of the problem. Section 7 concludes by discussing implications for climate change adaptation in Malawi and the region, formulating recommendations for institutions, donors, policymakers and practitioners.

## **2. HIV/AIDS and the erosion of institutional capacity in Malawi**

*In countries where 10% of the adult population has HIV infection, almost 80% of all deaths in young adults aged 25-45 will be associated with HIV. (UNAIDS 2001)*

The first case of HIV in Malawi was reported in 1985. Since then, the spread of HIV has been alarming. According to the Malawi National AIDS Commission estimates (NAC 2006), 14.1% of Malawians between 15 to 49 years old are HIV positive - almost a million people. The estimated national prevalence rate points to the severity of the epidemic, especially in comparison to the rest of Sub-Saharan Africa where the average adult prevalence rate is 6.1% (UNAIDS/WHO, 2006).

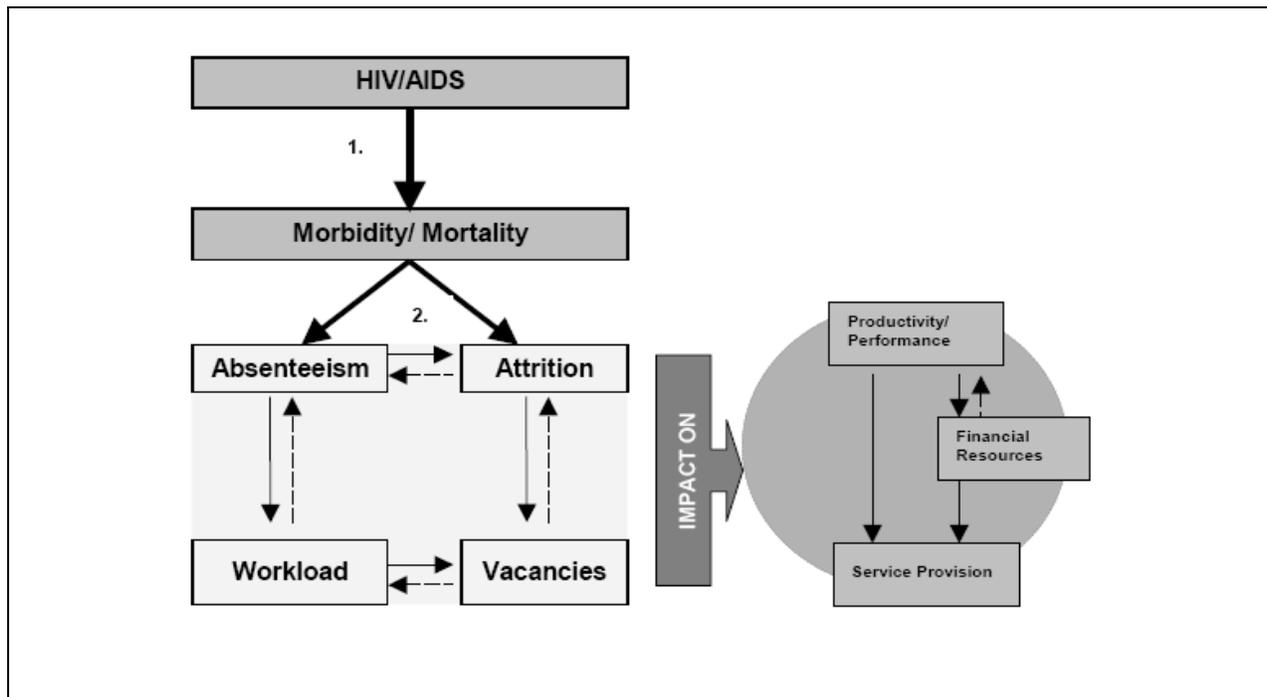
The effect of HIV/AIDS on the Malawian population poses a phenomenal developmental and humanitarian crisis. The pandemic has been responsible for increased death and disability, reduction in the average life expectancy at birth from 48 years in 1987 to just below 40 in 2005, a breakdown of social safety nets, high costs to the health care system due to re-emergence of other diseases such as tuberculosis, loss of productivity, and food insecurity at household, community and national levels.

A critical reason of concern for disaster-related institutions is the impact of HIV/AIDS on subsistence agriculture. Several studies have addressed this issue in Africa, notably Barnett and Blaikie (1992) and

Mutangadura, Mukurazita and Jackson (1999). Solid conceptual frameworks are emerging on the links between agriculture and health (see for example Hawkes and Ruel 2006).

Another crucial reason for concern is the erosion of organizational capacity. The pandemic affects the national economy (Cuddington and Hancock 2002), reducing the availability of funds for investing in human resources, equipment and other needs. More directly, the pandemic affects human resources through staff mortality and morbidity. A study by the International Labor Organization (ILO 2002) shows that across all occupational sectors in sub-Saharan Africa it is becoming increasingly difficult to replace skilled as well as unskilled labor lost to HIV/AIDS. The impact of HIV/AIDS on the delivery of public and social services is considered to be reaching alarming levels.

The organizational capacity of disaster management institutions can be defined as their ability to perform the tasks and attain the objectives pertaining to their mandate. It is affected by its human, scientific, and technological resources capabilities, as well as by its organizational and regulatory systems and practices. HIV/AIDS-related mortality and morbidity can have substantial impacts on organizational capacity, as Figure 2 shows.



**Figure 2:** Impact of HIV/AIDS on organizational capacity (source: UNDP 2002)

### *Attrition*

Staff attrition in all its forms (i.e. death, dismissal, redundancy, resignation, and retirement) amounts to organizational loss of labor. This is particularly relevant when the departed employee had rare skills or contributed to the preservation of institutional memory. Generally, attrition is difficult to predict except for retirements. Organizations cannot plan ahead with enough time and, as a result, there is always a slack between loss and getting a replacement.

### *Vacancies*

Attrition in turn leads to vacancies (i.e. a shortfall in the human resources profile designed to achieve the objectives of the institution). Any vacancy that occurs disrupts certain activities and can have adverse effects on the overall performance on an organization, particularly when it cannot be filled promptly.

### *Absenteeism*

Increased morbidity leads to higher levels of absenteeism (defined as absence from work for unofficial reasons). Concurrently, as family members of employees fall ill, the employees spend increasing amounts of time caring for their loved ones at home. If the sick die then the employee shall be absent as they attend the funeral. Disease-related absenteeism can negatively affect the planning, implementation and evaluation of programs and activities within institutions.

### *Workload*

Both absenteeism and vacancies lead to great workload for the 'survivors', resulting in additional responsibilities and stress for remaining staff, usually without improvement in their compensation or incentives.

Absenteeism, attrition, vacancies and workload collectively have a negative impact on three issues: productivity, finances and service provision. These factors also reinforce each other in multiple ways.

Furthermore, capacity erosion has significant financial implications in terms of increasing costs on recruitment and re-training, medical benefits, transport, funeral costs and death benefits. On the other hand, resources are likely to be diverted away from service delivery in order to cope with attrition-related expenses, thereby further thwarting the quality and quantity of services. Emotional impacts such as fear, low morale and stress are other ways in which HIV/AIDS affects performance.

Organizational performance is also affected by the loss of experience and institutional memory. Whereas people and skills can be replaced through proper human resource planning, institutional memory is often irreplaceable. In addition, the capacity erosion affects services delivery across institutions. For example, if the Department of Meteorology fails to deliver the seasonal rainfall forecast in a timely fashion due to illness or death of weather forecasters, then agricultural extension workers cannot assist farmers to choose what seeds to buy and plant for the season. The erosion of human resource capacity will negatively impact on the performance of individual employees, organizational units, and Malawi's disaster management institutional system as a whole, with severe implications for adaptation to climate change.

### **3. Climate change and growing demand on Malawian disaster-related institutions**

Climate hazards in Malawi include droughts, floods and tropical cyclones, and to a lesser extent tornadoes, hailstorms and thunderstorms. Virtually the whole of Malawi is vulnerable to droughts, with areas such as the Lower Shire Valley and Rumphi West affected most severely. The severe drought conditions in 1991/92 and the extreme flooding events in 2000/01 and early 2007 have had enormously damaging effects on crop and livestock production. Between 1990 and 2005, the International Federation of Red Cross and Red Crescent Societies (IFRC) has launched 12 appeals and operations in Malawi as a result of climate-related disasters, with a total of 25.8 million Swiss francs contributed directly by the IFRC (IFRC 2006).

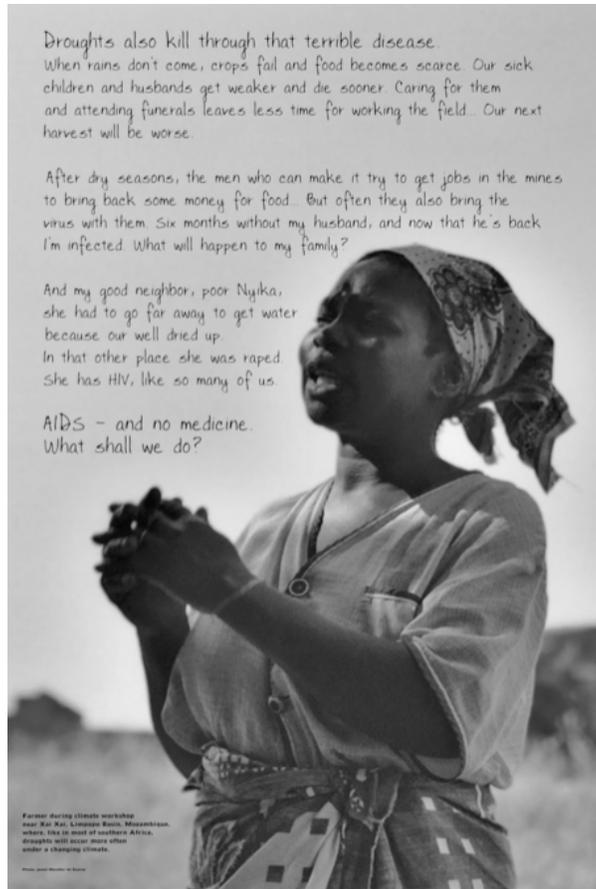
There is unequivocal evidence that the global climate is changing (IPCC 2007). For southern Africa, numerous studies based on observed and projected changes highlight the risk of deteriorating conditions for an already vulnerable subsistence-farming sector, such as the occurrence of more extreme temperature events (New et al. 2006), later onset of the rainy season (Tadross, Hewitson and Usman 2005), and general decline in rainfall (Ngondongondo 2006). In a recent study based on observed daily rainfall, Tadross, Suarez and Lotsch (2007) found significant increases in mean rainfall intensity on wet days (which favors soil erosion) but a reduction of rain days at the end of the season, augmenting the chances of crop failure for many maize varieties currently used in the region.

There is consensus in the scientific community regarding an increase in the frequency and intensity of extreme events such as floods and droughts (IPCC 2001, 2007). Climate change is expected to affect southern Africa across sectors including health (Haines et al. 2006), agriculture and food security (Gregory, Ingram and Brklacich 2005), and water management (Arnell, Hudson and Jones 2003).

Malawi's National Adaptation Programme of Action (Environmental Affairs Department 2006) identifies the most important impacts in key sectors such as agriculture, health, energy, water and fisheries. This document highlights response strategies for the country, with explicit responsibilities assigned to different Malawian institutions, both governmental and non-governmental. Lack of organizational capacity is often listed among the barriers to the implementation of this program.

#### **4. Dreadful synergies: The complex relationship between climate and HIV/AIDS**

Climate change and HIV/AIDS together can lead to combined negative effects greater than would result from the sum of their separate effects. Figure 3 offers compelling anecdotal evidence of the complex interactions between droughts and the pandemic. Dreadfully synergistic mechanisms can create new, severe problems among vulnerable communities, therefore increasing the need for disaster-related institutions to provide more services among people at risk.



**Figure 3:** Poster from the “Gender, Water, Climate” exhibit supported by the Global Environment Facility and the Gender and Water Alliance. The texts are based on anecdotes shared by subsistence farmers during a participatory workshop on climate change adaptation in the district of Xai-Xai. (Photo: J. Mandler; graphic design: B. Fuller).

#### 4.1. Extreme events and their impact on communities with high HIV/AIDS prevalence

De Waal and Whiteside (2003) argue that HIV has created a new variant famine because the pandemic has reduced the viability of farming livelihoods. The pandemic has substantially increased the sensitivity of rural communities to droughts and other climate-related shocks (Foster 1993). As climate change increases the chances of droughts and dry spells in southern Africa, the complex relationship between food security and HIV/AIDS can make matters worse for disaster management in two ways. On one hand, the nutritional requirements of people living with HIV/AIDS are higher: up to 15% greater for protein and

50% greater for energy (Piwoz and Preble 2000). Additionally, HIV/AIDS amplifies the effect of drought on nutrition (Mason et al. 2005). This creates a vicious circle: inability to provide adequate nutrition in times of drought weakens the immune system and increases susceptibility to opportunistic infections, which in turn undermine the overall nutritional status.

On the other hand, AIDS has led to lowered productivity as more and more farmers are infected and affected. Many survivors have to spend time attending funerals (which in Malawi can last days), looking after orphans, or managing the estates of the deceased. Absenteeism from school and work is common during times of sickness and bereavement in families. A study by Dominguez, Jones and Waterhouse (2005) highlights the loss of knowledge about locally adapted seeds and varieties, and the increasing difficulty in acquiring new knowledge. Such changes negatively influence the ability of the region to prepare for a changing climate, and increase the demand on institutions dealing with risk reduction and disaster response.

#### 4.2. Disaster coping strategies and the spread of HIV

Drought-induced food insecurity, rural poverty and lack of livelihood opportunities can create conditions that are favorable for the spread of the disease through a variety of coping strategies. For example, population movements often increase in times of drought. Black-Michaud (1997) observed that the site of infection and initial illness may be geographically distant from the site of impact. In response to unfavorable rainfall conditions, many rural folk migrate to urban centers where they engage in trading to earn a living and are more likely to get infected, bringing the virus back to the community upon return. Such pattern may become more prevalent if, as argued by Meze-Hausken (2000) climate change induces migration in dryland areas.

Other climate mechanisms that can accelerate the spread of HIV/AIDS are amplified by gender inequality and cultural patterns in southern Africa (Patt, Dazé and Suarez forthcoming). It is not uncommon for girl-children to be married off early in times of drought, usually to older men who have had numerous sexual partners. The net effect may have been a faster growth in HIV prevalence. Women with no other

subsistence options may resort to selling sex for gifts or money (Malawi Government 2001). Again, the spread of the disease may indirectly add to the workload of institutions serving these communities at risk.

#### 4.3. Increased workload for field staff and the risk of contagion

In times of drought and flood, more frequent, longer trips are needed by field staff engaged in disaster relief. This increases the chances of risky sexual behavior, as observed in agricultural extension officers (Bota, Mphepo and Malindi 2001). Climate change adaptation will require more regular visits to the field in order to communicate not only the rainfall and temperature projections for different regions but also the possible response strategies, such as changes in seed varieties and farming practices. If frontline staff has to respond to more climate crises through prolonged field visits (therefore increasing the chances of contagion), their health may deteriorate a few years down the road, reducing institutional capacity.

The three mechanisms outlined above are expected to increase the demand on disaster-related institutions in Malawi, and may also impair the ability of these institutions to adequately promote climate change adaptation.

### **5. Case studies: Six Malawian institutions involved in disaster management**

This section presents six case studies selected after a day-long inception workshop held during May 2006 in Malawi's capital, Lilongwe, with 25 representatives from institutions involved in different aspects of disaster management in the country (9 government agencies, 4 NGOs, 2 academic institutions and 3 international organizations). This workshop was designed to identify opportunities and constraints for the research (including choice of target institutions and research questions), build political and technical goodwill, and improve the probabilities of appropriate institutional response to the study's findings and recommendations.

The institutions targeted in this study are: Meteorological Department (*MET*), Department of Poverty and Disaster Management Affairs (*Dis. Mgmt*), Ministry of Agriculture and Food Security (*M.Agr*),

Ministry of Irrigation and Water Development (*M. Water*), the Malawi Red Cross Society (*Red Cross*), and the National Smallholder Farmers' Association of Malawi (*NASFAM*).

Only MET has explicit responsibilities in the realm of climate change specified in its *de jure* mandate (as the technical focal point for the United Nations Framework Convention on Climate Change). While the remaining institutions have a role to play in climate adaptation, they do not have a mandate to do so. A summary of their stated missions and potential role for adaptation is presented below.

**Table 1:** The six institutions examined in this study

<b>Institution</b>	<b>Mission</b>	<b>Main role in climate adaptation</b>
<b>MET</b> <i>Meteorological Services</i>	Provide weather and climate information and services	Produce scenarios of climate change and provide early warnings; improve communication of forecasts
<b>Dis. Mgmt</b> <i>Department of Poverty and Disaster Management Affairs</i>	Direct and coordinate disaster management activities in Malawi	Improve preparedness and response for expected changes in disaster profile
<b>M.Agr</b> <i>Ministry of Agriculture and Food Security</i>	Accelerate broad-based agricultural and rural development	Inform farmers about climate change; promote farm practices better suited for expected climate conditions
<b>M. Water</b> <i>Ministry of Irrigation and Water Development</i>	Ensure equitable access to water at all times for all Malawians	Ensure reliability of water supply systems under different climate
<b>Red Cross</b> <i>Malawi Red Cross Society</i>	Alleviate human suffering	Prepare for more frequent disasters; reduce vulnerability of those at risk
<b>NASFAM</b> <i>National Smallholder Farmers' Association of Malawi</i>	Empower farmers through collective action	Promote adaptation practices among members; scale up risk sharing schemes

### *Meteorological Department (MET)*

The mission of MET is to provide reliable, responsive and high quality weather and climate services to meet national, regional and international obligations through timely dissemination of accurate and up-to-date data and information for socio-economic development, including early warnings. Specifically MET functions include (a) safety of life and property through natural disaster early warnings; (b) safety and regularity of air transport through weather reports at airports; (c) production of food and fiber through agro-meteorological advisories; and (d) management and maintenance of national climate data bank.

While the MET is the natural institution for analyzing the observed record and formulating future climate scenarios, it currently lacks the capacity to carry on this kind of work in a rigorous and comprehensive way. Strengthening the capacity of the MET is essential for adaptation: Without climate scenarios for adaptation, Malawi cannot know what climate to adapt *to*. Additionally, the MET will have to improve its forecasting and communication efforts to better address projected increases in climate variability. From short-term floods associated with storms and tropical cyclones to seasonal precipitation forecasts, the role of the MET will necessarily have to grow as the climate continues to pose growing risks to the country.

*Department of Poverty and Disaster Management Affairs (Dis. Mgmt)*

This department directs and coordinates social protection programs and projects and disaster management activities at national level in order to improve and safeguard the quality of life of Malawians. The Disaster Management Affairs section coordinates and directs disaster prevention, preparedness, mitigation, response and recovery. It is in charge of liaising with relevant line ministries, district assemblies, NGOs and cooperating partners; mobilizing and managing resources for disaster management; ensuring the effectiveness of early warning system; building capacity at district level; supporting the initiation and implementation of disaster-related programs and activities, and ensuring monitoring and evaluation.

Climate adaptation for Malawi means better preparedness and response for more frequent and intense disasters. Dis. Mgmt needs to learn about projected changes in climate, assess new threats, identify gaps in its capacity to address those changes, and strengthen collaboration with other institutions and stakeholders at national, district and community level in order to adequately manage new risks.

*Ministry of Agriculture and Food Security (M.Agr)*

The mission of this ministry is to accelerate broad-based agricultural and rural development as a major element of fighting poverty through a) improving food self-sufficiency and nutritional status of the population; b) expanding and diversifying agricultural and livestock product exports; and, c) raising farm incomes and promoting economic growth while conserving natural resources.

M.Agr needs to play a leading role in promoting climate change adaptation among subsistence farmers by disseminating information about observed and projected changes in rainfall and temperature, testing and promoting the use of seed varieties and farming practices better suited for expected conditions, and monitoring for outbreaks of pests and diseases that may severely impact rural livelihoods.

*Ministry of Irrigation and Water Development (M.Water)*

The mission of this Ministry is to ensure that every Malawian individual and entrepreneur has equitable access to water at all times for social welfare and country's sustainable economic growth and prosperity. Its objectives include to identify, develop and conserve and monitor water resources; and to advise the actions of the ministries and other actors concerning water development.

M.Water needs to examine the sensitivity of Malawi's existing and planned infrastructure to the projected changes in climate. From defining a strategy for drinking water provision under declining levels in aquifers to carrying out new irrigation projects in areas where rainfed agriculture may cease to be feasible, substantial additional work will be needed by M.Water staff at all levels.

*Malawi Red Cross Society (Red Cross)*

The mission of the Malawi Red Cross Society is to alleviate human suffering. Its climate-related programs include disaster management, health, food security and water & sanitation. The Red Cross has access to and credibility among targeted rural communities, and substantial logistical capabilities. Its team includes 220 staff members (over 70% with advanced degrees), and 30,000 volunteers across the country.

The projected changes in frequency and intensity of extreme events are expected to increase the demand for disaster relief, the organization's core service. This NGO is currently embarked in a program entitled "Preparedness for Climate Change", which aims to mainstream climate change considerations into the programs and activities of the organization. In addition to the need to increase its capacity to respond to disasters, the Red Cross needs to understand and address the implications of a changing climate on its rainfall-sensitive activities, notably food security and health.

### *National Smallholder Farmers' Association of Malawi (NASFAM)*

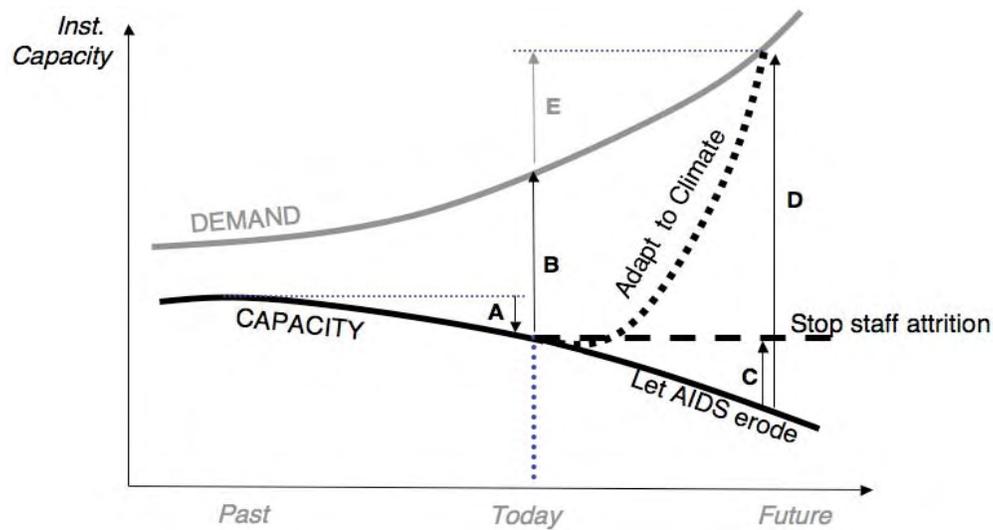
NASFAM is a member-owned organization that provides business services to its smallholder farmer members. Founded on the principles of collective action and self-reliance, the organization works to empower farmers at the grass-root level, encouraging them to form cohesive village-based clubs and associations in order to realize increasing returns and contribute to economic development. Currently NASFAM has a membership of over 100,000 smallholder farmers growing and marketing high value cash crops including chilies, cotton, groundnuts, rice, paprika and soya.

This NGO can play a leading role in promoting climate change adaptation among its constituents. In addition to supporting crop diversification and the promotion of seed varieties and practices better suited for expected climate conditions, NASFAM is helping implement innovative financial tools to cope with climate variability through risk sharing. A pilot microinsurance scheme that protects farmers from losing credit standing in case of drought has been successfully tested in central Malawi in its first year (Suarez, Linnerooth-Bayer and Mechler 2007), and scaling up will require substantial training and capacity building within the organization.

## **6. Changes in organizational capacity (1995-2005)**

### 6.1. Methodological approach and the problem of attribution

In order to analyze the role of HIV/AIDS in eroding institutional capacity, the study aimed to develop and measure a series of indicators that could help attribute causality and consequently allow for a more complete understanding of the issue at hand. Figure 4 illustrates the approach envisioned for the development of indicators.



**Figure 4:** Proposed approach to indicators of institutional capacity in the context of HIV/AIDS and climate change. (A) capacity lost until present; (B) current capacity gap; (C) projected capacity loss; (D) Capacity investment needed; and (E) additional demand due to climate change and other factors.

Revisiting the example of the Agricultural Extension Service presented in section 1, the following indicators could be defined:

- (A) Capacity lost until present: number of qualified extension workers lost to staff attrition (a fraction of the observed capacity loss is attributable to HIV/AIDS).
- (B) Current capacity gap: Difference between existing extension workers and number needed to ensure that no more than 500 farmers are served by each member of the staff.
- (C) Projected capacity loss: Estimated number of extension workers that can be expected to be lost given trends in HIV/AIDS, training, salaries and other factors (a fraction of the projected capacity loss would be caused by the pandemic)
- (D) Capacity investment needed: number of new, adequately trained extension workers that would be needed in the future to meet expected demand
- (E) Additional demand: number of new extension workers that would be required to meet changing demand due to factors such as changes in farmer population, climate change needs

(i.e. less farmers per staff member because of more time needed for training and for explaining new adaptation measures to each farmer). A fraction of this additional demand would be attributable to climate change.

Attempts were made to identify institution-specific indicators and assess them, building on the methodology described in UNDP (2002), through a combination of quantitative methods (based on statistical and logical analysis of data involving human resources and organizational activities and budgets), as well as qualitative approaches (such as interviews and focus groups). A detailed description can be found at Givah and Storey (2007). Even though during the research design phase there was solid support for providing necessary data on the part of the managers consulted, at the implementation stage data collection proved difficult. For example, institutions could not provide quantitative indicators of the current gap between capacity and service demand for their main tasks. They do not maintain adequate records on morbidity and absenteeism (this was not foreseen by managers who attended the inception workshop). Similarly, there are no records on most attrition-related expenditures and impacts on performance. Interviews and surveys are often inadequate for producing new data, because HIV/AIDS remains a taboo issue when dealing at the individual level. With a few exceptions, this state of affairs made it almost impossible to quantitatively analyze patterns in staff attrition, particularly given the need to disaggregate by gender, age, educational level and other variables of interest.

Importantly, there was no data allowing for the quantitative attribution of HIV/AIDS causality regarding institutional erosion. For example, for deaths among staff members, there was no data on the seroprevalence status of the deceased – and not even clinical diagnosis of what had caused the death (otherwise it would have been possible to obtain estimates: HIV/AIDS itself is not a lethal disease but a condition that provides fertile ground for opportunistic diseases like tuberculosis to thrive and kill the infected person).

Nonetheless, as indicated by the quote that opens section 2, it is well known that HIV/AIDS is responsible for most of the excess mortality and morbidity experienced among Malawians. Yet other factors may be

playing an important role in the decline of human resources, such as budgetary constraints, migration to richer countries or more frequent car accidents. We therefore proceed with the presentation of the study findings, recognizing that we are not in a position to strictly attribute all the negative effects of institutional capacity erosion to the pandemic.

## 6.2. Evidence of declining organizational capacity

### *6.2.1. Staff Attrition*

There has been an increasing trend of attrition in the six organizations between 1995 and 2005. In the four organizations where quantitative data was available, the proportion of staff leaving the organization annually has ranged between 10% and 17.9% over the study period. The highest attrition rate was reported in NASFAM with 26.9%, followed by the Department of Poverty and Disaster Management (20.8%), Ministry of Irrigation and Water Development (18.7%) and Department of Meteorological Services (8.1%). When examining the data, an interesting pattern emerges regarding the fraction of staff attrition explained by mortality: It is much higher in public sector organizations than in NGOs, where resignation followed by redundancy were the main causes of attrition. One explanation given is that the public sector organizations do not have enforceable exit policies when an employee is chronically sick.

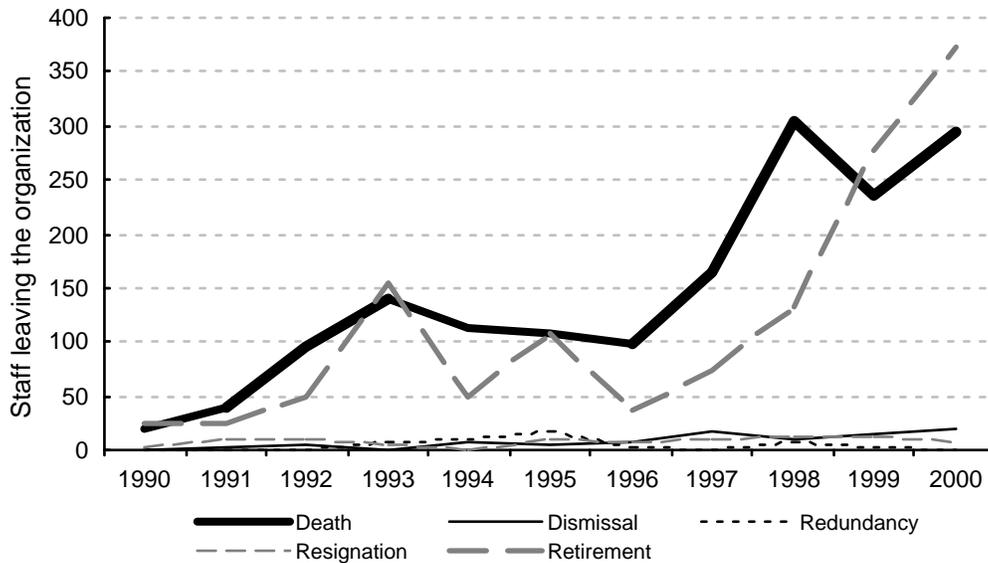
**Table 2:** Observed and expected deaths (based on Malawi’s average death rate) deaths among M.Agr. personnel, 1995-2005

<b>Staff Category/Cadre</b>	<b>Expected Deaths</b>	<b>Observed Deaths</b>
Agriculture Officers	19.3	39
Research Scientist	8.8	21
DAHI Professionals	4.6	21
Technical Officers	41.9	68
Technical Assistants	474.6	707
Others	258	443

All target institutions reported high staff mortality. Assuming that the conclusion of the UNAIDS (2001) report quoted at the beginning of section 2 is valid for the Malawi context (which should be the case,

since the country's HIV and AIDS prevalence rates are at 14%), most of the deaths reported were as a result of HIV and AIDS. Table 2 shows expected and observed deaths among staff at M.Agr. Mortality rates are again substantially higher than the national average.

**Figure 5: Staff attrition causes at M.Water, 1990-2000**



**Figure 5** depicts staff attrition by cause at M.Water, with a very sharp growth in number of deaths during the past decade, undoubtedly influenced by the HIV/AIDS pandemic. Discussions with ministry officials revealed that many of those who died had jobs that involved substantial travel, such as borehole maintenance overseers and technical officers, who experienced extremely high excess mortality (over five times above the national mortality rate).

### 6.2.2. Absenteeism

All organizations reported that absenteeism is a cause for concern, and has been increasingly common due to staff illness, staff attending to sick relatives, and funerals. Apart from NASFAM, all other target institutions do not have a system of recording and monitoring absenteeism and its causes. Although the Government has tried to place registers by the entrance for employees to record the time that they have reported for work this has not been successful as adherence has been a problem. While in the public

service there is a clear sick leave policy, those charged with enforcement often look at the emotional side of HIV/AIDS and connive with the sick person.

Study results indicate that employees absent themselves for between 1-10 days per month due to personal illness, about 2-5 days per month to care for the sick, and between 1-10 days per month to attend funerals (which usually last more than one day and may involve travel). The main illnesses that affected those who were chronically or frequently ill were malaria (which is expected to become more prevalent with climate change as rising temperatures in high altitude areas allow mosquitoes to cover new territory) and tuberculosis, or TB. In the absence of HIV/AIDS, malaria is treatable, but the drugs are dangerous for those affected by the pandemic. Tuberculosis, on the other hand, is an opportunistic disease closely associated with the pandemic: over 70% of TB cases are also HIV-positive in Malawi.

### *6.2.3. Vacancies*

All assessed organizations showed very high vacancy levels. The duration of vacancies differed within and across institutions. In the public sector, they range from a few months to up to five years, with longest times associated with technical and professional positions. Tables 3 and 4 illustrate this issue by listing vacancy levels at MET and M.Water, disaggregated by employment category. The average vacancy rate at M.Water is 46%. A trend analysis indicates that the vacancy situation has been worsening over the past decade, and a comparison between the vacancy analysis and the analysis of deaths among various occupations indicates that deaths may have contributed to vacancies particularly among technical officers, technical assistants and support staff.

**Table 3:** Vacancy levels at M.Water

<b>Staff Category</b>	<b>Posts</b>	<b>Vacancies</b>	<b>Vacancy Rate</b>
Management & Support Services	71	18	25%
Human Resource Management	30	12	40%
Financial Management	45	17	38%
Planning & policy review	16	8	50%
Internal Audit	9	5	56%
Hydrological Services	15	6	40%
Hydro-geological services	18	9	50%
Water Quarterly Control	7	3	43%
Rural Water Supply	12	7	58%
Water Resources Board	53	38	72%
Source Water Division	11	7	64%
Community Board Management	11	8	73%
<i>TOTAL</i>	298	138	46%

**Table 4:** Vacancy levels at MET

<b>Staff Category</b>	<b>Minimum Qualification</b>	<b>Posts</b>	<b>Vacancies</b>	<b>Vacancy Rate</b>
Weather Observers	O-Level	110	48	44%
Weather Forecasters	Diploma	11	0	0%
Meteorologists	BSc/MSc	22	8	36%
Engineering Technicians	BSc/MSc	5	0	0%
Support Staff: (HR, Finance, IT)	O-Level	88	14	16%
<i>TOTAL</i>		236	70	30%

In the case of MET the average vacancy rate was found to be 30%, with weather observer posts being vacant at the highest rate in the organization (44%). The lack of meteorologists is particularly concerning given the time needed to fully train a new professional, and the difficulty of retaining graduating students who may prefer to seek better opportunities in Europe or North America. The average vacancy rate at Dis.Mgmt was found to be 42%. It is worth noting that the Disaster Managers section is supposed to have thirteen professional officers but has only five (61% vacancy rate). There should be six relief and rehabilitation officers but there is only one. This means that existing staff is overworked and that in times of crisis the communities affected cannot possibly receive the services they need.

#### 6.2.4. Workload

High vacancy rates and increased absenteeism across organizations has meant more work for ‘survivors’. For example, assuming that a proper job analysis was done when establishing posts at Dis.Mgment, the high vacancy rates mean that each officer is covering the tasks that should be done by more than one person. The result is the overload of existing staff. According to staff interviews, the extra work does not in any way turn into more pay or overtime allowances and is considered a major source of frustration.

Similarly, all staff interviewed at M.Agr stated that their workload had increased as a result of the number of vacancies in their sections or departments. It was noted that increased workload particularly affects field staff, because they are at the helm of service delivery. The analysis of the workload of frontline extension staff, which compares the ratio of Field Assistants to farmers, confirmed that shortage of staff had resulted in excess workload. According to the Director of the Agricultural Extension Service, the standard ratio is one Field Assistant to 500 farmers. Yet, as shown in Table 5 below, the average ratio is about 1: 1600, more than tripling the number of farmers that an average field assistant must serve.

**Table 5.** Ratio of Field Extension Assistants to Farmers, 2003

<b>District</b>	<b>Estab. Posts</b>	<b>Staff In Post</b>	<b>Farmers</b>	<b>Staff: Farmer Ratio</b>
Karonga	104	133	66,757	1: 502
Mzuzu	268	342	185,901	1: 543
Kasungu	232	151	270,000	1: 1,788
Machinga	596	278	484,911	1: 1,744
Salima	560	240	182,734	1: 761
Lilongwe	394	209	452,244	1: 2,164
Blantyre	544	231	500,000	1: 2,164
Shire Valley	184	171	143,987	1: 842
<i>TOTAL</i>	<i>2,880</i>	<i>1,426</i>	<i>2,286,534</i>	<i>1: 1,603</i>

Even Field Assistants in districts with relatively lower ratios, like Salima and Shire Valley, have heavier workloads because they work in more than one section, despite the stipulation that each Field Assistant should be working in one section. Bicycles are their mode of transport, and consequently staff members have to spend a larger proportion of their work time going from one community to another. The average time spent with each farmer decreases faster than the staff-to-farmer ratio. Instead of the recommended fortnightly visits, only 21.1% of smallholder farmers were visited only twice a month whereas 47.9% received no visits at all during the same period.

### 6.3. Evidence of impact on delivery of disaster management services

#### *6.3.1. Productivity and performance*

The most immediate result of the changes in staff attrition, absenteeism, vacancies and workload is that workers cannot provide all the services that the organization is supposed to deliver. A more important implication from the perspective of climate change adaptation is that institutions are unable to spend time or resources planning for a different future when the present poses a permanent state of crisis.

According to officers consulted at M.Agr, for example, the human resource situation affects the planning and implementation of key services that should be intensified to support adaptation to climate change. These include the promotion of (a) drought tolerant crops such as cassava, sorghum and millet; (b) winter cropping and irrigation technologies; (c) water conservation and water harvesting practices; (d) soil conservation and fertility such as use of manure, alley cropping, and agro forestry; (e) crop diversification; and (f) dietary diversification. Other affected activities include awareness campaigns on effective disaster mitigation measures, information sharing, and farmer organization and mobilization.

M.Agr employees were asked about the job performance of staff members who are either frequently or chronically ill. 33% of respondents said the productivity of such officers on the job is average, 53% said it

is below average and 14% said such officers are not productive at all, with the variation depending mostly on the nature of the illness.

Other reported impacts across target organizations include low morale, inadequate program monitoring and evaluation, and reduced quality of services resulting from unqualified staff or employees occupying higher and/or professional positions that their skills warrant. For example, the required training of extension workers has been substantially reduced to allow for faster filling of vacant posts: this has resulted in many instances where new staff communicate low quality or plainly wrong messages to farmers, in particular in the case where generalists act in the place of Subject Matter Specialists.

At M.Water, managers reported that the loss of even a small number of highly skilled engineers places the entire water system at risk. Water systems require constant maintenance of wells, boreholes, dams and embankments, and after floods only highly skilled water engineers can bring these systems back to standard. Vacancies in very low-skill posts can also be very detrimental: even the collection of hydrological data was reportedly hampered by lack of staff. As a result, river flow measurements are now plagued with missing data and cannot be used for identifying climate change signals, impairing the ability to plan for climate adaptation.

MET is severely affected by the declining human resource capacity, making it extremely difficult to support the country with information about climate change. Staff attrition due to deaths, early retirement, and prolonged illnesses, together with other causes like vandalism and budgetary limitations, resulted in closure of about 700 rainfall observation stations because of the compromise in data quality and gaps in the climate data bank. Table 6 shows the decline in weather observing stations between 1988 and 2006. In view of this situation, MET no longer has the level of rainfall station density needed to capture the variability caused by Malawi's irregular topography, thereby increasing the error margins on weather and climate information disseminated to the public. There have been complaints and loss of public confidence in weather and seasonal climate forecasts – products that would be much more reliable with a denser

station network. The loss of trust in weather information poses a big challenge in preparing for climate change considering the role of predictions in planning and implementation of adaptation measures.

**Table 6:** Loss of weather observing stations in Malawi, 1988-2006

<b>Weather station category</b>	<b>1988</b>	<b>2006</b>
Principal MET Stations	24	21
Subsidiary MET Stations	70	13
Rainfall Stations	Over 800	135

Red Cross reported that HIV/AIDS-related attrition of staff and volunteers results in numerous negative impacts, including (a) delayed and poor quality delivery of disaster response services, (b) increased workload for remaining staff and volunteers leading to poor quality performance, (c) failure to meet deadlines of submission of reports and proposals, (e) failure to approve allocation of funding, or making timely decisions to respond to emergencies when those in charge are not available, and (f) inability to attend national and international events, leading to poor perception and relative loss of credibility in the organization by other partners, which to some extent has an effect on the ability to fundraise for humanitarian work. This makes it very difficult to attract and re-train new staff and volunteers to boost the capacity appropriately to meet the ever-increasing demands of humanitarian assistance to the affected communities. According to the Director of Programs, in some instances the organization has had to narrow down the scope of operations due to staff and volunteer absenteeism and deaths. The organization lags behind in integrating new issues such as climate change adaptation due to inadequate staffing.

### *6.3.2. Impact on community-level activities*

The pandemic not only affects services because of reduced capacity in the institution working on disaster-related issues: When the prevalence rate is high in rural communities, services cannot be delivered even if optimal human resources were dispatched. According to Red Cross, NASFAM and M.Agr, when it comes to risk reduction and possible climate adaptation initiatives, there are two main avenues through which HIV/AIDS is directly affecting their work with rural communities:

- (1) Communities consider that the benefits of risk reduction and climate adaptation will only be reaped in the long-term. Many farmers find it unattractive to invest in the future when HIV/AIDS has such a profound impact in day-to-day life.
- (2) It is increasingly difficult to mobilize communities because too many farmers are either attending to funerals or attending to the sick (if they themselves are not sick). The situation has resulted in organizations competing for fewer able-bodied community members to attend meetings or join community-based projects.

### *6.3.3. Impact on Finances*

The six target institutions reported that over the past decade, HIV and AIDS related attrition has negatively affected the financial capacity of the organizations (and therefore indirectly impacted on services delivery). The impact was mainly through increasing funeral-related direct expenses as well as increasing cost of absenteeism.

None of the organizations store records indicating actual funeral expenses over the last ten years, yet the problem is pervasive. For example, Red Cross reported increasing numbers of funerals within the organization, resulting in overspending on budget lines for funeral costs hence using funding originally allocated for disaster management work. It should be noted that the policies on funerals in Malawi usually state that when an employee dies, the employer shall provide a coffin and a maximum of three vehicles. The actual support from institutions, however, tends to extend to direct dependants of the employee, for cultural reasons.

The 2002 UNDP report calculated the cost of absenteeism on the basis of the estimated 816 months of absenteeism due to HIV/AIDS-related morbidity and mortality in 2000 alone. Based on an average monthly salary of 3,000 Malawi Kwachas (MK), this translated into an estimated opportunity cost of almost MK 2.5 million in 2000 – a substantial amount for Malawian standards. Further, the study estimated the opportunity cost related to absenteeism due to funeral attendance (see Table 7).

**Table 7:** Estimated loss of productive time due to funeral attendance, M.Agr, 1990-2000 (UNDP 2002)

Number of Deaths		Total Funeral Attendants	Total # of Days Lost	Total # of Months Lost	Average Salary per Funeral Attendance (MK)	Total Salary Lost (MK)
Total	1,613	32,260	64,520	2,933	3,000	8,799,000
HIV-related	158	3,160	6,320	287	3,000	861,000

#### 6.4. Role of policies and practices regulating human resource management

In addition to morbidity and mortality, the human resource policy environment has a bearing on the ability of target institutions to effectively respond to the HIV/AIDS pandemic and mitigate its impact. For the public sector, the following policies are of particular relevance:

- *Recruitment:* The centralized human resources system in the public sector ensures standardization of practice in the entire service, but makes agencies more vulnerable to HIV/AIDS (for example by slowing down the process of filling vacancies).
- *Retirement:* A civil servant qualifies for retirement on medical grounds. In practice, this provision is rarely implemented because there are no mechanisms for monitoring HIV/AIDS-related illnesses in the public service. This state of affairs affects such organizations like Ministry of Agriculture which has officers spread all over the country that are highly affected by HIV/AIDS-related morbidity, especially where there are prolonged cases of illnesses.
- *Absenteeism and Sick Leave:* Civil servants who are absent during normal working hours without permission from responsible officer or controlling officer, or without a valid excuse, is guilty of misconduct. If the period exceeds five consecutive days, it amounts to abscondment and results in dismissal. However, this regulation is defeated in practice, as some officers do not have line supervisors and there is currently no rigorous system in place for monitoring and recording absenteeism.

- *Retention and Remuneration:* The Malawi Public Service has no deliberate policy to retain qualified staff, especially those with rare skills and valuable experience. As a result most young skilled staff shun working for the government institutions and instead prefer to work for NGOs, or to emigrate.
- *HIV/AIDS workplace programs:* Institutions lack adequate information for assessing the current and potential magnitude of HIV-related problems, and no incentives to respond to the problem. Managers are understandably hesitant to commit their organizations to policy reforms and prevention activities if they lack information on how HIV/AIDS is affecting their services delivery.

## **7. Conclusions and Recommendations**

The combined effects of HIV/AIDS and climate change threaten to vastly overstretch the capacity of disaster management institutions in southern Africa. Targeting four government agencies and two NGOs involved in disaster management in Malawi, we found ample evidence of a growing gap between demand for services and ability to meet such demand. The six organizations reported that absenteeism was a cause for concern. In the last ten years, increasing erosion of human resources (most likely due to HIV/AIDS-related morbidity and mortality) has resulted in staff attrition, and very high vacancy rates. No organization can be expected to function adequately with 42% posts unfilled, as is the case in the Department of Poverty and Disaster Management Affairs. It will not be easy to plan for adaptation at the local level given that the MET had to close about 84% of its rainfall stations since 1988).

The erosion of human capacity is negatively impacting productivity and performance of individual employees and organizations as a whole. As a result the services related to climate change adaptation and disaster management are increasingly compromised or even fail altogether in some organizations. Furthermore, staff attrition has significant financial implications. Additionally, organizations working directly with subsistence farmers face important difficulties in promoting risk reduction and climate change adaptation when communities are substantially affected by the HIV/AIDS pandemic.

In order to better address the challenges posed by the combined effects of HIV/AIDS and climate change, disaster management institutions need to improve their understanding of the impacts of the pandemic on organizational capacity, and the evolving nature of the demand for their services in a changing climate. Such efforts need to be based on sound methodologies (section 6.1. provided the basic outline of a possible approach).

Based on the results of this research, the following recommendations emerge:

(a) Organizations involved in disaster management in southern Africa should

- Improve data collection, information management, analysis and planning regarding human resources (particularly staff attrition and absenteeism of specific cadres that may be difficult to replace), and assess expected growth in service demand due to climate change.
- Tailor new education and incentive packages to expected gaps in key personnel (such as agricultural extension officers, weather forecasters or water engineers).
- Identify services and processes that could be automated to avoid disruption in service delivery due to high attrition rates. For example, the MET could speed up the adoption of equipment for automated data collection.
- Revise HIV/AIDS workplace programs to reduce prevalence rates and mitigate HIV/AIDS impacts, and review human resources policies and practices that contribute to the erosion of organizational capacity.

(b) Donors, policy makers and practitioners involved in disaster management and climate change adaptation should

- Recognize the enormous magnitude of the institutional challenges associated with capacity erosion, and invest not just in programs and activities directly aimed at reducing risk but also at general capacity building.

- Fund HIV/AIDS-related programs affecting implementation of proposed activities. For example: Improving the distribution of antiretroviral drugs among key personnel may prove to be an efficient approach to accelerate climate change adaptation.
- Further explore and address the threats that HIV/AIDS poses to adaptation. Particular attention should be given to adaptive measures that are well suited for the changing reality in communities and institutions affected by the pandemic (i.e. favor options that are less labor intensive).

The organizational capacity of disaster management institutions is grossly inadequate to support, let alone lead, adaptation to climate change in Malawi. Further work is needed to fully understand the magnitude of the challenge posed by HIV/AIDS on disaster-related institutions. While calls for embracing adaptation abound, little is being done to actually assess and strengthen the organizational capacity of institutions like those targeted in this study, which should play leading roles in any attempt to help their country prepare for a changing climate. We hope that the findings of this work can help policy makers and practitioners plan for the increasing risks associated with climate change taking into account the realities of the HIV/AIDS pandemic.

## REFERENCES

- African Union 2007, 'Decision on Climate Change and Development in Africa', (DOC. ASSEMBLY/AU/12 (VIII)), Eighth African Union Summit, Addis Ababa, 22-30 January 2007.
- Allison, EH & Seeley, JA 2004, 'HIV and AIDS among fisherfolk: a threat to 'responsible fisheries'?' *Fish and Fisheries* 5 (3): 215-234.
- Arnell, NW, Hudson, DA & Jones, RG 2003, Climate change scenarios from a regional climate model: Estimating change in runoff in southern Africa. *Journal of Geophysical Research - Atmospheres* 108 (D16): Art. No. 4519
- Barnett, T & Blaikie, P 1992, *AIDS in Africa: its present and future impact*, John Wiley and Co, London.
- Bennell, P 2005, 'The impact of the AIDS epidemic on teachers in sub-Saharan' Africa. *Journal of Development Studies* 41 (3): 440-466.
- Black-Michaud, A 1997, *Impact du VIH/SIDA sur les systemes d'exploitations agricoles en Afrique de l'Ouest*, AGSP, FAO, Rome.
- Bota, S, Mphepo, M & Malindi, G 2001, *Impact of HIV/AIDS in Agricultural Extension Organization and Field Operations in Selected Countries of sub Saharan Africa, with and Appropriate Institutional Response*. UNDP/FAO, Lilongwe.
- Cuddington, JT & Hancock, JD 2002, 'Assessing the impact of AIDS on the growth path of the Malawian economy', *Journal of Development Economics* 43:363-368.
- De Waal, A. & Whiteside, A 2003, 'New variant famine: AIDS and food crisis in southern Africa', *Lancet* 362 (9391): 1234-1237.
- Dominguez, CO, Jones, RB & Waterhouse, R 2005, 'The impact of HIV/AIDS on seed security in southern Mozambique', International Conference on HIV/AIDS and Food and Nutrition Security, Durban, 14-16 April.
- Eakin, H & Lemos, MC 2006, 'Adaptation and the state: Latin America and the challenge of capacity-building under globalization', *Global Environmental Change – Human and Policy Dimensions* 16 (1): 7-18.
- Environmental Affairs Department 2006, *Malawi's National Adaptation Programme of Action (NAPA)*. Environmental Affairs Department, Lilongwe.
- Foster, S 1993, 'Maize production, drought and AIDS in Monze district, Zambia'. *Health Policy and Planning* 8 (3): 247-254.
- Givah, P & Storey, K 2007, *HIV/AIDS, Climate Change and Disaster Management: Challenges for Institutions In Malawi*, Report to the World Bank Development Economics Research Group, Malawi Institute of Management, Lilongwe.
- Government of Malawi 2006, *National disaster management profile in Malawi*, Department of Poverty and Disaster

Management Affairs, Lilongwe.

- Gregory, P.J, Ingram, JSI & Brklacich, M 2005, 'Climate change and food security', *Philosophical Transactions of the Royal Society B- Biological Sciences* 360 (1463): 2139-2148
- Guinness, L, Walker, D, Ndubani, P, Jama, J & Kelly P 2003, 'Surviving the impact of HIV-related illness in the Zambian business sector', *AIDS Patient Care and STDS* 17 (7): 353-363.
- Haines, A, Kovats, RS, Campbell-Lendrum, D & Corvalan, C 2006, 'Climate change and human health: Impacts, vulnerability and public health', *Public Health* 120 (7): 585-596
- Hawkes, C & Ruel, M 2006, 'The links between agriculture and health: An intersectoral opportunity to improve the health and livelihoods of the poor', *Bulletin of the World Health Organization* 84 (12): 984-990.
- IFRC – International Federation of Red Cross and Red Crescent Societies 2007, *Appeals / operations co-ordinated by the International Federation 1919-2006*, IFRC, Geneva.
- ILO – International Labour Organization 2002, *Global Programme on HIV/AIDS and World of Work Report*, International Labour Organization, Geneva.
- IPCC - Intergovernmental Panel on Climate Change 2001, *Climate change 2001: Impacts, adaptation and vulnerability*, Cambridge University Press, Cambridge.
- IPCC - Intergovernmental Panel on Climate Change 2007, *The Physical Science Basis. Summary for Policymakers. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, viewed October 10 2007, <www.ipcc.ch>.
- Malawi Government 2001, *Sexual and reproductive health behaviours in Malawi: A literature review to support the situational analysis for the National Behaviour Change Interventions Strategy on HIV/AIDS and Sexual and Reproductive Health*. National AIDS Commission and Ministry of Health and Population, Lilongwe.
- Malawi Government 2002, *Malawi Poverty Reduction Strategy Paper*. Ministry of Finance and Economic Planning, Lilongwe.
- Mason, JB, Bailes, A, Mason, KE, Yambi, O, Jonsson, U, Hudspeth, C, Hailey, P, Kendle, A, Brunet, D & Martel, P 2005, 'AIDS, drought, and child malnutrition in southern Africa', *Public Health Nutrition* 8 (6): 551-563.
- McCourt, W & Awases, M 2007, 'Addressing the human resources crisis: a case study of the Namibian health service', *Human Resources Health* 5 (1).
- Meze-Hausken, E 2000, 'Migration caused by climate change: how vulnerable are people in dryland areas?' *Migration and Adaptation Strategies for Global Change* 5 (4): 379-406.
- Mutangadura, G, Mukurazita, D, & Jackson, H 1999, *A Review of household and community responses to the HIV/AIDS epidemic in rural areas of sub-Saharan Africa*, UNAIDS, Geneva
- NAC - National AIDS Commission 2003, *Situation Analysis of HIV/AIDS in Malawi*, Malawi National AIDS

Commission, Lilongwe.

- New, M, Hewitson, B, Stephenson, DB, Tsiga, A, Kruger, A, Manhique, A, Gomez, B, Coelho, CAS, Masisi, DN, Kululanga, E, Mbambalala, E, Adesina, F, Saleh, H, Kanyanga, J Adosi, J, Bulane, L, Fortunata, L Mdoka, ML & Lajoie, R 2006, 'Evidence of trends in daily climate extremes over Southern and West Africa' *Journal of Geophysical Research*, 111 (D14): Art. No. D14102.
- Ngondongondo, CS 2006, 'An analysis of long-term rainfall variability, trends and groundwater availability in the Mulunguzi river catchment area, Zomba mountain, Southern Malawi' *Quaternary International* 148: 45-50
- O'Brien, G, O'Keefe, P, Rose, J & Wisner, B 2006, 'Climate change and disaster management' *Disasters* 30 (1): 64-80.
- Ogunseitan, OA 2003, 'Framing environmental change in Africa: cross-scale institutional constraints on progressing from rhetoric to action against vulnerability', *Global and Environmental Change – Human and Policy Dimensions* 13 (2): 101-111.
- Palmer, D 2006, 'Tackling Malawi's human resources crisis', *Reproductive Health Matters* 14 (27): 27-39.
- Patt, AG, Dazé, A & Suarez, P forthcoming, 'Gender and climate change vulnerability: What's the problem, and what's the solution?', in *The Distributional Effects of Climate Change: Social and Economic Implications*, eds. M Ruth & ME Ibararán, Edward Elger, Cheltenham.
- Piot, P & Seck, AMC 2001, 'International response to the HIV/AIDS epidemic: planning for success', *Bulletin of the World Health Organization* 79 (12): 1106-1112.
- Piwoz, E & Preble, E 2000, *HIV/AIDS and nutrition: A review of the literature and recommendations for nutritional care and support in Sub-Saharan Africa*, USAID, Washington DC.
- Schipper, L & Pelling, M 2006, 'Disaster risk, climate change and international development: scope for, and challenges to, integration', *Disasters* 30 (1): 19-38.
- Suarez, P, Linnerooth-Bayer, J & Mechler, R 2007, *Feasibility of Risk Financing Schemes for Climate Adaptation: The case of Malawi*, International Institute for Applied Systems Analysis, Laxenburg.
- Tadross, MA, Hewitson BC & Usman MT 2005, 'The interannual variability of the onset of the maize growing season over South Africa and Zimbabwe', *Journal of Climate* 18(16), 3356-3372.
- Tadross, M, Suarez, P & Lotsch, A 2007, 'Observed and projected changes in rainfall characteristics for central Malawi: Implications for adaptation in the agricultural sector', Report to the World Bank Development Economics Research Group, University of Cape Town Climate Systems Analysis Group, Cape Town.
- Thomalla, F, Downing, T, Spanger-Siegfried, E, Han, G & Rockström, J 2006, 'Reducing hazard vulnerability: towards a common approach between disaster risk reduction and climate adaptation', *Disasters* 30 (1): 39-48.
- Tompkins, EL & Adger, WN 2005, 'Defining response capacity to enhance climate change policy', *Environmental Science and Policy* 8 (6): 562-571.

UNAIDS 2001, *AIDS Epidemic Update 2001*, UNAIDS/World Health Organization, Geneva.

UNAIDS 2006, *Report on the global AIDS epidemic 2006*, UNAIDS/World Health Organization, Geneva.

UNDP – United Nations Development Programme 2002, *The Impact of HIV/AIDS on Human Resources in the Malawi Public Sector*. United Nations Development Programme, Lilongwe.

Van Aalst, MK 2006, 'The impacts of climate change on the risk of natural disasters', *Disasters* 30 (1): 5-18.