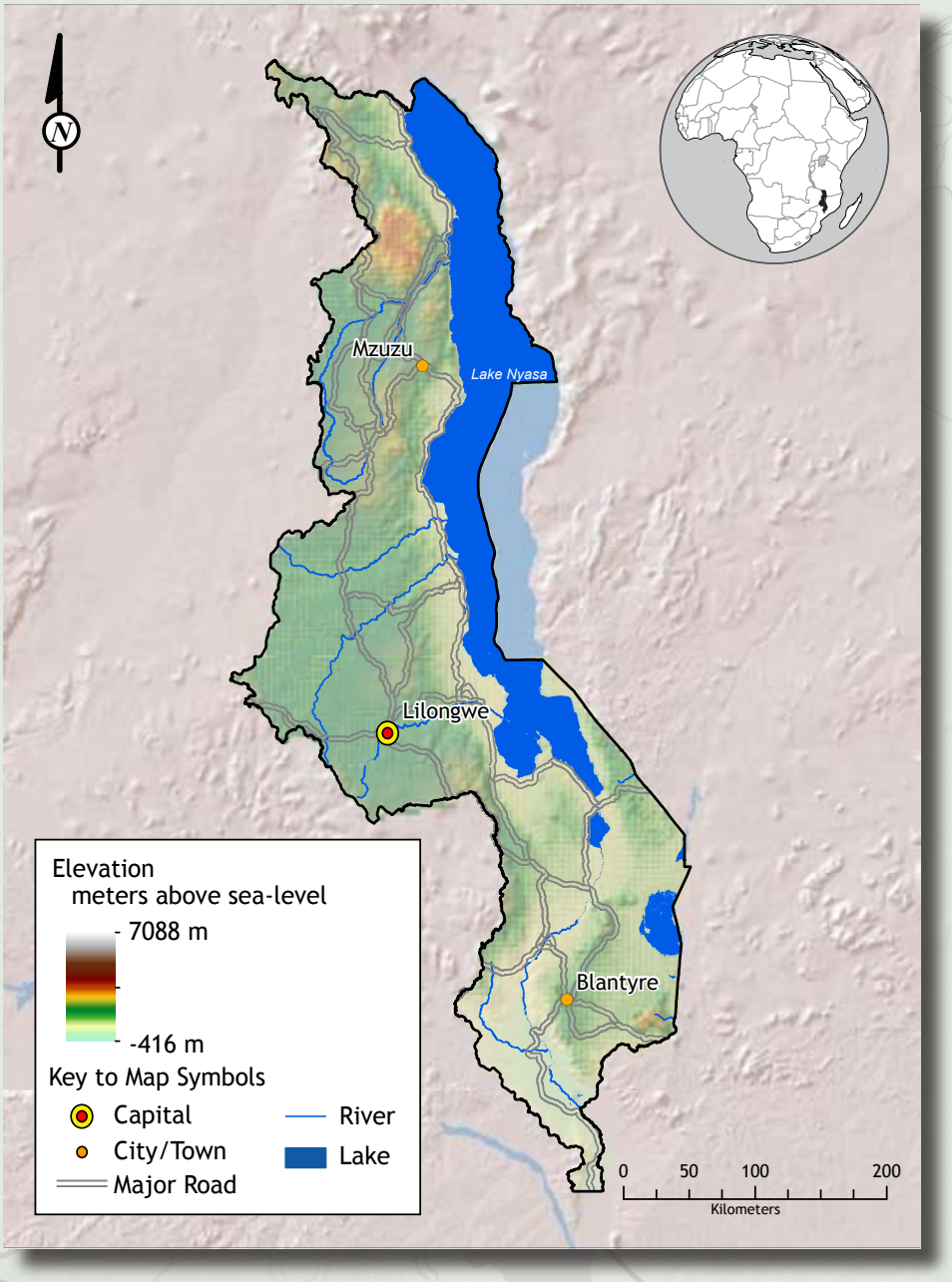


Vulnerability, Risk Reduction, and Adaptation to Climate Change

CLIMATE
DISASTER RISK REDUCTION
ADAPTATION

MALAWI

GFDRR
Global Facility for Disaster Reduction and Recovery

Climate Change Team ENV

COUNTRY OVERVIEW

Located in southern Africa and bordered by Mozambique, Tanzania, and Zambia, Malawi is a small, densely populated, and landlocked country with one of the lowest levels of per capita income in the world (USD$164 in 2006). Over the past ten years, Malawi's poverty levels have remained largely unchanged as economic growth and development have stagnated due to widespread emigration, HIV/AIDS, a deteriorating infrastructure, macroeconomic instability, limited competitiveness of Malawian products in international markets, and a rapid population growth rate.

Malawi's topography is varied; the Great Rift Valley that contains Lake Malawi stretches from north to south with elevations ranging from 800-1200 meters. Highland peaks can reach as high as 3000 meters above sea level. While the country's climate is tropical overall, temperatures in higher elevations can be relatively cool. The flood plains, wetlands, and forests of the Lower Shire Valley are particularly vulnerable to climate change, with drought and flood disasters currently directly affecting over half a million people. These areas also serve as vital habitats for wildlife and for crop production (rice, cotton, beans, sorghum, millets, and sugar cane).[1] Over the past two decades, drought and flood events have increased in frequency, intensity, and magnitude with negative consequences for food and water security, water quality, energy, and the sustainable livelihoods of rural communities.

Malawi's National Adaptation Programme of Action assesses impacts of climate change on the agriculture, water, human health, energy, fisheries, wildlife, and forestry sectors, as well as the implications on gender. The sector that will be most severely impacted by climate change is agriculture. Over 50 percent of the population lives below the poverty line and one in five people is chronically food insecure. Rainfed subsistence agriculture is the main livelihood for 85 percent of the population, leaving them highly vulnerable to weather shocks such as erratic rainfall that can cause flooding in the south, and periodic droughts that affect the entire country. Meeting the development challenge in Malawi requires increasing agricultural productivity, improving irrigation, developing and strengthening input and output markets, improving vital infrastructure service and delivery, and improving the investment climate overall.[2]

PRIORITY ADAPTATION MEASURES

Malawi published a National Adaptation Programme of Action (NAPA) in March 2006. The document prioritized the following adaptation actions:[3]

- Improve community resilience to climate change through the development of sustainable rural livelihoods;
- Restore forests in the Shire River Basin to reduce siltation and associated water flow problems;

Key Sectors
Agriculture
Water Resources
Health

Source: Malawi's National Adaptation Programme of Action, 2006.

[1] National Adaptation Programme of Action of Malawi. March 2006.
[2],[3] Country Assistance Strategy of Malawi 2007.

- Improve agricultural production under erratic rains and changing climatic conditions;
- Improve Malawi's preparedness to cope with droughts and floods; and
- Improve climate monitoring to enhance Malawi's early warning capability and decision making, and sustainable utilization of Lake Malawi and lakeshore areas resources.

CLIMATE BASELINE AND CLIMATE FUTURE

CLIMATE BASELINE

Malawi's climate is as varied as the country's topography. The vast surface water of Lake Niassa tends to have a cooling effect on the margins of the lake, where long, hot seasons with high humidity occur, along with mean annual temperatures of 24° C. Rainfall patterns are heaviest along the coast of Lake Malawi where precipitation is heaviest (averaging 1600 mm annually); the rest of the country's rainfall ranges between 750 and 1000 mm annually. Overall, the country experiences three seasons: a cool season (May to mid-August), a hot season (mid-August to November), and a rainy season (November to April), with rains continuing longer in the northern and eastern mountains. Lilongwe, the country's capital, is located in the center of the country at an elevation of 1,041 m (3,415 ft) and has a moderately warm climate. The average daily minimum and maximum temperatures in November, the hottest month, are 17°C and 29°C, respectively; those in July, the coolest month, are 7°C and 23°C.

RECENT CLIMATE TRENDS

- Mean annual temperature has increased by 0.9°C between 1960 and 2006, an average rate of 0.21°C per decade. This increase in temperature has been most rapid in the rainy summer (December-February) and lowest in the hottest season (September-November).
- Daily temperature observations show significantly increasing trends in the frequency of hot days and nights[4] in all seasons.
- The average number of 'hot' days per year in Malawi has increased by 30.5 between 1960 and 2003. The rate of increase is seen most strongly in December-February, when the average number of hot December-February days has increased by 3.9 days per month over this period.
- The average number of 'hot' nights per year increased by 41 (an additional 11.1 percent of nights) between 1960 and 2003. The rate of increase is seen most strongly in December-February, when the average number of hot December-February nights has increased by 5.5 days per month (an additional 17.6 percent of December-February nights) over this period.
- The frequency of cold days[5] and nights has decreased significantly since 1960 in all seasons except September-November. The average number of 'cold' days per year has decreased by 16 (4.3 percent of days) between 1960 and 2003. This rate of decrease is most rapid in March-May, when the average number of cold days has decreased by 2.4 days per month (7.2 percent of

[4] 'Hot' days or nights are defined as the temperature exceeded on 10 percent of days or nights in current climate of that region and season per year.
[5] 'Cold' nights are defined as the temperature below which 10percent of days or nights are recorded in current climate of that region or season per year.

March-May days) over this period.

- The average number of 'cold' nights per year has decreased by 33 days (8.9 percent of days). This rate of decrease is most rapid in March-May, when the average number of cold March-May nights has decreased by 3.2 nights per month (10.4 percent of March-May nights) over this period.
- As year-to-year variability in rainfall is very high in Malawi, long-term trends are difficult to identify. In 2006, wet-season (December-February) rainfall over Malawi was markedly low, possibly causing a decreasing trend in December-February rainfall; however, evidence does not reveal consistent decreases.

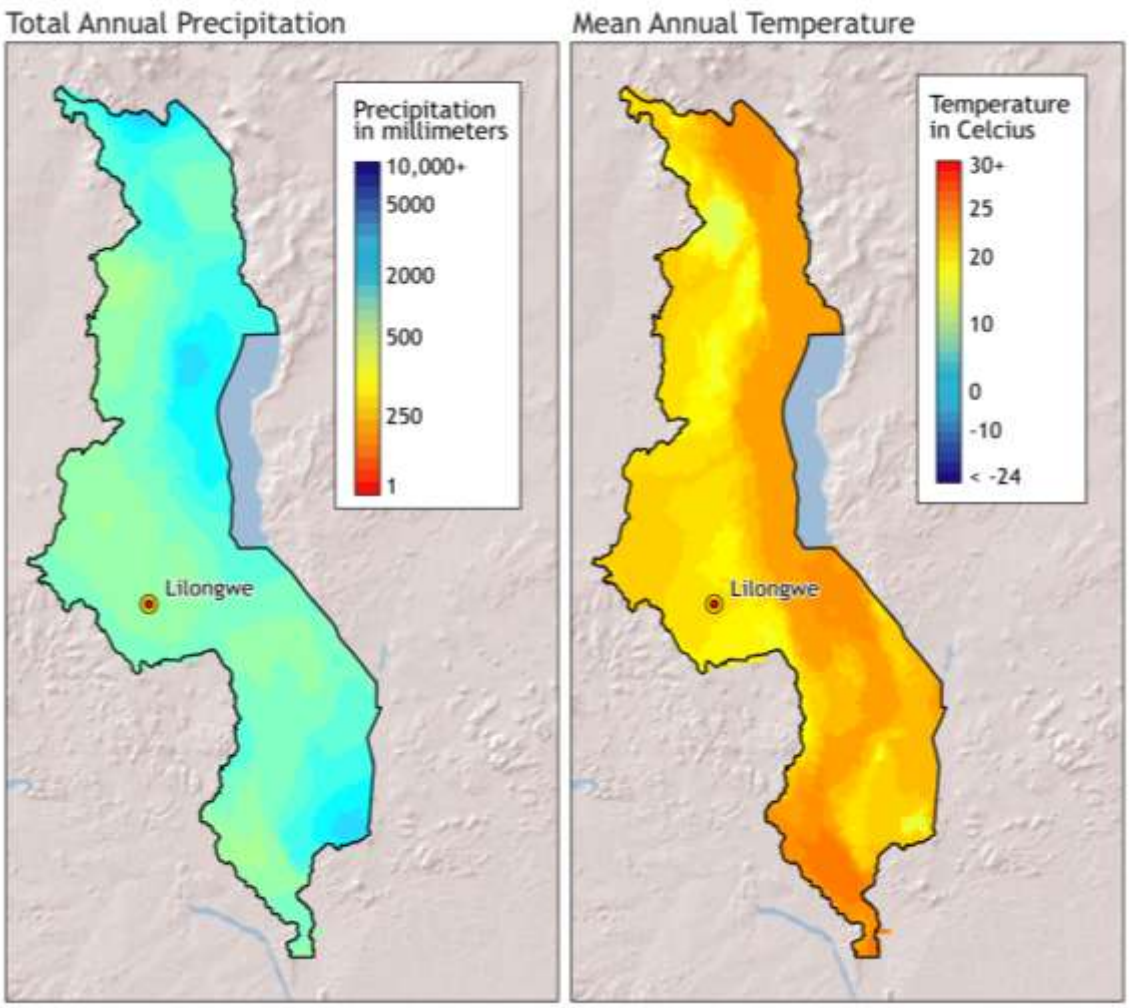


Figure 1: Total annual rainfall (left) and mean temperature (right) in Malawi[6]

[6] WorldClim 1960-1990 averages. Robert J. Hijmans, Susan Cameron, and Juan Parra, at the Museum of Vertebrate Zoology, University of California, Berkeley, in collaboration with Peter Jones and Andrew Jarvis (CIAT), and with Karen Richardson (Rainforest CRC). www.worldclim.org/current

CLIMATE FUTURE

The climate science community sources a suite of models to inform decision makers on future climate. Among the most widely used are GCMs (Global Climate Models), RCMs (Regional Climate Models), and downscaling techniques (both empirical and statistical), along with several comprehensive reviews on the subject. GCMs are our primary source of information about future climate. They comprise simplified but systematically rigorous interacting mathematical descriptions of important physical and chemical processes governing climate, including the role of the atmosphere, land, oceans, and biological processes (Figure 2).

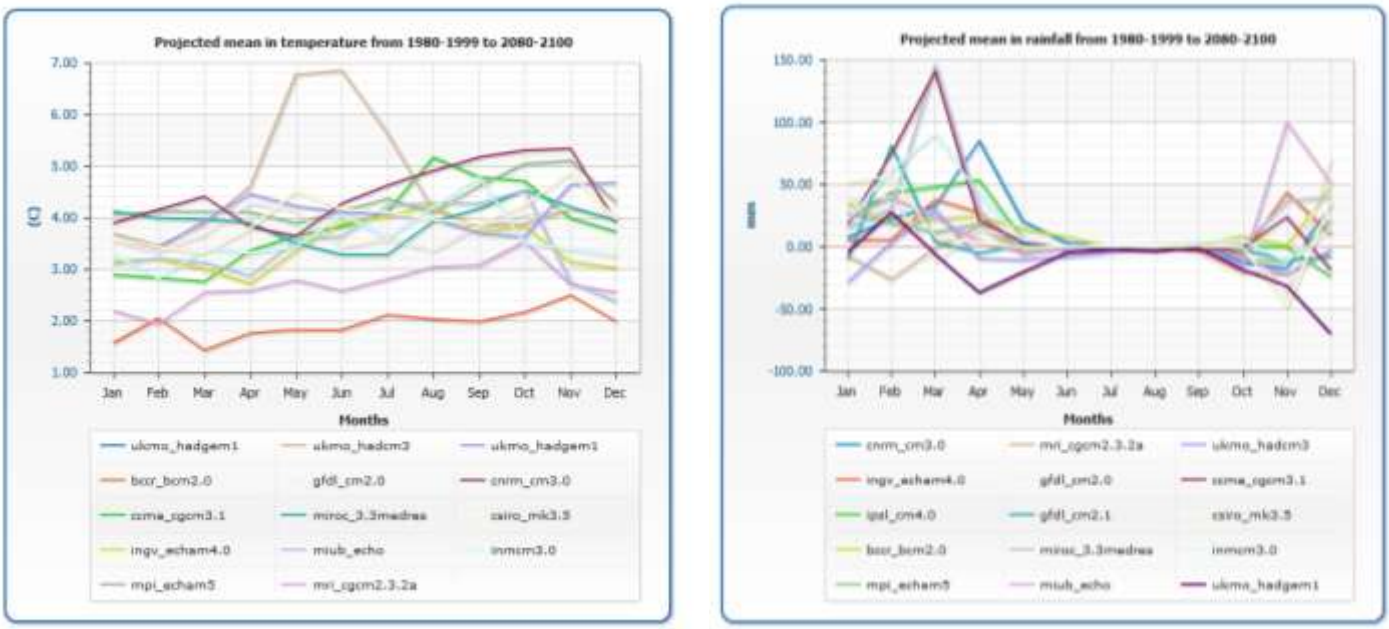


Figure 2: Projected change in rainfall, 1980-1999 to 2080-2100 (left), and change in temperature 1980-1999 to 2080-2100 (right) in Northern Malawi

The following insights into the changing climate are from a suite of GCMs used by the Intergovernmental Panel on Climate Change[7]:

- Mean annual temperature is projected to increase by 1.1 to 3.0°C by the 2060's, and by 1.5 to 5.0°C by the 2090s. All projections indicate substantial increases in the frequency of days and nights that are considered 'hot' in current the climate. Annually, projections indicate that 'hot' days will occur more often.
- Nights that are considered 'hot' for the annual climate of 1970-99 are projected to increase more quickly than hot days. Decreases in the frequency of days and nights that are considered 'cold' in the current climate are projected, and these events did become exceedingly rare by the 1990s.

[7] UNDP Climate Change Country Profile for Malawi.

- Substantial changes in annual rainfall are not projected between June and October and monthly rainfall changes for November through May are inconsistent, with some models projecting increases and others projecting decreases, particularly in the period from September-May.[8]
- All models consistently project increases in the proportion of rainfall that falls in heavy events in the annual average of up to 19 percent by the 2090s.

CLIMATE CHANGE IMPACTS ON NATURAL HAZARD VULNERABILITY

AT A GLANCE

Malawi is particularly prone to adverse climate hazards that include dry spells, seasonal droughts, intense rainfall, riverine floods, and flash floods (Figure 3). **Droughts** and **floods**, the most severe of these hazards, have increased in frequency, intensity, and magnitude over the past twenty years, with dire consequences on food and water security, water quality, energy resources, and sustainable livelihoods of the most rural communities.[9] From 1979 to 2008, 2,596 people perished due to natural disasters, and nearly another 21.7 million people were adversely affected.[10] Floods and droughts are the leading cause of chronic food security, which is endemic in many parts of the country.

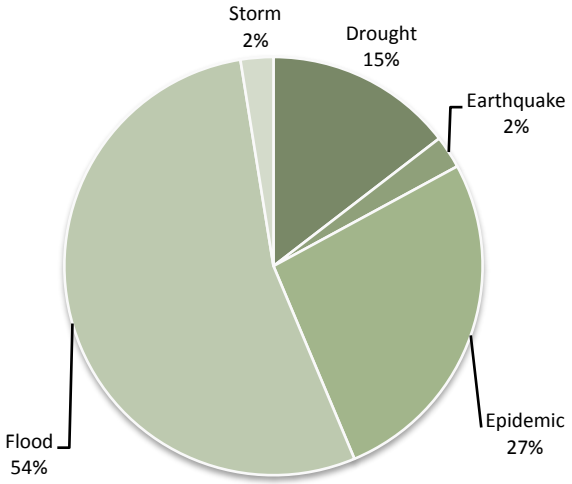


Figure 3: Annual average disaster distribution[11]

- **Floods** cause annual losses of about 12 percent of maize production in the south, where about one-third of Malawi's maize is grown.[12] People living near riverbanks are the most vulnerable to floods, which result in untimely deaths, large disease outbreaks, and the destruction of crops and property. Models estimate that floods may cause an average GDP loss of almost 1 percent every year, while during periods of drought, economic losses are found to be much higher. For example, during a 1-in-25 year drought, as was the drought that struck Malawi in 1991/92, GDP can contract by as much as 10.4 percent. Drought destroys on average 4.6 percent of the maize production each year in Malawi (based on today's adoption of different varieties). Together, droughts and floods constitute a major obstacle for agriculture and food security in the country.[13]

[8] Source: World Bank's Climate Change Knowledge Portal. http://sdwebx.worldbank.org/climateportal/.
[9] Human Development Report 2007. National Adaptation Strategy to Climate Change Impacts, a case study of Malawi.
[10] GFDRR. Economic Vulnerability and Disaster Risk Assessment in Malawi and Mozambique: Measuring Economic Risks of Droughts and Floods.
[11] Preventionweb.org
[12] Ibid note 9.
[13] Ibid note 9.

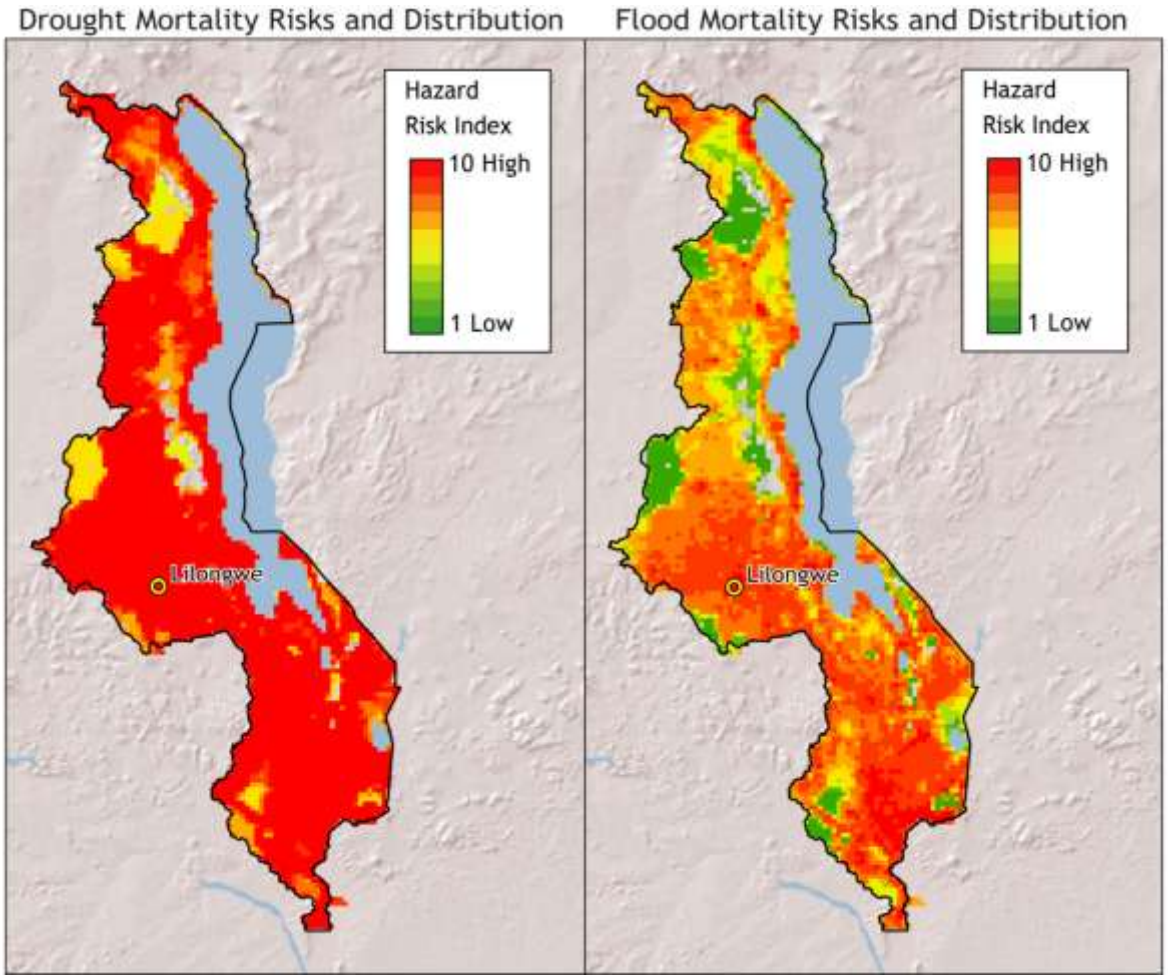


Figure 4: Exposure to climate-related hazards across Malawi[14]

- **Droughts** have been observed to increase poverty by 1.3 percentage points, but this rises to almost 17 percentage points during a 1-in-25 year drought (roughly equal to an additional 2.1 million people falling below the poverty line). Children, the elderly, and female-headed households tend to suffer the most from droughts through malnutrition and consequential high susceptibility to diseases. In addition, livestock and wild animals are adversely affected by drought. Urban households as well as those engaged in off-farm activities will also continue to suffer from droughts due to higher food prices and declining nonfarm wages. Droughts result in reduced river-flow rates and the complete drying up of rivers. The water table also recedes, thereby affecting boreholes and wells, which are major sources of potable water in rural areas. Alternative ways of ensuring adequate water supply for rural communities need to be explored and implemented.

[14] This dataset is the result of collaboration among the Columbia University Center for Hazards and Risk Research (CHRR), International Bank for Reconstruction and Development/The World Bank, and Columbia University Center for International Earth Science Information Network (CIESIN).

Implications for Disaster Risk Management

- Model results estimate that droughts, on average, cause GDP losses of almost 1 percent every year. Economic losses are much higher during extreme droughts.
- One study suggests a possibility that rainy seasons will grow shorter, potentially leading to more frequent failures in maize cultivation, which in turn has significant implications for future food security.[15]

To cope with recurring droughts, interventions are likely to be site-specific, depending on terrain, soil type, and methods of water extraction and delivery, among many others. Some of the potential interventions include:

- Construction of medium- to large-scale dams and small rainfall-harvesting structures, such as water troughs, small dams, and infiltration gullies.
- Construction of deep wells for the provision of water for domestic purposes, irrigation, and animal use.
- To cope with recurring floods, potential interventions should focus on the construction of flood protection structures.

Sectoral Climate Risk Reduction Recommendations

Agriculture

Agriculture is central to Malawi's economy; maize production accounts for 52 percent of total agricultural crop area, 34 percent of GDP, and 85 percent of employment. Notably, maize is highly vulnerable to changes in average annual rainfall patterns.[16] Sorghum, millet, pulses, rice, root crops, vegetables, and fruits supplement maize production. Industrial export crops grown by smallholders include cotton, rice, groundnuts, coffee, macadamia nuts, and tobacco. The main estate-grown crops are tobacco, coffee, tea, and sugar. After Zimbabwe, Malawi is the second largest producer of tobacco in Africa. In 2003, agriculture contributed 37.6 percent to the country's GDP of US$1700 million.[17] Agriculture also accounts for roughly 90 percent of the country's export earnings, with tobacco alone accounting for 60 percent, and it provides employment for 81 percent of the economically active population. Drought has already led to poor crop yields if not total crop failure, and resulting food shortages have worsened malnutrition.[18,19] Continued reliance on the maize crop will restrict livelihood options for millions and exacerbate food insecurity over the long term.

[15] Tadross, M., Suarez, P., Lotsh, A., Hachigonta, S., Mdoka, M., Unganai, L., Lucio, F.Kamdonyo, D., and Muchinda, M. Changes in growing season rainfall characteristics and downscaled scenarios over southern Africa: implications for growing maize.
[16] Initial National Communication of Malawi, 2002.
[17] FAO.AQUASTAT Information System on Water and Agriculture. Malawi Country Profile.
[18] Malawi Country Assistance Strategy 2007
[19] National Adaptation Programme of Action of Malawi. March 2006.

Table 1: Projected changes in major cereal crops under several management options for Malawi

Crop	Baseline Yield (1961 - 1990)	Future Projected Yield	Change %	Period	Options
Wheat	2929	2325	-20.62	2020s	High Input, Rainfed
Wheat	2929	1211	-58.65	2050s	High Input, Rainfed
Wheat	2929	0	-100	2080s	High Input, Rainfed
Wheat	1010	0	-100	2080s	Low Input, Rainfed
Rice	3861	4200	8.78	2020s	High Input, Rainfed
Rice	3861	4533	17.4	2050s	High Input, Rainfed
Rice	3861	5068	31.26	2080s	High Input, Rainfed
Rice	2508	1981	-21.01	2080s	Low Input, Rainfed
Maize	8826	9238	4.67	2020s	High Input, Rainfed
Maize	8826	9419	6.72	2050s	High Input, Rainfed
Maize	8826	9721	10.14	2080s	High Input, Rainfed
Maize	3597	4016	11.65	2080s	Low Input, Rainfed
Sorghum	7265	7583	4.38	2020s	High Input, Rainfed
Sorghum	7265	7386	1.67	2050s	High Input, Rainfed
Sorghum	7265	7497	3.19	2080s	High Input, Rainfed
Pearl Millet	3146	3150	0.13	2020s	High Input, Rainfed
Pearl Millet	3146	3110	-1.14	2050s	High Input, Rainfed
Pearl Millet	3146	3188	1.34	2080s	High Input, Rainfed
Pearl Millet	1030	1342	30.29	2080s	Low Input, Rainfed
Best Cereal	8826	9239	4.68	2020s	High Input, Rainfed
Best Cereal	8826	9419	6.72	2050s	High Input, Rainfed
Best Cereal	8826	9721	10.14	2080s	High Input, Rainfed

Source: World Bank Climate Change Data Portal –Agricultural Model Generated by IIASA.

Malawi's population as a whole is chronically food insecure. The major reasons for this insecurity include:[20]

- A growing human population in Malawi increasing the demand for food production;
- Increasing incidences of drought and inability to use existing water sources for agricultural production;
- Declining soil fertility and reduction in the size of average farm holdings;
- Inappropriate and outdated agricultural technologies;
- Food reliance on maize when in fact other types of cereals that are more adaptable to drought are available.

[20] Ibid note 13.

These factors mean that even during favorable growing conditions the majority of households cannot produce enough food to sustain their livelihoods. In addition, limited access to storage and an immediate need for cash often cause farmers to engage in maladaptive practices, including selling crop yields for short-term gains when prices are low, which exacerbates their vulnerability over the long term.[21] To improve food security and reduce future risks, crop diversification and promotion of a wide range of food sources is vital. These steps can ensure food security, improve nutrition, and increase the income of those most vulnerable to climate change impacts.[22]

WATER RESOURCES

Malawi derives its water from both surface- and ground-water sources. An extensive river system covers 20 percent of the country's surface area, comprising the Shire, Ruo, Bua, Rukuru, and Songwe Rivers, and numerous lakes such as Malawi, Chilwa, Chiuta, and Malombe supply the country's surface water. Lake Malawi, the third largest lake in Africa, plays a particularly important role in surface-water supply and in the socio-economic development of the country. Water resource distribution varies dramatically both by season and by geographic region; almost 90 percent of the runoff in major rivers occurs between December and June. Agriculture/irrigation continues to be the major water-withdrawing sectors. As both socio-economic development levels and population growth have increased over the past ten years, water withdrawal for agricultural and municipal purposes has concurrently risen. Over the last 15 years, irrigation has been a low priority in the country. The oldest traditional irrigation method used in the country is the watering can. It is probably the cheapest and simplest technology and hence most widely used by smallholder farmers in self-help schemes. Since 1998, the Department of the Interior has introduced several irrigation technologies targeting smallholder farmers, including motorized pumps, river diversions, and manual pumps (treadle pumps). The constraints to expanding irrigation for agricultural production have been:

- Focusing of the agricultural economy on rainfed agriculture and existing irrigation schemes, where emphasis was on funding extension activities;
- Reluctance of donors to fund irrigation development;
- Replacement of irrigation services under the Ministry of Agriculture, which has focused on rainfed agriculture;
- Price setting for crops not viable for irrigation;
- Almost no irrigation technology training facilities within the country;
- A poorly funded and understaffed Department of Irrigation; and
- Lack of farmer ownership of plots on government schemes.

Unfortunately, unreliable water supplies caused by hydrological variability discourage investment into national industry and services and thwart efforts to promote local economic development and diversification of activities.[23] Frequent droughts and floods pose a systematic risk to the economy of Malawi and require the development of a longer-term approach for adapting to drought and flood

[21] Country Assistance Strategy of Malawi 2007.
[22] See reference 14 above.
[23] National Adaptation Programme of Action of Malawi. March 2006.

risks and to conditions of chronic hydrological variability.[24] The increasing frequency of droughts and floods already seriously disrupts water availability, quantity, and quality. In the city of Blantyre, water shortages are common and often lead to disease outbreaks during times of drought. Water shortages also occur during flood events, when water pipes burst and dams silt.[25] Both droughts and floods already significantly curtail access to safe water sources. Adaptation strategies proposed in the water sector include:

- Demand side management through water allocation
- Construction of boreholes
- Water harvesting
- Water resource management
- Flood management

HEALTH

The health sector in Malawi is directly affected by climate change, in particular by the increasing incidence of floods and droughts, which lead to infant malnutrition and chronic ailments associated with malaria, cholera, and diarrhea. Malaria alone is expected to increase and spread to previously cool zones as temperatures increase due to global change.[26] Coupled with climate change, HIV/AIDS poses a significant threat to development in Malawi, and both dynamics already affect business practices of disaster management institutions. According to the Malawi National AIDS Commission estimates, 14.1 percent of Malawians between 15 to 49 years old are HIV positive—which amounts to almost a million people. When compared to the rest of Sub-Saharan Africa where the average adult prevalence rate is 6.1 percent, the gravity of this pandemic is evident. HIV/AIDS is already increasing the vulnerability of rural communities to drought and other climate-related shocks. HIV/AIDS drives down the productivity of the labor force, as those infected (i.e. farmers) are unable to be as productive as healthy people.[27] One study demonstrated how knowledge about locally adapted seeds and varieties will be lost as infected farmers die; a knowledge base on how to manage climate variability that will be depleted and weaken Malawians' capacity to adapt to climate change. Specifically, those infected with HIV/AIDS require improved nutritional intake (i.e. more protein) to fight off infections, which will become increasingly difficult as recurring droughts undermine agricultural production and livestock health and well-being. At the same time, the inability to fight off infection due to malnutrition in the near term will only become more acute over the long term. Institutions involved in risk reduction and disaster response will need to be prepared to provide additional support to those in need.[28]

The health sector in Malawi must overcome a series of challenges to have a positive impact on Malawians. These include a high patient to doctor ratio, inadequate infrastructure, prevalence of serious communicable diseases, and a lack of adequate resources to purchase necessary medicines.

[24] See reference 19, above.
[25] Human Development Report 2007. National adaptation Strategy to Climate Change Impacts, a case study of Malawi.
[26] National Adaptation Programme of Action of Malawi. March 2006.
[27] World Bank, 2008. HIV/AIDS, Climate Change and Disaster Management: Challenges for Institutions in Malawi. World Bank Policy Research Working Paper 4634.
[28] Dominguez, CO, Jones, RB, and Waterhouse, R: '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, 2005.

As the most productive age group in Malawi is to a large extent affected by the HIV/AIDS pandemic, extreme weather events such as droughts and floods will be an additional weight on already stressed ecosystems and social systems. Adaptation measures to address the impacts of climate change on the health sector include:

- Improved nutrition for infants and other vulnerable groups, including crop diversification and food supplementations for the under five-year-olds;
- Prevention of diseases such as malaria, through increased distribution of insecticide-treated bed-nets (ITNs), and diarrhea, through improved water treatment infrastructure.

EXISTING ADAPTATION FRAMEWORK/STRATEGY/POLICY AND INSTITUTIONAL SETUP

AT A GLANCE

The following ministries have responsibility for climate change:

- Ministry of Forestry, Fisheries and Environmental Affairs
- Ministry of Poverty and Disaster Management Affairs (DoDMA)
- Ministry of Agriculture and Food Security
- Department of Irrigation and Water Development
- Department of Agricultural Research & Technical Services (DARTS)
- The National Statistics Office of Malawi
- A National Climate Change Committee (NCCC) chaired by the Department of Climate Change and Meteorology, with its Secretariat in the Environmental Affairs Department, reviews policies and programs on climate change.

Limited financial capacity at the national level poses one barrier to the implementation of adaptation activities. At the same time, numerous additional factors hinder efforts to build resilience, including (i) extreme poverty and low levels of education amongst the most vulnerable groups, causing difficulties for the transfer of new technologies and meaningful long-term planning; (ii) poor infrastructure, especially poor roads and bridges, leaving many rural areas isolated and consequently unable to receive farm inputs (e.g. fertilizer and seeds) and access markets; (iii) limited credit opportunities for rural communities, to facilitate access to farm inputs; (iv) widespread food insecurity at the regional level, preventing acquisition of food from neighboring countries and exacerbating existing low levels of adaptive capacity; (v) prevalence of HIV/AIDS orphans, who drain family energy, cash, and food supplies and reduce productivity rates of those suffering from the disease; (vi) substandard health conditions of resource-poor rural communities, directly related high rates of malnutrition, especially amongst the children and the elderly, and curtailed opportunities for sick individuals to work; and (vii) shortfalls in the ability of personnel to accurately analyze the threats and impacts of climate change in order to inform adaptation interventions.[29]

[29] Human Development Report 2007. National Adaptation Strategy to Climate Change Impacts, a case study of Malawi.

INSTITUTIONAL AND POLICY GAPS

Institutions addressing disaster risk management (DRM) and climate-related activities in Malawi suffer from a lack of inter-sectoral coordination. The planning and management of climate change and disaster management is currently conducted on a sectoral basis, and the involvement of relevant stakeholders, including local community members, is limited. The absence of an integrated planning and management strategy gets in the way of successful adaptation. There are also limited skills and resources at the local level to implement new policies.[30] As Malawi shifts focus from disaster risk management to climate risk reduction and disaster preparedness, the capacity to address the following challenges will largely determine long-term sustainability and success of interventions:

- The development of a national policy, strategy, and action plan for DRM to guide the implementation of DRM priorities and objectives stated in the MDGS (2006-2011);
- The finalization and adoption of an adequate institutional scheme and framework, based on a comprehensive and objective analysis of the existing situation;
- The definition and adoption of an adequate legal framework, including the revision and update of the DPR Act 1991, with a set of legal and regulatory instruments and tools to fully operate the new institutional framework;
- The adoption of appropriate operational mechanisms, including the definition of proposed roles and responsibilities for each DRM phase, and the definition and adoption of appropriate organizational arrangements, operating mechanisms, and related tools; and
- The enhancement of the technical and material capacities of DoDMA, and its organizational and structural capacity, based on a comprehensive and objective situation diagnosis vis-a-vis its overall mandates and responsibilities, considering it as a reform.

Necessary climate risk financing support includes:

- Reviewing and improving the current National DRM funding mechanism, including budgetary arrangements and allocation, based on a clearly defined DRM-financing strategy to address existing shortcomings. These shortcomings include delays in accessing emergency funding by the DoDMA; limited emergency funding options for sectoral ministries; inadequate funding for DoDMA's core activities; lack of adequate funding options and mechanisms for disaster risk reduction, at all levels; and finally lack of adequate budget allocations for District Assemblies.
- Continuing the piloting of risk transfer mechanism for drought at a macro and micro levels.
- Investigating possible extension of the pilot risk transfer tool to other hazards, mainly floods.
- Strengthening financial mechanisms that promote the link between social protection and DRR at the community level and the protection of livelihoods and economic post-disaster recovery.
- Exploring feasibility and advantages of adopting a financial risk transfer regional mechanism, comparable to the CCRIF (Caribbean Catastrophic Risk Insurance Facility).[31]

[30] Ibid.
[31] GFDRR. Economic Vulnerability and Disaster Risk Assessment in Malawi and Mozambique: Measuring Economic Risks of Droughts and Floods.

Ongoing Efforts- At a Glance

Vulnerability Reduction	*Agency or Donor*
Water rights in informal rural economies in the Limpopo and Volta Basins.	CGIAR Challenge Program on Water & Food
Drought Tolerant Maize for Africa (DTMA) Project	CIMMYT, IITA, funded by the Bill & Melinda Gates Foundation
Lessening risks for fishers in climate change hot spots	MRAG Ltd, UK
Climate change and adaptation strategies: a case study of the Mulanje Mountain Forest Reserve and its surroundings.	Mulanje Mountain Conservation Trust, IIED
Mainstreaming Climate Change Adaptation and Mitigation in Sectoral and National Development Plans and Strategies in Malawi.	Bunda College of Agriculture, by the Centre for Agricultural Research and Development (CARD), in conjunction with Christian Aid-Malawi
National Contingency Plan—outlines the Government of Malawi's response to emergency flood and drought situations to prevent and help reduce any potential negative impacts.	Government of Malawi
GFDRR Interventions (examples)	***Agency or Donor***
Economic Vulnerability and Disaster Risk Assessment	World Bank/GFDRR /RMSI (completed in January 2010)

RESEARCH, DATA, AND INFORMATION GAPS

Food security in Malawi is largely determined by the availability of maize—the staple crop. While climate variability and climate change can have major adverse effects on the maize crop, government policies to intensify maize production have also contributed to this problem[32]. Malawians have a long history of adapting to climate variability and dealing with floods and droughts. Traditional coping mechanisms have included shifting homes to higher ground, storing grain in local granaries, hunting small animals, gathering and eating wild fruits and vegetables, sinking boreholes, and using traditional medicines to cure various ailments and diseases. However, the increasing frequency, magnitude, and intensity of these extreme weather events are rendering many of these coping strategies ineffective. Malawi's Initial Communication to the Framework Convention on Climate Change provides a list of ongoing and proposed adaptive measures to manage these changes in the agriculture, water, forestry, fisheries, and wildlife sectors.

[32] Action Aid, 2006. Climate change and smallholder farmers in Malawi: Understanding poor people's experiences in climate change adaptation.

Malawi's status as a developing country dependent mainly on agriculture makes it particularly susceptible to the effects of climate change. Added to this is the fact that like most other developing countries, Malawi does not have adequate monitoring systems for predicting the likelihood of extreme events occurring, or for assessing possible changes in weather patterns, thus making the task of developing short-term response or disaster mitigation strategies extremely difficult. Adaptation strategies are likewise difficult to formulate unless detailed vulnerability and impact assessment studies are undertaken. These challenges are outlined below.

Research Gaps

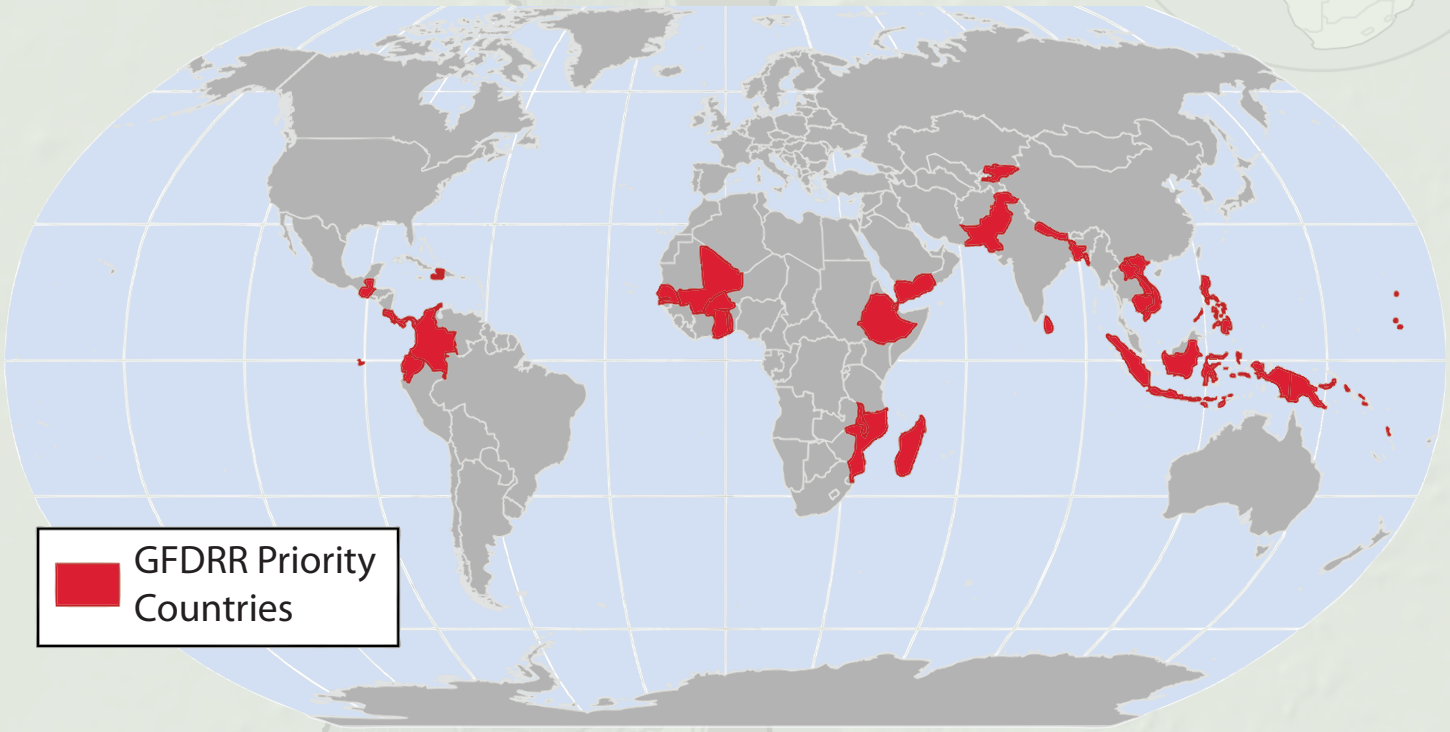
- A better understanding of the differential nature of vulnerability within Malawi's high-risk geographic regions is needed. Analyses of sector impacts must be better complemented by social, economic, and political assessments of vulnerability and resilience.[33] A more holistic analysis of vulnerability and adaptation to extreme weather events is also vital for developing climate-resilient development interventions.[34]
- Research is needed on the costs and options for ensuring adequate water supply for rural communities, especially those dependent on maize production.
- Rampant HIV/AIDS in Malawi will have far-reaching effects on disaster management in Malawi, although exactly how these effects will impact disaster-related institutions is uncertain. HIV/AIDS erodes human capital and leads to high vacancy rates and absenteeism, which will likely have broad implications for organizational capacity to manage climate change adaptation. Enhanced understanding of this cause and effect relationship is essential to ensuring organizations' continued capacity to contribute to promoting climate change adaptation.[35]

Data and Information Gaps

- Securing adequate water supplies to future generations will require the installation of appropriate irrigation infrastructure. Irrigation has contributed to the significant increases in maize production since 2005. However, the limited availability of meteorological information on the upper reaches of key rivers and a general lack of flow gauges prevent the appropriate design of the necessary irrigation infrastructure.

[33] CARE. Making National Adaptation Plans Work for the Poor. Malawi Case Study.
[34] Ibid.
[35] World Bank, 2008. HIV/AIDS, Climate Change and Disaster Management: Challenges for Institutions in Malawi. World Bank Policy Research Working Paper _4634.

This Country Profile *(**http://countryadaptationprofiles.gfdrr.org**) is part of a series of 31 priority country briefs developed by the Global Facility for Disaster Reduction and Recovery (GFDRR) as part of its Disaster Risk Management Plans. The profile synthesizes most relevant data and information for Disaster Risk Reduction and Adaptation to Climate Change and is designed as a quick reference source for development practitioners to better integrate climate resilience in development planning and operations. Sources on climate and climate-related information are linked through the country profile's online dashboard, which is periodically updated to reflect the most recent publicly available climate analysis.*



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