Climate Change and Disaster Risks in Uganda

Climate Change and Disaster Risk Guide

Which climate and disaster Risks affect Uganda?

How affect climate change and disaster risks Uganda?

Jonas Köppel and Marion Künzler

Bread for all

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BREAD FOR ALL

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Picture Front Side

Devastation after a land slide in Bududa District, North Mbale Diocese in Eastern Uganda.

Text

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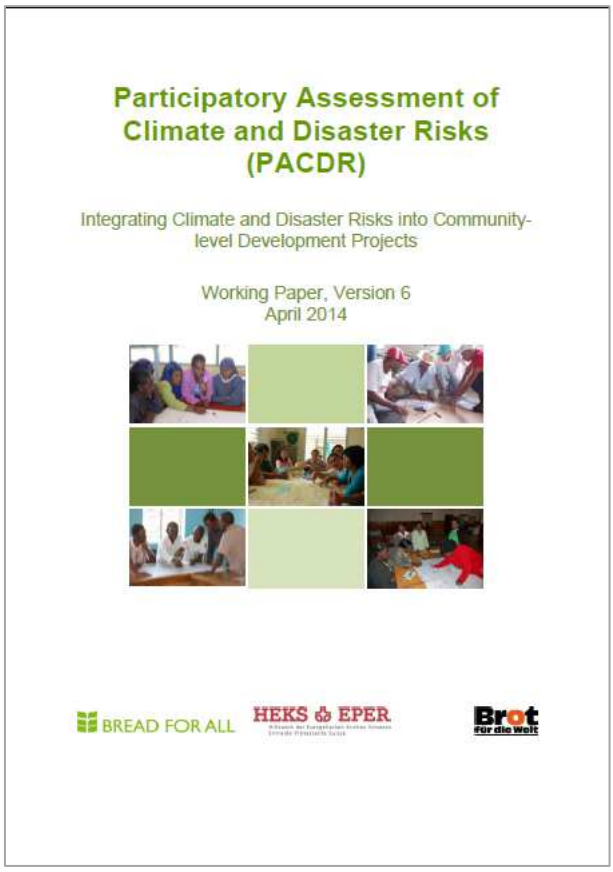
Bread for All is the development organization of the Swiss Protestant Community of Churches. The organization supports 400 development projects and programs in 57 countries in Africa, Asia, and Latin America. In addition, its development policy has the goal of creating fairer international socioeconomic structures, maintaining creation, and bringing peace.

Tearfund is a Christian relief and development organization. Together with Christian partner organizations in countries of the south, Tearfund promotes and strengthens disadvantaged people through education, basic health and income generation.

Contents

1 Introduction

Climate change is one of the largest problems humanity faces today. Communities in Uganda suffer now and in the future from the impacts of this global phenomenon, even though people in Uganda have contributed little to causing climate change.


Participatory Assessment of Climate and Disaster Risks (PACDR)

Integrating Climate and Disaster Risks into Community-level Development Projects

Working Paper, Version 6
April 2014

BREAD FOR ALL HEKS EPER Brot für die Welt

The first step in order to be able to cope with the adverse effects of climate change is to know about climate change and its impacts. Thus, this guide aims at providing basic information on climate change, its causes, and how it affects us. Furthermore, this guide can also be used to analyse the climate context with the *Participatory Assessment of Climate and Disaster Risks (PACDR)* developed by *HEKS*, *Bread for all and Bread for the World*.

An introduction for the terminology on climate change and disaster risk reduction can be found in the PACDR on page 7 which can be downloaded here:

www.breadforall.ch/download_drr_e/PACDR or www.breadforall.ch/download_drr_e

2 Climate Change and Disaster Risks in Uganda

As climate change is a long-term phenomenon, it is not easy to identify. In order to be able to distinguish between “natural” climate variations and man-made, long-term trends of climate change, it is necessary to know what Uganda`s “general” or “normal” climatic conditions are like. On this basis, trends can be identified. When working on climate change in a specific region, it is advisable to find out about local climate conditions there first.

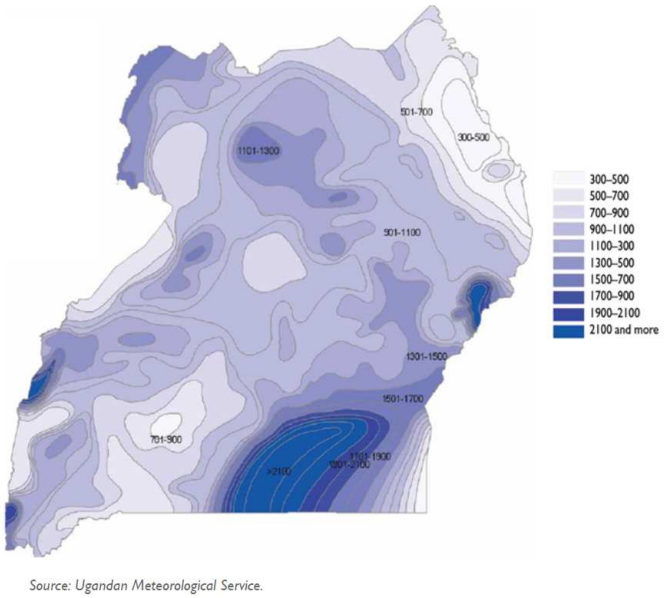
General Climate in Uganda

Uganda is located on the East African plateau and lies almost completely within the Nile basin. Situated along the equator, its climate is mainly tropical. Nevertheless it has diverse climate patterns due to the country’s geographic features such as topography (mountain ranges), prevailing winds, lakes and rivers (Tetra Tech ARD 2013, Hepworth 2010).

Precipitation

Generally, the country has two well-defined rainy seasons (March to May, September to November) and two dry seasons (December to February, June to August), progressively merging into one rainy season as one moves north and eastward. Most of the territory receives an annual rainfall of at least 1000 mm and is, therefore, relatively humid. Precipitation levels vary considerably between regions. Generally, conditions are drier in the western part of the country whereas the northeastern Karamoja region has the driest climate (see Figure 1) (Tetra Tech ARD 2013, Hepworth 2010).

Figure 1: Average annual precipitation in Uganda, in mm/year



Source: Tetra Tech ARD 2013

The regions climate is naturally dynamic with high temporal and spatial rainfall variability. A part of this variability can be explained by large scale oscillations in atmospheric and ocean circulations, such as the El Niño Southern Oscillation (ENSO). During ENSO, sea-surface temperatures of the Pacific ocean rise and tend to lead to more rain, especially during the latter part of the September to November season. Partly due to such phenomenon, extreme events like droughts or floods occur regularly (Tetra Tech ARD 2013, Hepworth 2010).

Temperatures

Although Uganda is situated on the equator, its climate is rather warm than hot. Average temperatures vary little throughout the year but generally by altitude. For instance on Lake Albert, the mean annual maximum temperature is 29°C and the mean annual minimum temperature is 22°C. In Kabale in the southwest, 1,250 m higher, the mean annual maximum temperature is 23°C and the mean annual minimum temperature is 10°C. In Kampala, mean temperatures range between 27°C and 17°C. Generally, average temperatures increase in the south of the country as the elevation decreases towards the Sudanese plain (Hepworth 2010; Kyoheirwe, Kabones and Muhanguzi 2012; McSweeney, New and Lizcano N/A).

Climatic zones

Uganda's climate can be broadly subdivided into

- the highland climate with cool temperatures and moderate rainfall,
- the savanna tropical climate (including the lake basin climate) with moderate annual temperatures high mean annual rainfall and
- the semi-arid climate with relatively high average temperatures and relatively low mean annual rainfall.

2.1 Past Trends of Climate Change and Disaster Risks in Uganda

Climate change is already happening now in Uganda, as well as around the world. Please have a look into the PACDR Tool (www.breadforall.ch/download_drr_e/PACDR or www.breadforall.ch/download_drr_e) for details on global trends, which are a clear prove of the reality of man-made climate change.

Past and present changes help to indicate possible future developments so it makes sense to have a look at climate changes during the last decades.

In general, the east African region is not known for a strong decadal variability of its climate. Whereas there's been a significant increase in average annual temperatures over the last 60 years, developments of precipitation levels are less clear. The overall trend points to a gradual wetting trend while seasonally there's been a decrease of rainfall at the regional scale (Hepworth 2010, Tetra Tech ARD 2013).

Temperature

Analyzing data produced by 16 representative weather stations over the last 60 years (1951-1980 and 1981-2010) a recent study (Tetra Tech ARD 2013) found a significant overall increase of average annual temperatures in Uganda. Whereas the minimum temperature rose by 0.5-1.2 °C, maximum temperatures increased by 0.6-0.9 °C. Other studies recorded even higher overall increases by about 1.3 °C since 1960, an average rate of 0.28 °C per decade. Daily temperature observations showed significantly increasing trends in the frequency of hot[1] days and nights (McSweeney et al. N/A).

Rainfall

In contrast to the raising temperatures, different studies aren't consistent regarding the development of precipitation levels over the last decades. Overall trends seem to point to a small increase in annual precipitation in Uganda. These long-term changes aren't always certain (depending on the source) and they are relatively modest compared to the high inter-annual variations of rainfall (Kyoheirwe et al. 2012, Tetra Tech ARD 2013).

The finding of no strong long-term changes in precipitations in Uganda doesn't exclude shorter-term changes in rainfall and its variability. For instance, researchers recently identified a decline in rainfall during the March to May season at a regional scale, persisting since 1999. There is also evidence for a shift in timing of peak seasons and in the magnitude and intensity of precipitation (Kyoheirwe et al. 2012). The inter-annual variability regarding the onset, cessation, and the length of the rainy seasons is significant but, here again, no overall (long-term) trend, or spatial pattern, has been detected (Tetra Tech ARD 2013).

Extreme events

[1] 'Hot' day or 'hot' night is defined by the temperature exceeded on 10% of days or nights in current climate of that region and season.

In Uganda, rainfall is the most sensitive climate variable that affects social and economic activities. Although there's been no significant overall trend in precipitation levels over the last decades, the population has been increasingly affected by extreme events induced by climate change. In many regions other than the central region (Kampala and Entebbe) there is evidence of an increased frequency of droughts in recent years. In general, the incidences were more pronounced in western and north eastern parts of Uganda (Government of Uganda 2002). The northeastern Karamoja region has been most affected by this phenomenon, experiencing not less than six severe droughts since the late 1980s, according to the International Disaster Database (EM-DAT)[2]. Floods have even been far more frequent, occurring almost every year in the last decades, but generally affecting significantly less people than droughts. Landslides are of raising concern as well, like the 2010 incident resulting in at least 388 deaths, according to EM-DAT.

Other risks

By far the most frequent disaster in Uganda are epidemics. Bacterial and viral infectious diseases occur regularly, leading to dozens to hundreds of deaths every year. Modern epidemics include avian influenza (bird flu), Ebola hemorrhagic fever and malaria. There have also been earthquakes in 1988 and 1994. Indeed, available seismic information indicate that parts of Western and Central Uganda are prone to seismic activity. Other disasters include pests infestations and crop and animal diseases resulting in yield losses and food insecurity (Government of Uganda 2011).

2.2 Projected Trends of Climate Change and Disaster Risks in Uganda

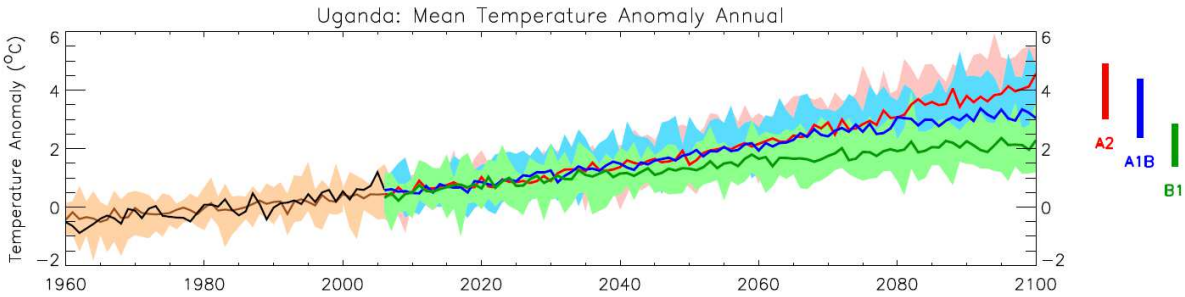
The International Panel on Climate Change (IPCC) consists of a large number of climate scientists from around the world and its task is to model future climate change and its impacts. With the help of very complex computer models which have been "filled" with huge amounts of data from the present and the past, those scientists try to forecast climate change for the next decades. Of course, the future is always uncertain. However, by using different scenarios and by cross-checking the models with the past, fairly good projections for the future can be made.

Temperature

Different models and scenarios from several studies agree on the continuation of the already observed increasing trend in temperatures. Annual average temperatures in Uganda are predicted to increase on the order of 0.8-1.4 °C until 2030 (Tetra Tech ARD 2013), 1.0-3.1 °C until 2060 and, 1.4-4.9 °C for a 2090 horizon (McSweeney et al. N/A) (see Figure 2).

[2] http://emdat.be/disaster_list/index.html

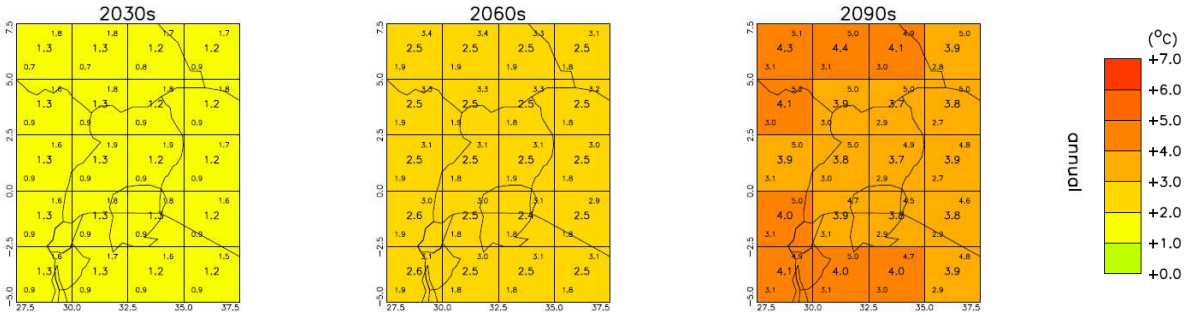
Figure 2 : Annual mean temperature anomaly 1960-2100



Trends in annual and seasonal mean temperature for the recent past and projected future. All values shown are anomalies, relative to the 1970-1999 mean climate. Black curves show the mean of observed data from 1960 to 2006, Brown curves show the median (solid line) and range (shading) of model simulations ofrecent climate across an ensemble of 15 models. Coloured lines from 2006 onwards show the median (solid line) and range (shading) of the ensemble projections of climate under three emissions scenarios. Coloured bars on the right-hand side of the projections summarise the range of mean 2090-2100 climates simulated by the 15 models for each emissions scenario. Source: McSweeney et al. N/A.

Temperatures are going to increase evenly over whole Uganda. There is no clear spatial pattern (see Figure 3). Furthermore, no season stands out as warming significantly faster than others, although some models predict higher warming rates in the coldest season from July to September, by 1.5-5.4 °C.

Figure 3: Spatial patterns of projected change in mean annual temperatures until 2090s



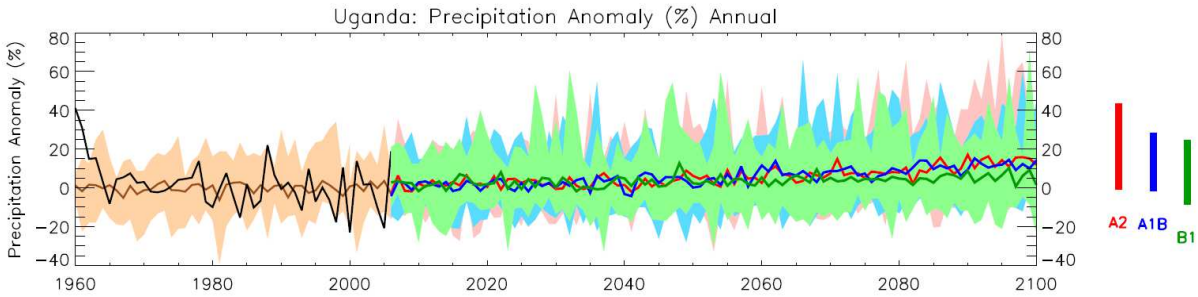
Spatial patterns of projected change in mean annual and seasonal temperature for 10-year periods in the future under the SRES A2 scenario. All values are anomalies relative to the mean climate of 1970-1999. In each grid box, the central value gives the ensemble median and the values in the upper and lower corners give the ensemble maximum and minimum. Source: McSweeney et al. N/A.

Projections indicate significant increases in the frequency of days and nights considered 'hot' in current climate. By the 2060s, 16-43% of days will be 'hot', and 18-73% of days by 2090. 'Hot' nights are projected to increase even faster, occurring on 31-84% of nights by the 2060s and 35-97% of nights by the 2090s. The occurrence of days and nights considered 'cold' in current climate is expected to become exceedingly rare. For a 2090 horizon and under the highest emissions scenarios, they don't occur at all.

Precipitation

Developments of future precipitation levels are less certain than the increasing temperatures. Some studies point to a small, but not significant, increase in annual rainfall totals by the 2030s (Tetra Tech ARD 2013). Others (McSweeney et al. N/A) indicate a significant increase in annual rainfall, with ensemble median changes of +7% to +11% for a 2090 horizon (see Figure 4).

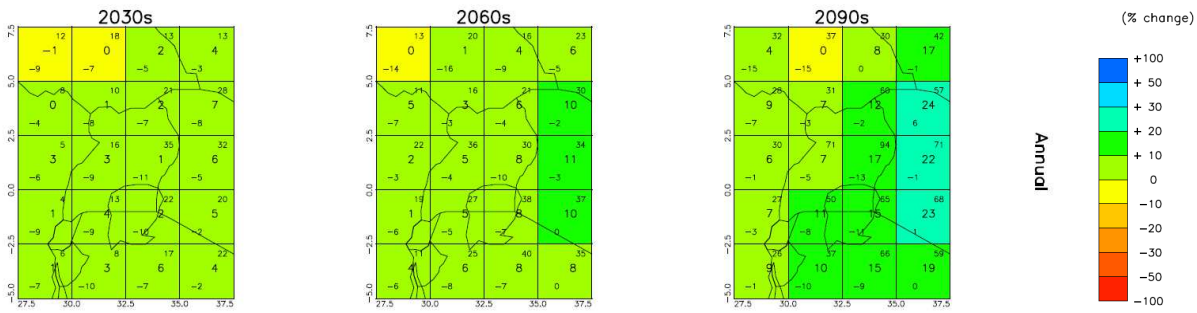
Figure 4 : Annual precipitation anomaly until 1960-2100



Trends in monthly precipitation for the recent past and projected future. All values shown are percentage anomalies, relative to the 1970-1999 mean climate. Source: McSweeney et al. N/A.

Increases in rainfall are predicted to be highest from December to February, which is historically the driest season. This development could lead to a change of seasonality of rainfall in the future, with the March to May rainy season shifting forwards in time or the September to November rains extending into, what's today, the dry season. Spatial patterns (see Figure 5) suggest stronger increases of annual rainfall in the eastern part of Uganda. Although long term projections point in an upward direction, precipitation could decrease for a 2030 horizon, depending on the season and the geographical region.

Figure 5: Spatial patterns of projected change in monthly precipitation until 2090s



Spatial patterns of projected change in monthly precipitation for 10-year periods in the future under the SRES A2 scenario. All values are percentage anomalies relative to the mean climate of 1970-1999. Source: McSweeney et al. N/A.

Extreme events

Projections indicate an increase of the proportion of rain falling in heavy events with the largest increases being seen in the rainy seasons. Rainfall maxima could increase by 27mm in 1-day events and up to 37mm in 5-day events (McSweeney et al. N/A). Extremely wet and extremely dry years will become more frequent, as suggested by some models (Hepworth 2010). In other words, climate variability will increase further and will result in more frequent and intense extreme weather and climate events such as droughts, floods, landslides and heat waves.

2.3 Impacts of Climate Change and Disaster Risks in Uganda

Ongoing changes of Uganda`s climate have had severe adverse impacts on different environmental and social resources and sectors, as they increased extreme weather and climate events. Floods like those which occurred in 1997/98 or 2007 resulted into enormous losses of agricultural land, crops and livestock and lead to infrastructure damage and displacement. In a period of 10 years (from 1991-2000) Uganda experienced seven droughts which caused

severe water shortage, leading to loss of animals, low production of milk, food insecurity, increased food prices and generally negative effects on the economy. The highlands, which were previously malaria-free, are now invaded by the disease, because of the temperatures rising over the last decades. These impacts will increase in the future, as climate change worsens.

Some sectors are particularly vulnerable to these adverse effects of climate change: Health, agriculture, pastoralism, biodiversity and eco systems, and water resources.

Health

Increased temperatures and heavy rainfall can result in shifts in the spread of diseases like malaria or sleeping sickness. In originally malaria-free belts, particularly in the highland ecosystems the populations have no protective immunity which exposes them to high infection rates, morbidity and mortality. Indeed, malaria has been identified as the most serious killer disease. According to the Malaria Control Programme (2002) malaria causes more illness and death in Uganda than any other single disease accounting for about 15-40% of outpatients attendances at health care facilities and about 9-14% of deaths of in-patients. (Government of Uganda 2007)

Floods pose serious pollution problems to sources of drinking water, with the potential danger of outbreaks of cholera and other waterborne diseases such as diarrhoea, typhoid and dysentery. Longer dry seasons could increase the incidence and severity of respiratory diseases. Increased workloads in coping with climate change impacts could cause stress and ill health. Furthermore, extreme weather and climate events can weaken the infrastructure of health services and lead to a decrease in quality of medical care (Government of Uganda 2007, McSweeney et al. N/A).

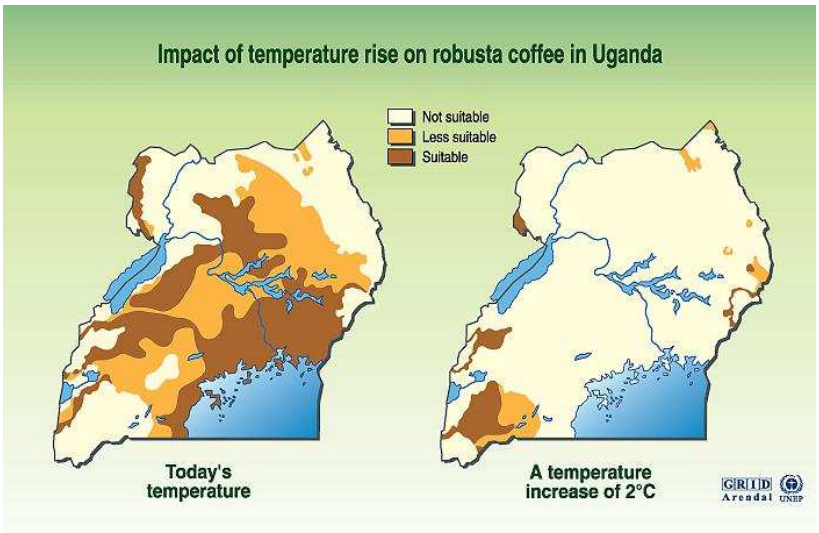
Agriculture and food security

Agriculture is the backbone of the Ugandan economy. It employs over 80% of the workforce and accounts for over 20% of GDP. The main export crops, coffee, tobacco and fish, account for 43% of export earnings. Most of Uganda's agriculture is rain-fed and grows food crops for subsistence and the local market.

Climate change affects agricultural production in a diverse and complex manner. While temperature increases lead to extension of growing period for crops in high-latitudes and an increase in yield at higher than normal CO2 level in colder conditions, it is also associated with increased prevalence and emergency of pests and vectors resulting into escalation of diseases. Changing rainfall patterns and intensities affect soil moisture, crop growth at different stages, post-harvest storage conditions, and especially increases in "dry season" rainfall.

While crops such as cassava, which thus far did not do well in the cold zones of the mountains, are now grown in higher altitudes, others such as coffee are endangered by the rising temperatures induced by climate change. According to UNEP's analysis, in a conservative scenario with a 2 °C rise in temperature, conditions for Robusta coffee will become unsuitable across most Uganda's coffee growing area (see Figure

Figure 6: Impact of temperature rise on robusta coffee in Uganda



Source: Otto Simonett, Potential impacts of global warming, GRID-Geneva, case studies on climatic change, Geneva, 1989.

6). As the nation's leading export commodity, the loss of coffee within 30 to 70 years could lead to the loss of US $266 million in exports, 40% of export revenue and 3% of GDP (Hepworth 2010). Further, this could have implications for other commercial crops that are grown, such as paddy rice and cotton.

But it's not only cash crops that are affected by rising temperatures, increasing rainfall and more frequent extreme events. Food crops like matooke, maize, beans or rice which are essential for Uganda's food security are also vulnerable to adverse effects of climate change, even if not to the same extent. Table 1 summarizes the vulnerability to adverse effects of climate change of the most frequently grown crops in Uganda. Coffee is to be seen as the most important cash crop while maize is the most important subsistence crop.

Furthermore, heavy rains can lead to landslides, land degradation and soil erosion. The latter accounts for over 80% of the annual cost of environmental degradation representing 4-10% of GNP and estimated at about US $625 million per annum (Government of Uganda 2007). The problem is exacerbated by deforestation through increased demand for firewood, charcoal and arable land.

Another key sector in the Ugandan economy and an important source for food is fishery. It is estimated that over 200,000 Ugandans are directly involved in the fishing industry and fish are the second largest export earner, bringing revenue of US$125 million in 2007 (Hepworth 2010, Government of Uganda 2007). Prolonged droughts result in lower water levels in Uganda's lakes which can lead to lower fish yields and, together with poor agricultural production, to severe food shortages.

Table 1: Comparison of the extent of climate related vulnerability by crop

Vulnerability	Coffee*	Matooke	Maize	Beans	Rice	Sorghum	Sweet Potatoes	Cassava
Rising temperature threatens suitability for production	+++	++	++	+	+	+	+	0
Falling soil fertility reduces yields and makes crop more vulnerable to climatic stresses	+++	+++	+++	++	++	++	+	+
Poor moisture retention capacity of soils increases vulnerability to precipitation variability	+++	+++	++	++	++	+	+	+
Pests and diseases increasing with rising temperatures	+++	+++	+	++	++	+	+	-
International prices increasingly volatile as a result of climate change impacts on supply	++	0	++	0	0	0	0	0
High temperatures and unseasonable rain promote rapid spoilage and threaten quality	+++	+++	++	+	0	0	+	+
Rising international concern over carbon footprint may threaten demand for exports	+++	++	0	0	0	0	0	0
Shortages of disease-free planting materials, exacerbated by unreliable precipitation	+++	+++	0	0	0	0	+++	+++
Crop is perishable. Extreme precipitation and flooding make transport more costly & difficult	++	++	+	+	+	+	++	++
Increasing variability of precipitation and extreme events threatens suitability for production	++	++	+++	+++	+++	+	+	+

Key: Relative impact of climate change on various aspects of vulnerability by crop:

+++ Highly Vulnerable
++ Moderately Vulnerable
+ Limited Vulnerability
0 Not Affected

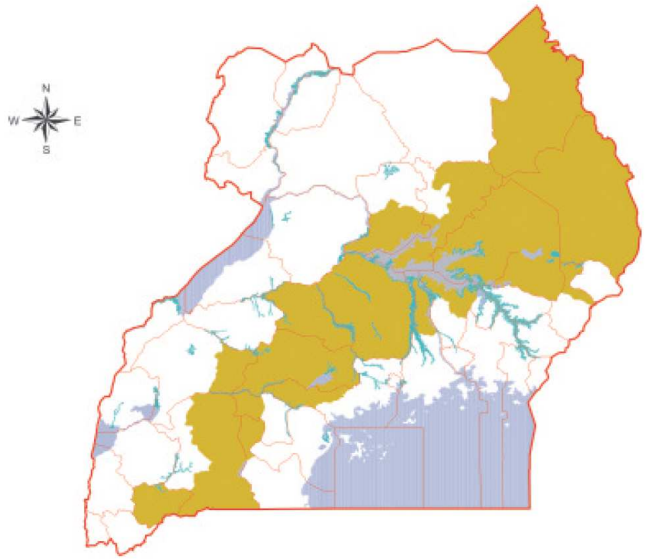
**Note: Threat of rising temperatures is much more acute for Arabica coffee than for Robusta*

Source: Tetra Tech ARD 2013

Pastoralism

The semi-arid areas that form the cattle corridor (see Figure 7) are supplying most of Uganda's livestock and meat products. Stretching from the northeast to the southwest it is a fragile ecosystem, and depends on rainwater for human consumption and production. Prolonged and frequent droughts in these areas have led to loss of animals, poor quality of meat, low production of milk and almost perpetual dependency on food aid (Government of Uganda 2007).

Figure 7: The cattle corridor in Uganda



Source: NAPA 2011.

Although in the longer run, increasing rainfall could increase grazing areas for livestock in the cattle corridor, increased temperatures, seasonal shifts and possible reduced rainfall in the dry season will lead to even scarcer water resources for human and livestock consumption. Participatory research revealed that lack of water accounts for 72% of livestock production issues. For every kg of dry-matter intake, 3 kg of water must be available to the animal. Shortage of water escalates infertility and lowers growth and milk production. But during the dry season, forage for livestock is also scarce and there there's been reported an increase in livestock diseases. According to NAPA research, malnutrition and worm infection accounts for 41% of livestock health issues.

Biodiversity and eco systems

Forest products (timber, poles, rattan, bamboo, food, fodder, medicine, and firewood etc.) and services (biodiversity habitat, moderating of micro climate, shade and wind breaks for enhancing agricultural productivity) play a very important role in the social and economic development of Uganda. Forests are especially pivotal to the rural communities' livelihoods. For example, over 99% of Uganda's rural people use wood or charcoal as fuel. Forests play also an important role in moderating climate, particularly microclimate (Government of Uganda 2007).

Today, deforestation is the main environmental issue confronting Uganda's forests, Savannah woodlands and bush land. Deforestation is caused by a number of factors, including population increase and poor agricultural practices. But climate change is also an issue because the distribution of plants and animals is determined by temperature and moisture patterns. According to Hopkins bioclimatic law, for every three degrees Celsius rise in temperature, there is a northward shift in vegetation of 250km. The disappearance of medicinal plant species has already been reported. This is serious because a large proportion of the rural population depends on direct herbal medicine to treat a wide range of ailments. Also, dry conditions and prolonged droughts frequently lead to outbreaks of fire that degrade forests resulting in serious environmental consequences (Government of Uganda 2007).

Uganda, with a convergence of seven major biogeographic regions, is extremely rich in biodiversity, having over 1,000 bird species (over 11% of the world total). There are at least 345 known mammal species, 165 reptile species, 43 amphibian species, 49 fish species and 4900 known species of higher plants. Climate change induced changes are likely to affect wildlife in various ways. The impacts manifest through a number of extrinsic and intrinsic reactions. In wildlife, extrinsic behavior involves movement to hostile environment in search of food and water. Intrinsic manifestations involve imbalance in physiology leading to phenomena, such as reduced immunity and also hormonal imbalance giving rise to disruption in reproduction. Also, the drought-induced movement contributes to increased tendency of wild animals to hide, thus making the affected protected areas less attractive to tourists (Government of Uganda 2007). According to the National Biodiversity Data Bank (NBDB), Uganda's biodiversity index shows an alarmingly and steadily decreasing trend, reaching roughly 70% of the 1960-level in 2010[3].

Water resources

Uganda has abundant water resources although its distribution is not even, particularly in the semi-arid areas of the country. The rainfall in good years offsets the water distribution prob

lems particularly during the rainy season. Streams, which a large proportion of the population depends upon, tend to dry up during droughts causing serious stress for a large proportion of the rural communities. The scarcity of water in such areas has resulted in movements into neighboring districts in search for pasture and water. These movements have frequently led to ethnic conflicts and disruption of production, affecting the development of these communities. The water scarcity in the dry land areas is likely to worsen with climate change (Government of Uganda 2007).

Although precipitation is projected to increase, additional recharge and run-off may be offset by the grater evaporative losses brought by higher temperatures. In addition, heavy rainfall, leading to floods and landslides, complicates water management and is likely to affect both the availability and the quality of water, which in turn impacts on livelihoods (Hepworth 2010, McSweeney et al. N/A). Prolonged and severe droughts can lead to low water levels in lakes, rivers, underground aquifers and reservoirs, impacting on the hydrology, water supply and the potential for hydropower generation (Government of Uganda 2007).

[3] National Biodiversity Data Bank (NBDB): http://nbdb.mak.ac.ug/index.php/ugandas-biodiversity

3 Uganda's Contribution to Climate Change

Uganda is one of the countries with the lowest greenhouse gas emissions in the world, ranking 196th with per capita carbon dioxide (CO2) emissions of 0.11 tons in 2011. Neighboring countries Kenya and Tanzania had yearly emissions of 0.31 and 0.15 tons respectively in the same year. The United States of America, as an industrialized country and ranking 12th, emitted 17.5 tons of CO2 per person in 2011[4].

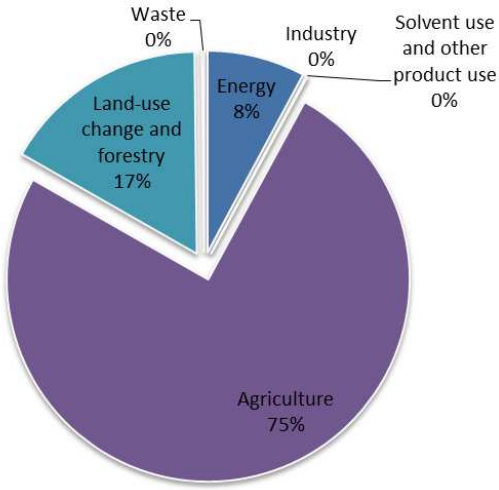
The available data of the greenhouse gas inventory for Uganda date back from 1994 and are therefore out of date. Nevertheless, the First National Communication (2002) showed the structural characteristics of Uganda's economy regarding greenhouse gas emissions. Six sectors were identified: energy, industrial processes, solvent use, agriculture, waste and land-use change and forestry. Following these statistics, agriculture is by far the most important producer of greenhouse gas emissions in Uganda, with roughly 75% of total emissions. Other important amounts result from land-use change and forestry (17%) as well as the energy sector (8%) (see Figure 8). The other listed sectors, notably industrial processes, don't contribute considerably to Uganda's greenhouse gas inventory (see Table 2).

Table 2 : Uganda's greenhouse gas inventory 1994

Sector	Emission Totals Gg CO2 equivalent
Energy	3,905.12
Industry	43.50
Solvent use	-
Agriculture	37,500.51
Land-use change and forestry	8,252.70
Waste	95.05
Total	**49,796.88**

Source: UNFCCC Greenhouse Gas Inventory Data (http://unfccc.int/di/DetailedByParty/Event.do?event=go)

Figure 8 : Greenhouse gas emissions by sector



Source: UNFCCC Greenhouse Gas Inventory Data (http://unfccc.int/di/DetailedByParty/Event.do?event=go)

The **energy sector** is predominantly dependent on wood fuel, which accounts for up to 93% of the country's total energy consumption[5]. The other sources of energy in Uganda are petroleum and hydroelectricity accounting for 5% and 1.5% respectively. Uganda has one of the lowest per capita energy consumption in the world with commercial energy consumption accounting for about 10% of the total energy consumption. The transport sector is the major consumer of fossil fuels. It is also the single most important import commodity responsible for the high-energy import bills. Over 75% of the petroleum fuels are used in the transport sector (Government of Uganda 2002).

Access to electricity in Uganda is limited for most of the population. The Ugandan census of 2002 reported that 7.7% of households used electricity for lighting (37% of urban households and 2.6% of rural households). Until 2002, all of Uganda's electricity came from hydroelec-

[4] Unstats MDG Indicators: http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=751&crid=

[5] Note: Consumption of biomass energy (wood fuel, charcoal, etc.) is not considered in the greenhouse gas inventory.

tricity generated by the Nalubaale Power Station at Owens Dam (built 1949-54) at the outlet of Lake Victoria and the beginning of Victoria Nile. Since 2005, Uganda has rapidly opened three new thermal power plants running on diesel which account for roughly 50% of the country's power supply. Other sources of electric energy are smaller hydroelectric plants on Mubuku River or projects using biomass by-products from the sugar industry[6].

For **industrial processes** and solvents, only three industrial processes were considered due to Uganda's narrow industrial base. These are cement, lime and foam production. From cement, a total of 15.4 Gg of CO2 was emitted while lime and foam emitted 28.0 and 0.1 Gg of CO2 respectively (Government of Uganda 2002).

In **agriculture**, emissions were estimated from livestock, livestock manure, rice production, fertilizer use and burning of agricultural wastes. The vast majority of greenhouse gas emissions resulting from agricultural activities is due to savannah burning (approx. 32,500 Gg CO2-equivalent or 87%) followed by enteric fermentation. Accordingly, methane (CH4) and nitrous oxide (N2O) amount for nearly all of the emitted greenhouse gases in this category, with roughly 66% and 33% respectively. Emissions resulting from fertilizer use were minimal in Uganda in 1994 but might be significantly higher today due to important efforts to modernize the country's agricultural system.

Land-use changes were linked with agricultural cultivation, livestock grazing, and various types of forest clearance and managed forests (sinks and removals) (Government of Uganda 2002). Statistics about deforestation vary greatly because degradation and deforestation are invariably pinned on guesswork. Available information suggests that at the start of the 20th century, both forests and woodlands covered over 50% of the land and now the coverage is about 24% (Government of Uganda 2007).

4 Climate Change and Disaster Risk Management Policy

4.1 Climate Change Policy

International Climate Change Policy – UNFCCC conferences and outcomes:

UNFCCC in 1992: The international political response to climate change began with the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992. The UNFCCC sets out a framework for action aimed at stabilizing atmospheric concentrations of greenhouse gases to avoid "dangerous anthropogenic interference" with the climate system. The Convention, which entered into force on 21 March 1994, now has 195 parties (IISD 2012).

Kyoto Protocol in 1997: In December 1997 in Kyoto in Japan, delegates to the third session of the Conference of the Parties (COP) agreed to a Protocol to the UNFCCC that commits industrialized countries and countries in transition to a market economy to achieve emission reduction targets. These countries, known as Annex I parties under the UNFCCC, agreed to reduce their overall emissions of six greenhouse gases by an average of 5.2% below 1990 levels between 2008-2012 (the first commitment period), with specific targets varying from country to country. The Kyoto Protocol entered into force on 16 February 2005 and now has 193 parties (IISD 2012).

Bali Roadmap in 2007: Negotiations resulted in the adoption of the Bali Action Plan. Parties established a working group with the mandate to focus on key elements of long-term cooperation identified during the Convention Dialogue: mitigation, adaptation, finance, technology and a shared vision for long-term cooperative action. The Bali conference also resulted in

[6] The encyclopedia of earth: Energy profile of Uganda: http://www.eoearth.org/view/article/152538/

agreement on the Bali Roadmap. Based on two negotiating tracks under the Convention and the Protocol, the Roadmap set a deadline for concluding the negotiations in Copenhagen in December 2009 (IISD 2012).

Copenhagen, 2009: Disputes over transparency and processes dominated the Climate Change Conference in Copenhagen, Denmark and hindered the successful completion of the Bali Road Map. Informal negotiations of a group consisting of major economies and representatives of regional and other negotiating groups proposed "The Copenhagen Accord" which was after heavy debating "taken note of" by the plenary. In 2010 over 140 countries indicated support for the Accord in which amongst other topics the temperature limitation to 2°C, fast start finance, long term finance and scaled up, new and additional, predictable and adequate sources of funding are mentioned.

Cancun, 2010: By the end of the conference, parties had finalized the Cancun Agreements. The parties recognized the need for deep cuts in global emissions in order to limit global average temperature rise to 2°C. On finance, parties created the Green Climate Fund (GCF) and recognized the commitment by developed countries to provide US$30 billion of fast-start finance in 2010-2012, and to jointly mobilize US$100 billion per year by 2020 (IISD 2012).

DURBAN, 2011: The Climate Change Conference in Durban, South Africa was ending with outcomes, related to the Durban outcomes, covering a wide range of topics. The most notable results were the establishment of a second commitment period under the Kyoto Protocol, a decision on long-term cooperative action under the Convention and agreement on the operationalization of the GCF. Parties also agreed to launch the new ADP with a mandate "to develop a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties." The ADP is scheduled to complete negotiations by 2015. The outcome should enter into effect from 2020 onwards. (IISD 2012)

Doha, 2012: The Conference produced a package of documents collectively titled The Doha Climate Gateway over objections from Russia and other countries at the session, The documents contained: (1) An eight year extension of the Kyoto Protocol until 2020 limited in scope to only 15% of the global carbon dioxide emissions due to the lack of participation of Canada, Japan, Russia, Belarus, Ukraine, New Zealand and the United States and due to the fact that developing countries like China (the world's largest emitter), India and Uganda are not subject to any emissions reductions under the Kyoto Protocol. (2) Language on loss and damage, formalized for the first time in the conference documents. (3) The conference made little progress towards the funding of the Green Climate Fund [7]

Warsaw 2013:

Officially, the Warsaw Climate Conference concluded successfully (UNFCCC, 2013). However, this is seen much more critically by NGOs and independent observers. The media titles that the conference produced very little agreements (Washington Post) and many ambitious NGOs have been disappointed (e.g. Greenpeace, 2013). Negotiations in Warsaw focused predominantly on the implementation of agreements reached at previous meetings. The meeting adopted a decision that invites parties to initiate or intensify domestic preparations for their country mitigation contributions, and resolves to accelerate the full implementation of the Bali Action Plan and pre-2020 ambition. Parties also adopted a decision establishing the Warsaw international mechanism on loss and damage, and the "Warsaw REDD+ framework" (IISD, 2014). With regard to finance for helping poorer countries cope with climate change, Warsaw was a disappointment: Even though the Green Climate Fund was established as an independent institution and arrangements between the COP and the Green Climate Fund were settled, the developed nations did not keep their promise to set any concrete financial targets. Instead, it was only agreed that developed nations should set "increasing levels" of aid.

[7] http://en.wikipedia.org/wiki/2012_United_Nations_Climate_Change_Conference

The United Nations Climate Change Conference, COP21 will be held in Paris, France in 2015. The conference objective is to achieve a binding and universal agreement on climate, from all the nations of the world, including the biggest emitters of greenhouse gases. In order for the agreement to come into effect in 2020, at the end of the second commitment period of the Kyoto Protocol, subsequent COP meetings will work on finalizing its details.

Uganda‘s Climate Change Policy

Uganda ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1993 and the Kyoto-Protocol in 2005. In response to commitments under Articles 4 and 12 of the UNFCCC it submitted its ‘First National Communication on Climate Change’ in 2002. This comprised a national inventory of greenhouse gas and an assessment of vulnerability and adaption needs together with a set of recommendations. The Departement of Meteorology (DoM) acts as national focal point for the UNFCCC (Hepworth 2010).

At the national and local government levels, climate change is associated with disaster risk reduction and natural resource management with limited discrete planning and budgeting for climate change activities. Hence, Uganda does not have a comprehensive national policy on climate change yet. Nevertheless, there are a number of policies and laws that address issues relating to climate change matters. Furthermore, the establishment of the Climate Change Unit in the Ministry of Water and the Environment provides an institutional mechanism to develop and implement a coherent national response (Hepworth 2010, Kyoheirwe et al. 2012, Tetra Tech ARD 2013).

- Uganda’s National Adaption Program of Action (NAPA) was developed under the leadership of the DoM in 2007. “NAPAs provide a process for Least Developed Countries (LDCs) to identify priority activities that respond to their urgent and immediate needs to adapt to climate change – those for which further delay would increase vulnerability and/or costs at a later stage”[8]. Whilst Uganda’s NAPA is to be seen as a significant milestone, it is imperfect and even full implementation would not address the key vulnerabilities facing the country in a comprehensive way. However, it does identify most of the key issues which Uganda faces under the best estimates of future climate and sets out a group of projects which could potentially benchmark how the country could adapt (Hepworth 2010).
- The National Development Plan (NDP) is Uganda’s overall national framework that guides planning for all development sectors in the country. It also identifies strategies and interventions to address the effects of climate change. It makes a number of environmentally friendly proposals intended to promote sustainable development such as increasing electrification coverage and reducing power losses, increasing access to water for production or overhauling and automation of the meteorological instrumentation to enhance the predictability of the weather and climate parameters (Kyoheirwe et al. 2012).
- The Renewable Energy Policy for Uganda was developed in 2007 with a focus on making renewable energy a substantial part of the national energy consumption. It rooted in the government’s commitment on greenhouse gas emissions reductions under the Kyoto protocol. The overall goal of the policy is to increase the use of modern renewable energy from the current 4% to 61% of the total energy consumption by the year 2017 (Kyoheirwe et al. 2012).
- Uganda’s Forest Policy and the National Policy for the Conservation and Management of Wetland Resources promote the conservation of Uganda’s endangered forests and wetlands in order to sustain their ecological and socio-economic functions

[8] United Nations Framework on Climate Change Website: http://unfccc.int/national_reports/napa/items/2719.php

for the present and future well-being of the people. These policies provide for environmentally sound management of wetlands and forests as an adaption means to conserve them (Kyoheirwe et al. 2012).

Under the Kyoto Protocol, developing countries are encouraged to contribute to emission reductions through trading of emissions rights. The Clean Development Mechanism (CDM) allows mitigation projects in developing countries to earn certified emission reduction (CER) credits, which can be sold to industrialized countries to help them meet their emission targets. This mechanism aims at stimulating sustainable development and emission reductions in developing countries.

Uganda currently has a total of 19 CDM projects, of which 14 are registered and 5 are at validation. The majority are reforestation or afforestation projects followed by hydropower plant projects.[9]

4.2 Disaster Risk Management Policy

Disaster risk management includes "preparedness, mitigation, response, rehabilitation and recovery". It is "multi-disciplinary, and involves the participation of a multitude of partners and stakeholders, ranging from national governments, non-government organizations, International Cooperating Partners, donors, civil society and the private sector" (SADC 2014).

International Disaster Risk Management Policy

The **Hyogo Framework for Action (HFA)** is the key instrument for implementing disaster risk reduction, adopted by the Member States of the United Nations. Its overarching goal is to build resilience of nations and communities to disasters, by achieving substantive reduction of disaster losses by 2015 – in lives, and in the social, economic, and environmental assets of communities and countries.

The HFA offers five areas of priorities for action, guiding principles and practical means for achieving disaster resilience for vulnerable communities in the context of sustainable development. Since the adoption of the HFA, many global, regional, national and local efforts have addressed disaster risk reduction more systematically, much however, remains to be done. The United Nations General Assembly has called for the implementation of HFA, reconfirmed the multi-stakeholder ISDR System and the Global Platform for Disaster Risk Reduction to support and promote it. It is named after the Japanese prefecture of Hyogo, whose main city is Kobé and where the conference was held in 2005.

The General Assembly has encouraged Member States to establish multi-sectorial national platforms to coordinate disaster risk reduction in countries. Many regional bodies have formulated strategies at regional scale for disaster risk reduction. More than 100 Governments have designated official focal points for the follow-up and the implementation of the HFA (March 2007). Some have taken actions to mobilize political commitment and establish centers to promote regional cooperation in disaster risk reduction.

In March 2015, the HFA will come to an end and be replaced by a new post-2015 international framework for disaster risk reduction and resilience. There have been calls for an improved version of the current HFA, with a set of common standards, a comprehensive framework with achievable targets, and a legally-based instrument for disaster risk reduction. Member states have also emphasized the need to tackle disaster risk reduction and climate change adaption when setting the Sustainable Development Goals, particularly in light of an insufficient focus on risk reduction and resilience in the original Millennium Development Goals. For more information visit: http://www.preventionweb.net/posthfa/about

Uganda's Disaster Risk Management Policy

[9] CDM Pipeline overview: http://cdmpipeline.org

Uganda did an important step towards the implementation of the Hyogo Framework for Action by approving the first National Policy for Disaster Preparedness and Management in May 2011. The policy reflects a shift of focus from disaster response to disaster reduction, with the objective of providing a comprehensive disaster management framework to guide programming and actions of key stakeholders in this sector. It is hoped that the policy will go a long way in increasing coordination of programming by actors in disaster management (OCHA 2014).

The overall policy goal is to promote national vulnerability assessment, risk mitigation, disaster prevention, preparedness, effective response and recovery in a manner that integrates disaster risk management with development planning and programming. It provides a basis for the formulation of a comprehensive disaster preparedness and management legal framework and outlines an institutional framework from the national down to the community level (Government of Uganda 2011).

The lead agency is the Department of Disaster Preparedness and Management in the Office of the Prime Minister. It's supposed to coordinate risk reduction, prevention, preparedness, mitigation and response actions in the country in consultation with other line ministries, humanitarian and development partners, local governments and the private sector. On the operational level, the key institution will be the National Emergency Coordination and Operations Centre (NECOC) also established under the Office of the Prime Minister. It is responsible for the effective coordination, early warning and preparedness of the various emergency response institutions. It will among others ascertain training, general support and facilitation in order to implement its mandate (Government of Uganda 2011).

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