THE REPUBLIC OF UGANDA

Ntungamo District

Hazard, Risk and Vulnerability Profile

2016

ACKNOWLEDGEMENT

On behalf of Office of the Prime Minister, I wish to express my sincere appreciation to all of the key stakeholders who provided their valuable inputs and support to this Multi-Hazard, Risk and Vulnerability mapping exercise that led to the production of comprehensive district Hazard, Risk and Vulnerability (HRV) profiles.

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The HRV assessment team was led by Ms. Ahimbisibwe Catherine, Senior Disaster Preparedness Officer supported by Odong Martin, Disaster Management Officer and the team of consultants (GIS/ DRR specialists); Dr. Bernard Barasa, and Mr. Nsiimire Peter, who provided technical support.

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The entire body of stakeholders who in one way or another yielded valuable ideas and time to support the completion of this exercise.

Hon. Hilary O. Onek
Minister for Relief, Disaster Preparedness and Refugees

EXECUTIVE SUMMARY

The multi-hazard vulnerability profile outputs from this assessment was a combination of spatial modeling using socio-ecological spatial layers (i.e. DEM, Slope, Aspect, Flow Accumulation, Land use, vegetation cover, hydrology, soil types and soil moisture content, population, socio-economic, health facilities, accessibility, and meteorological data) and information captured from District Key Informant interviews and sub-county FGDs using a participatory approach. The level of vulnerability was assessed at sub-county participatory engagements and integrated with the spatial modeling in the GIS environment. The methodology included five main procedures i.e.

Preliminary spatial analysis

Hazard prone areas base maps were generated using Spatial Multi-Criteria Analysis (SMCA) was done in a GIS environment (ArcGIS 10.1).

Stakeholder engagements

Stakeholder engagements were carried out in close collaboration with OPM's DRM team and the district disaster management focal persons with the aim of identifying the various hazards ranging from drought, to floods, landslides, human and animal disease, pests, animal attacks, earthquakes, fires, conflicts etc. Stakeholder engagements were done through Focus Group Discussions (FGDs) and key informant interviews guided by checklist tools (Appendix I). At district level Key Informants included: District Agricultural Officer, Senior District Environment Officer and District Statistician while at sub-county level Key informants included: Sub-county and parish chiefs, community Development mobilizers and health workers.

FGDs were carried out in four purposively selected sub-counties that were ranked with highest vulnerability. FGDs comprising of an average of 12 respondents (crop farmers, local leaders, nursing officers, police officers and cattle keepers) were conducted at Itojo, Ihunga, Ngoma and Kayonza Sub-counties. Each Parish of the selected Sub-counties was represented by at least one participant and the selection of participants was engendered. FGDs were conducted with utmost consideration to the various gender categories (women, men) with respect to age groups since hazards affect both men and women though in different perspectives irrespective of age.

Participatory GIS

Using Participatory GIS (PGIS), local communities were involved in identifying specific hazards prone areas on the Hazard base maps. This was done during the FGDs and participants were requested through a participatory process to develop a community hazard profile map.

Geo-referencing and ground-truthing

The identified hazard hotspots in the community profile maps were ground-truthed and geo-referenced using a handheld Spectra precision Global Positioning System (GPS) unit, model: Mobile Mapper 20 set in WGS 1984 Datum. The entities captured included: hazard location, (Sub-county and parish), extent of the hazard, height above sea level, slope position, topography, neighboring land use among others. Hazard hot spots, potential and susceptible areas will be classified using a participatory approach on a scale of "not reported/ not prone", "low", "medium" and "high".

Data analysis and integration

Data analysis and spatial modeling was done by integrating spatial layers and non-spatial attribute captured from FGDs and KIIs to generate final HRV maps at Sub-county level.

Data verification and validation

In collaboration with OPM, a five days regional data verification and validation workshop was organized by UNDP in Mbarara Municipality as a central place within the region. This involved key district DDMC focal persons for the purpose of creating local/district ownership of the profiles.

Multi-hazards experienced in Ntungamo district were classified as:

- Geomorphological or Geological hazards including landslides, rock falls, soil erosion and earth quakes.
- Climatological or Meteorological hazards including floods, drought, hailstorms, strong winds and Lightning
- Ecological or Biological hazards including crop pests and diseases, livestock pests and diseases, human disease outbreaks, vermin and wildlife animal attacks and invasive species.
- Human induced or Technological hazards including bush fires, road accidents land conflicts.

General findings from the participatory assessment indicated that Ntungamo district has over the past two decades increasingly experienced hazards including landslides, rock falls, soil erosion, floods, drought, hailstorms, strong winds, Lightning, crop pests and diseases, livestock pests and diseases, human disease outbreaks, vermin, wildlife animal attacks, invasive species, bush fires, water accidents and land conflicts putting livelihoods at increased risk. Drought and floods were identified as most serious problems in Ntungamo district with almost all sub-counties being vulnerable to the hazards. This could be due to its location in the cattle corridor which is associated with prominent dry spells and droughts, but also the area is relatively flat with slope percentage rise (0-2) which is very prone to flooding in case of heavy rains.

The limited adaptive capacity (and or/resilience) and high sensitivity of households and communities in the district increase their vulnerability to hazard exposure necessitating urgent external support. To reduce vulnerability at community, local government and national levels should be a threefold effort hinged on:

- Reducing the impact of the hazard where possible through mitigation, prediction, early warning and preparedness;
- Building capacities to withstand and cope with the hazards and risks;
- Tackling the root causes of the vulnerability such as poverty, poor governance, discrimination, inequality and inadequate access to resources and livelihood opportunities.

The following were recommended policy actions targeting vulnerability reduction:

- The government should improve enforcement of policies aimed at enhancing sustainable environmental health.
- The government through MAAIF should review the animal diseases control act because of low penalties given to defaulters.

- The government should establish systems to motivate support of political leaders toward government initiatives and programmes aimed at disaster risk reduction.
- The government should increase awareness campaigns aimed at sensitizing farmers/ communities on disaster risk reduction initiatives and practices.
- The government should revive disaster committees at district level and ensure funding of disaster and environmental related activities.
- The government through UNRA and the District authority should fund periodic maintenance of feeder roads to reduce on traffic accidents.
- The government through MAAIF and the District Production Office should promote drought and disease resistant crop seeds.
- The government through relevant ministries coordinated by OPM should increase importation of Lightning conductors and also reduce taxes on their importation.
- The government through OPM and Meteorology Authority should support establishment of disaster early warning systems.
- The government through MWE increase funding and staff to monitor wetland degradation and non-genuine agro-inputs.
- The government through OPM should improve communication between the disaster department and local communities.
- The government through MWE should promote Tree planting along road reserves.
- The government through MAAIF should fund and recruit extension workers at sub-county level and also provide staff with necessary logistics.

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BBW	Banana Bacterial Wilt
DDMC	District Disaster Management Committee
DEM	Digital Elevation Model
DLG	District Local Government
DRM	Disaster Risk Management
DWD	Directorate of Water Development
DWRM	Directorate of Water Resources Management
ENSO	El Niño Southern Oscillation
FGD	Focus Group Discussion
GIS	Geographical Information Systems
HRV	Hazard Risk Vulnerability
KII	Key Interview Informant
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
MWE	Ministry of Water and Environment
NCCP	National Climate Change Policy
OPM	Office of the Prime Minister
PGIS	Participatory GIS
SMCA	Spatial Multi-criteria Analysis
STRM	Shuttle Radar Topography Mission
UBOS	Uganda Bureau of Statistics
UNDP	United Nations Development Program
UNRA	Uganda National Roads Authority
UTM	Universal Transverse Mercator
WGS	World Geodetic System

DEFINITION OF KEY TERMS

Climate change: Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer).

Drought: The phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems.

El Niño: El Niño, in its original sense, is warm water current that periodically flows along the coast of Ecuador and Peru, disrupting the local fishery. This oceanic event is associated with a fluctuation of the inter tropical surface pressure pattern and circulation in the Indian and Pacific Oceans, called the Southern Oscillation. This coupled atmosphere-ocean phenomenon is collectively known as El Niño Southern Oscillation, or ENSO. During an El Niño event, the prevailing trade winds weaken and the equatorial countercurrent strengthens, causing warm surface waters in the Indonesian area to flow eastward to overlie the cold waters of the Peru Current. This event has great impact on the wind, sea surface temperature, and precipitation patterns in the tropical Pacific. It has climatic effects throughout the Pacific region and in many other parts of the world. The opposite of an El Niño event is called La Niña.

Flood: An overflowing of a large amount of water beyond its normal confines.

Food insecurity: A situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life. It may be caused by the unavailability of food, insufficient purchasing power, inappropriate distribution, or inadequate use of food at the household level. Food insecurity may be chronic, seasonal, or transitory.

Impact: Consequences of climate change on natural and human systems.

Risk: The result of the interaction of physically defined hazards with the properties of the exposed systems i.e., their sensitivity or vulnerability.

Susceptibility: The degree to which a system is vulnerable to, or unable to cope with, adverse effects of climate change, including climate variability and extremes.

Semi-arid: Ecosystems that have more than 250 mm precipitation per year but are not highly productive; usually classified as rangelands.

Vulnerability: The degree of loss to a given element at risk or set of elements at risk resulting from the occurrence of a natural phenomenon of a given magnitude and expressed on a scale from 0 (no damage) to 1 (total damage)" (UNDRO, 1991) or it can be understood as the conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of community to the impact of hazards "(UN-ISDR 2009.)

Also Vulnerability can be referred to as the potential to suffer harm or loss, related to the capacity to anticipate a hazard, cope with it, resist it and recover from its impact. Both vulnerability and its antithesis, resilience, are determined by physical, environmental, social, economic, political, cultural and institutional factors" (J.Birkmann, 2006)

Hazard: A physically defined source of potential harm, or a situation with a potential for causing harm, in terms of human injury; damage to health, property, the environment, and other things of value; or some combination of these (UNISDR, 2009).

INTRODUCTION

1.1 Background

Uganda has over the past years experienced frequent disasters that range from drought, to floods, landslides, human and animal diseases, pests, animal attacks, earthquakes, fires, conflicts and other hazards which in many instances resulted in deaths, property damage and losses of livelihood. With the increasing negative effects of hazards that accompany population growth, development and climate change, public awareness and pro-active engagement of the whole spectrum of stakeholders in disaster risk reduction, are becoming critical.

The Government of Uganda is Shifting the disaster management paradigm from the traditional emergency response focus towards one of prevention and preparedness. Contributing to the evidence base for Disaster and Climate Risk Reduction action, the Government of Uganda is compiling a National Risk Atlas of hazard, risk and vulnerability conditions in the country to encourage risk mainstreaming of disaster and climate risk management in development planning and contingency planning at national and local levels.

Since 2013, UNDP has been supporting the Office of the Prime Minister to develop District Hazard Risk and Vulnerability profiles in the sub-regions of Rwenzori, Karamoja, Teso, Lango, Acholi and West Nile covering 42 districts. During the above exercise, local government officials and community members have actively participated in data collection and analysis. The data collected was used to generate hazard risk and vulnerability maps and profiles. Validation workshops were held in close collaboration with ministries, district local government (DLG), development partners, agencies and academic/research institutions. The developed maps show the geographical distribution of hazards and vulnerabilities up to sub-county level of each district. The analytical approach to identify risk and vulnerability to hazards in the pilot sub-regions visited of Rwenzori and Teso was improved in subsequent sub-regions.

This final draft report details methodological approach for HRV profiling and mapping for Ntungamo district in Southwestern Uganda.

1.2 Objectives of the study

The following main and specific objectives of the study were indicated:

1.2.1 Main objective

The main objective of the study was to develop Multi-hazard, Risk and Vulnerability Profile for Ntungamo District, Southwestern Uganda.

1.2.3 Specific Objectives

In fulfilling the above mentioned main objective the following are specific objectives as expected:

i. Collect and analyze field data generated using GIS in close collaboration and coordination with OPM.

ii. Develop District specific multi-hazard risk and Vulnerability profile using a standard methodology.

iii. Preserve the spatial data to enable use of the maps for future information.

iv. Produce age and sex disaggregated data in the HRV maps.

1.3 Scope of Work

Through UNDP's Project: "Strengthening Capacities for Disaster Risk Management and Resilience Building" the scope of work entailed following:

i. Collection of field data using GIS in close collaboration and coordination with OPM in Ntungamo district and quantify them through a participatory approach on a scale of "not reported/ not prone", "low", "medium" and "high".

ii. Analysis of field data and review the quality of each hazard map which should be accompanied by a narrative that lists relevant events of their occurrence. Implications of hazards in terms of their effects on stakeholders with the vulnerability analysis summarizing the distribution of hazards in the district and exposure to multi-hazards in sub-counties.

iii. Compilation of the entire district multi-hazard, risk and vulnerability HRV Profiles in the time frame provided.

iv. Generating complete HRV profiles and maps and developing a database for all the GIS data showing disaggregated hazard risk and vulnerability profiles to OPM and UNDP.

1.4 Justification

The government recognizes climate change as a big problem in Uganda. The draft National Climate Change Policy (NCCP) notes that the average temperature in semi-arid climates is rising and that there has been an average temperature increase of 0.28°C per decade in the country between 1960 and 2010. It also notes that rainfall patterns are changing with floods and landslides on the rise and are increasing in intensity, while droughts are increasing, and now significantly affect water resources, and agriculture (MWE, 2012). The National Policy for Disaster Preparedness and Management (Section 4.1.1) requires the Office of the Prime Minister to "Carry out vulnerability assessment, hazard and risk mapping of the whole country and update the data annually". UNDP's DRM project 2015 Annual Work Plan; Activity 4.1 is "Conduct national hazard, risk and vulnerability (HRV) assessment including sex and age disaggregated data and preparation of district profiles."

1.5 Structure of the Report

This Report is organized into four sections: Section 1 provides Introduction on the assignment. Section 2 elaborates on the overview of Ntungamo district. Section 3 focuses on the methodology employed. Section 4 elaborates the Multi-hazard, Risks and Vulnerability profile and Coping strategies for Ntungamo district. Section 5 describes Conclusions and policy related recommendations.

OVERVIEW OF NTUNGAMO DISTRICT

2.1 Location

Ntungamo is located in southwestern Uganda; between latitudes 0° 35' and 1° 15'south and longitudes 30° 05'East. It borders with Kabale District in the south, Rukungiri District in the west, Shema and Mitooma districts in the north, Mbarara District in the northeast, Isingiro district in the east, the Republic of Tanzania and Rwanda in the south east. The district has 15 sub-counties, 3 town councils and 1 municipality with 3 divisions. These include; Bwongyera, Ihunga, Kibatsi, Nyabihoko, Itojo, Ntungamo, Nyakyera, Ruhaama, Rukoni East, Rukoni West, Rweikiniro, Kayonza, Ngoma, Rubaare and Rugarama sub-counties. The town councils include; Rwashamaire, Kitwe and Rubaare. The divisions in the municipality are; Central, Eastern and Western (Figure 1).

Table 1: Administrative Units in Ntungamo District

DISTRICT	COUNTIES	SUB-COUNTIES/ DIVISIONS	NO. OF PARISHES/ WARDS	NO. OF VILLAGES
NTUNGAMO	Ruhaama	Rweikiniro	5	50
		Ruhaama	7	58
		Rukoni East	5	33
		Rukoni West	2	25
		Nyakyera	7	65
		Itojo	4	45
		Kitwe TC	6	24
		Ntungamo	7	51
TOTAL	**1**	**8**	**43**	**351**
	Ntungamo Municipality	Eastern	2	9
		Western	2	9
		Central	2	8
TOTAL	**1**	**3**	**6**	**26**
	Rushenyi	Rubaare	6	51
		Rugarama	6	74
		Kayonza	6	67
		Ngoma	7	59
		Rubaare TC	4	16
TOTAL	**1**	**5**	**29**	**267**
	Kajara	Nyabihoko	6	50
		Ihunga	5	78
		Bwongyera	8	98
		Kibatsi	5	62
		Rwashamaire TC	4	14
	1	5	28	302
	GRAND TOTAL	**21**	**106**	**946**

Source: Ntungamo District Planning Unit (2015)

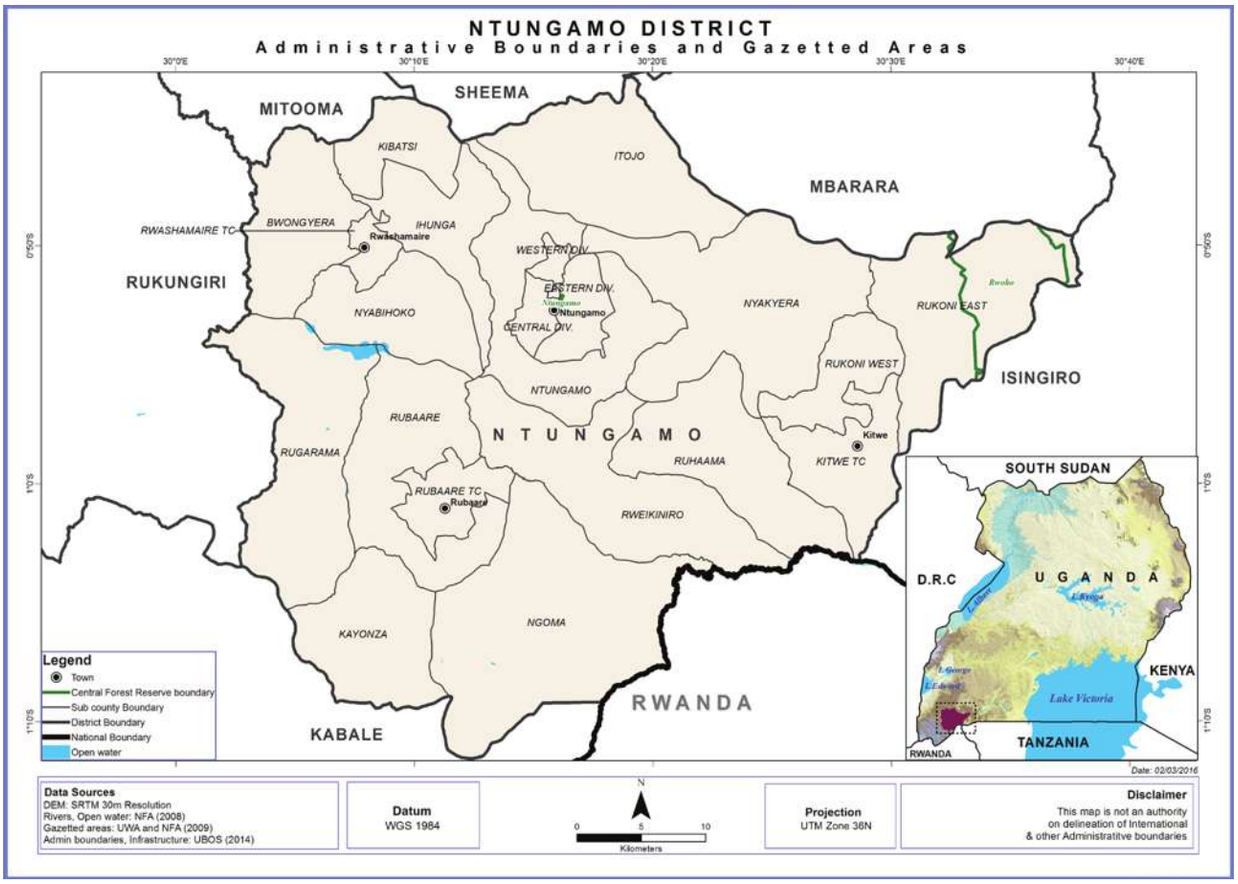


Figure 1: Administrative Boundaries and Gazetted Areas, Ntungamo District

2.1.1 Geomorphology

The district forms part of the plateau whereby the physiographic area is characterized by highlands, flatlands and valleys with underlying impervious rocks. The District is deeply incised in some areas within the rift ward drainage. The rise from the Central Region to the Western parts represents a long and continued deformation of the plateau by warping. This area has been dissected by rejuvenated drainage on gently undulating surface (Figure 2).

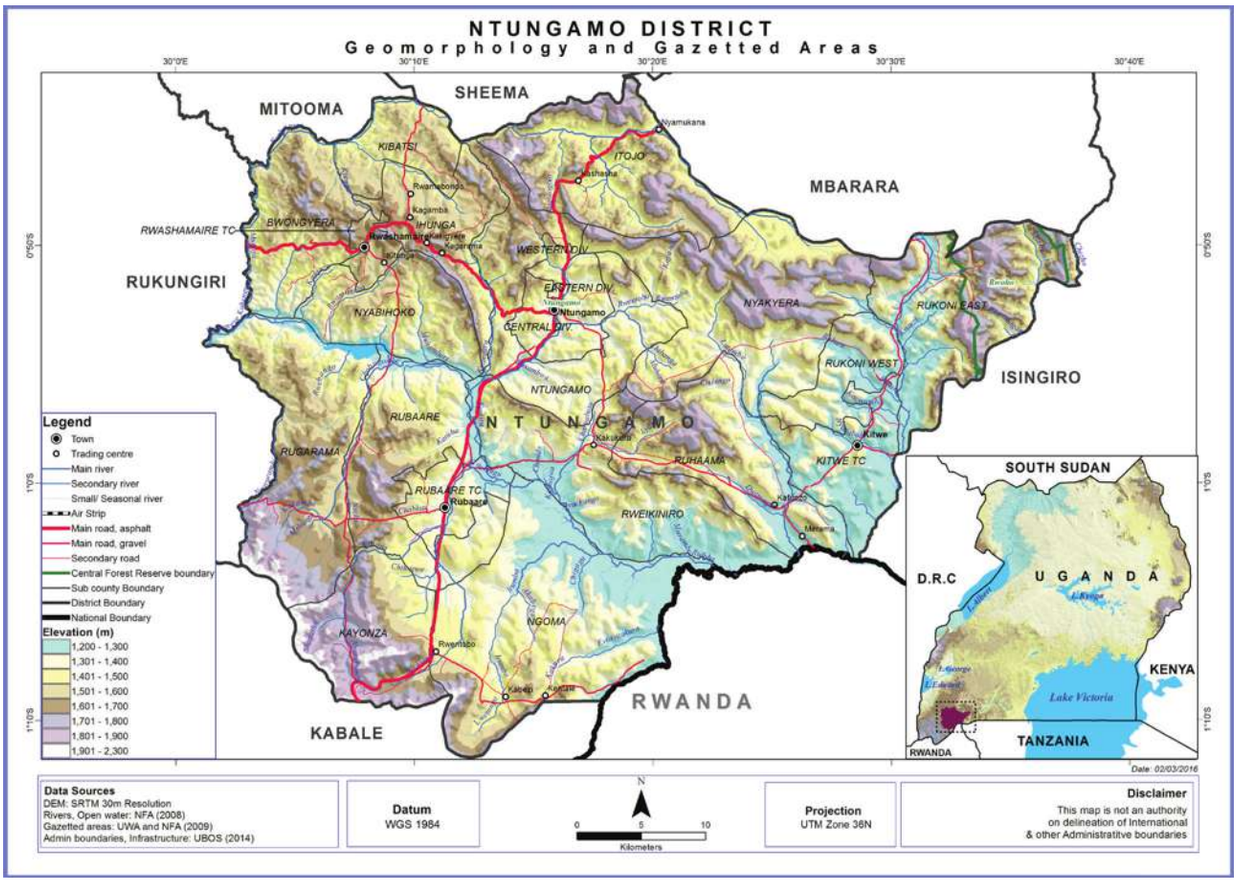


Figure 2: Geomorphology, Ntungamo District

2.1.2 Geology and Soils

Ntungamo soils are varied in nature and are influenced by a number of factors such as parent rock, age of formation and climate especially the amount of moisture and its fluctuations during the process of weathering. These soils belong to Karagwe-Ankolean system. They are indeed very old and are in their last stages of development with very little mineral reserves left. Their productivity, therefore, depends on the nutrient recycling propagated by the vegetation cover and its rooting system and are generally classified as soils of low to medium productivity; supporting few perennial crops like coffee, bananas and other annual crops where they are low in productivity. The major activity is pastoralism predominated in Ngoma Sub-county. Dominant soil types are reddish clay loams, shallow, dark-brown, sandy loams, yellowish red clay loams, podsolised black sandy loams, stoney loams and sandy to plastic clays which are hydromorphic, derived from the weathering of KA phyllites, Karagwe Ankolean schist's, sand stones and quartzite, granites and hydromorphic/alluvial soils in areas under permanent water logged or impeded drainage conditions (Figure 3).

The district is endowed with a wide variety of soil types. There are five main soil types as indicated in the table below however, soil types rarely correspond with sub-county boundaries hence one sub-county often has several different soil types.

Table 2: Soil Types, Location and their Suitability

Soil type	Suitability	Location
Dark brown sandy loams over dark grey clays	Bananas, coffee, beans, maize, sorghum, sweet potato, finger millet	Ngoma, Rweikiniro, Rukoni, and Ruhaama(those sub- counties bordering Rwanda)
Yellowish red gravely clay loams	Bananas, coffee, beans, maize, sorghum, sweet potato, finger millet	Ngoma, Rubaare, Ntungamo, Kayonza, Nyabihoko and Rweikiniro
Red sandy clay loams	Maize, Bananas, Sorghum, Coffee, sweet potato, finger millet	Kibatsi, Ihunga, Nyabihoko, Bwongyera, Rugarama and Ntungamo
Shallow dark brown or black sandy loams (often with many stones)	Banana, coffee, maize, sweet potato, finger millet	Bwongyera, Rugarama, Kayonza, Ngoma, Nyabihoko and Rweikiniro
Reddish brown clay loams	Banana, coffee, maize, sweet potato, beans	Ruhaama, Rweikiniro, Nyabihoko, Rubaare, Rugarama, Kayonza and Nyakyera.

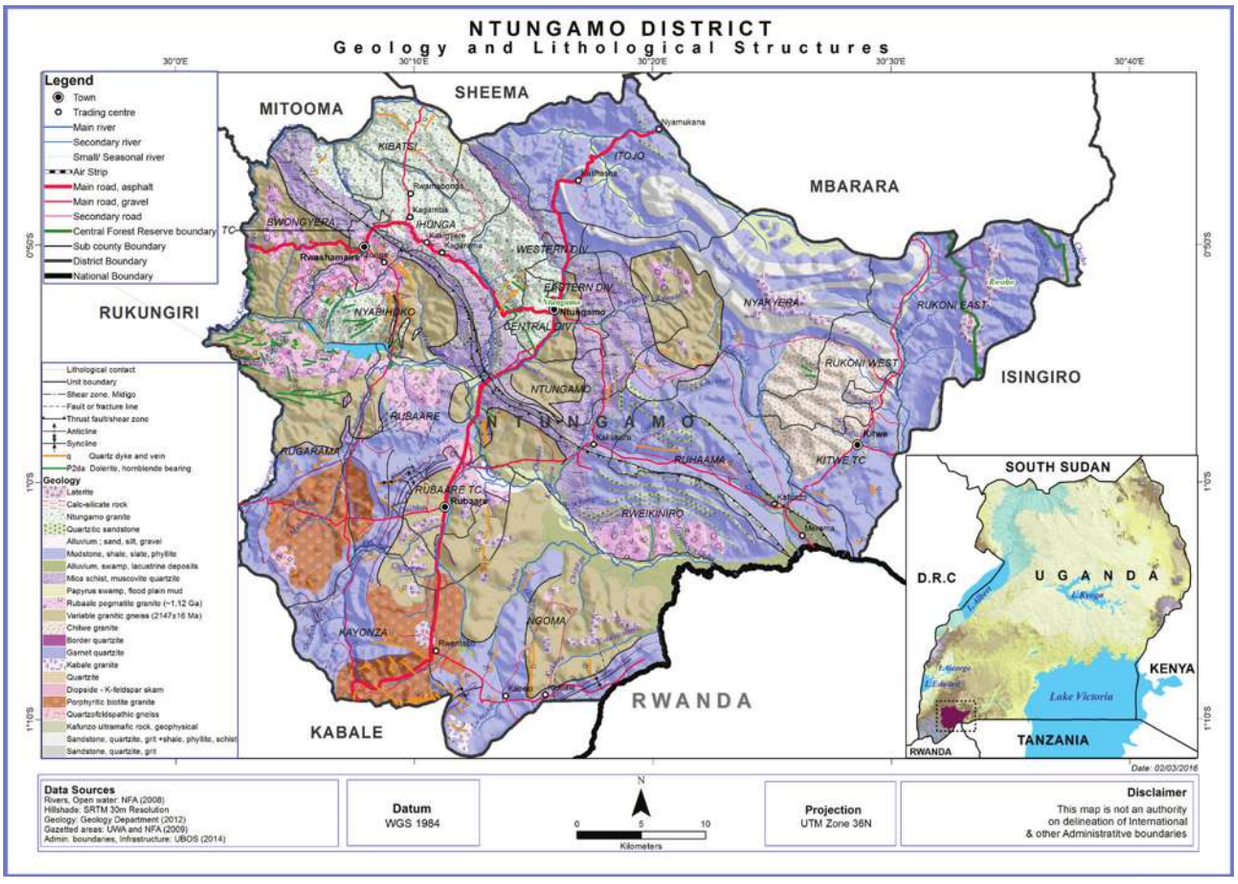


Figure 3: Geology and Lithological Structures, Ntungamo District

2.1.3 Vegetation and Land use Stratification

The vegetation in Ntungamo District can be broadly classified into five types namely grassland Savannah, Wood Savannah, Moist Acacia Savannah, Swamps and planted/cultivated vegetation. The most dominant of these is grassland savannah used for livestock grazing. Wooded savannah mainly in Rukoni, Ruhaama, Rweikiniro and Ngoma sub-counties is disappearing at a high rate due to charcoal burning, overgrazing and wetland conversion. Cultivated vegetation includes bananas, coffee, fruit trees, cassava, eucalyptus and pine (Figure 4).

Ntungamo district has 16 (sixteen) different types of vegetation. However, these can be more simply categorized as 5 (five) main types. The table blow shows the five main types and area.

Table 3: Vegetation Type and their Characteristics by Location

Grassland savannah	**Scattered shrubs that range from 2-5m in height, grasslands with trees of open canopy that range in height from 4-12 meters.**	**Rubaare, Ntungamo, Bwongyera, Ihunga ,Rugarama, Ngoma, Rweikiniro, Ruhaama, Rukoni, and Nyakyera**
Wooded Savannah	Woody species can reach a height of 6m, interspaced with grasslands.	Rukoni, Ngoma, Ruhaama, Rweikiniro and Kayonza
Moist Acacia Savanna	A moderate cover of Acacia which grows to a height ranging from 5-12m with underlying grasses reaching a height of 1-2 meters.	
Swamps	Vegetation reaches a height of 4m, rich in floral diversity inc. fresh water emergent reed swamps dominated by a single reed species	Kibatsi, Rubaare, Itojo, Nyabihoko, Nyakyera, Rweikiniro and Rukoni
Cultivated vegetation	Includes bananas, coffee, fruit trees and cassava	All sub counties

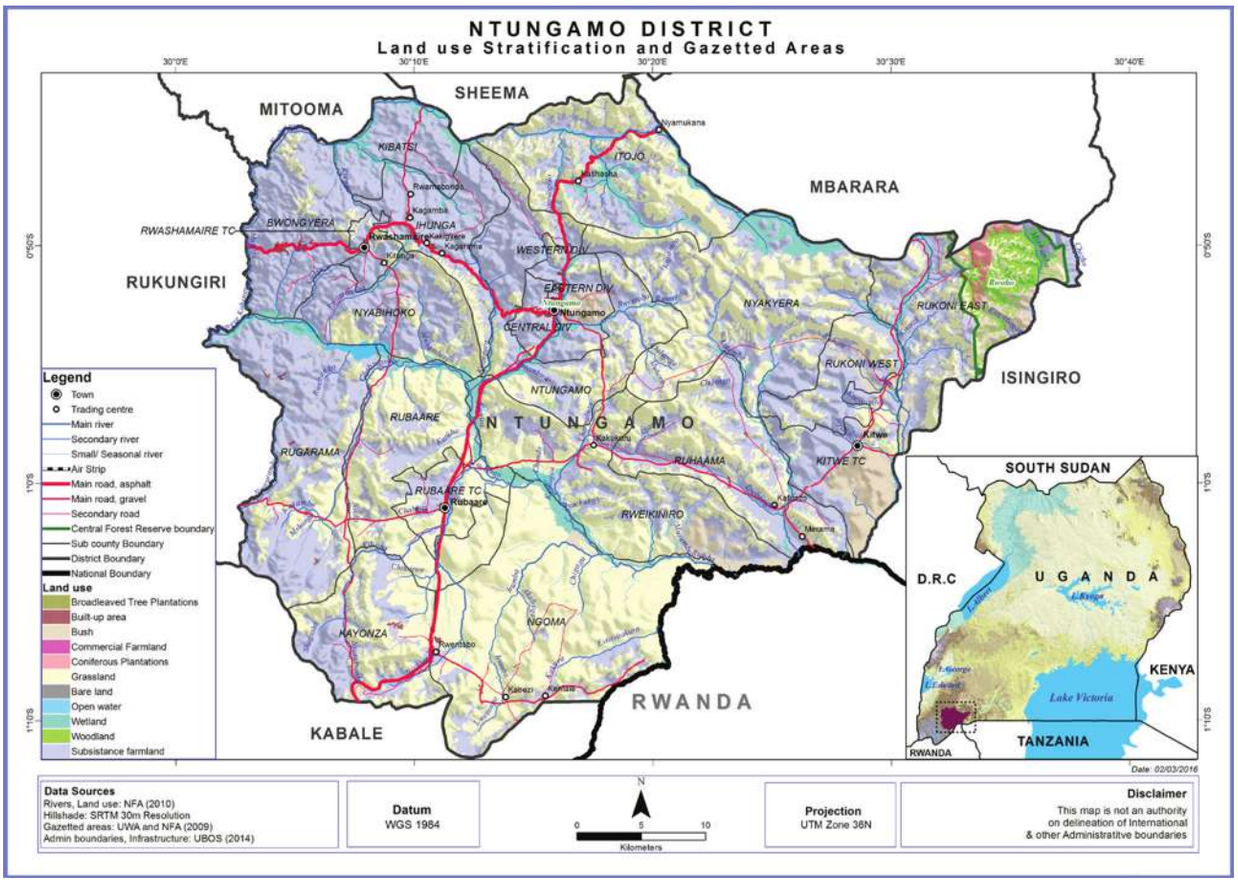


Figure 4: Land Use Stratification, Ntungamo District

2.1.4 Temperature and Humidity

The district experiences a mean annual temperature of 26°c and mean annual minimum of 14.5°c. High temperatures are recorded in the months of January – February and June- August which correspond to dry spells.

The relative humidity ranges from 93% - 85% in the morning and decreases to 60%-45% in the afternoon depending on the time of the year and other weather conditions occurring at that particular time. There is an average of 5-7 hours of sunshine daily. Maximum hours occur in June reaching 7 hours that in turn induces high evaporation. Relative humidity ranges between 80 - 90% in the morning and decreases to between 61- 66% percent in the afternoons during the months of January and May.

2.1.5 Wind

The long-term wind speed records from the East African Meteorological Department (1975) indicate average annual wind speeds of 3 knots and 5 knots at 0600 hours and 1200 hours, for Ntungamo. The wind speed values indicated, therefore, represent conditions of moderate to strong or turbulent conditions. The average number of calms experienced in the area, are indicated to be experienced for 99days at 0600 hours, and 27 days at 1200 hours, respectively, at Ntungamo. The general conclusion from these climatic figures is that for most of the year, Ntungamo experiences moderate to strong and gusty winds, increasing in the afternoon.

2.1.6 Rainfall

Ntungamo district lies in the Ankole-South Uganda Climatic Zone. The rainfall received is mainly convectional and averages about 900mm per annum. There are two rainfall regimes which are associated with the equatorial trough; one season begins in March to May and the other in August to November which is the largest. Two dry seasons occur, with a pronounced one in June-July and a less severe one and often interrupted by scattered showers between December and February. However, as evidenced from the table below; rainfall levels have generally decreased since 2002; a pattern that is attributed to increasing environmental degradation. The trend has significant implications for current farming practices undertaken in Ntungamo district.

Ntungamo is located in the semi-arid stretch of the Ankole- Masaka dry corridor. This belt experiences a bimodal pattern of rainfall. However in recent period, Ntungamo District experienced severe drought, and the rainfall pattern has been complicated as it has received a unimodal type of rainfall that ranges from on average 450 - 750 mm (Figure 5). Two dry seasons occur with the more pronounced ones in July-September and December-February.

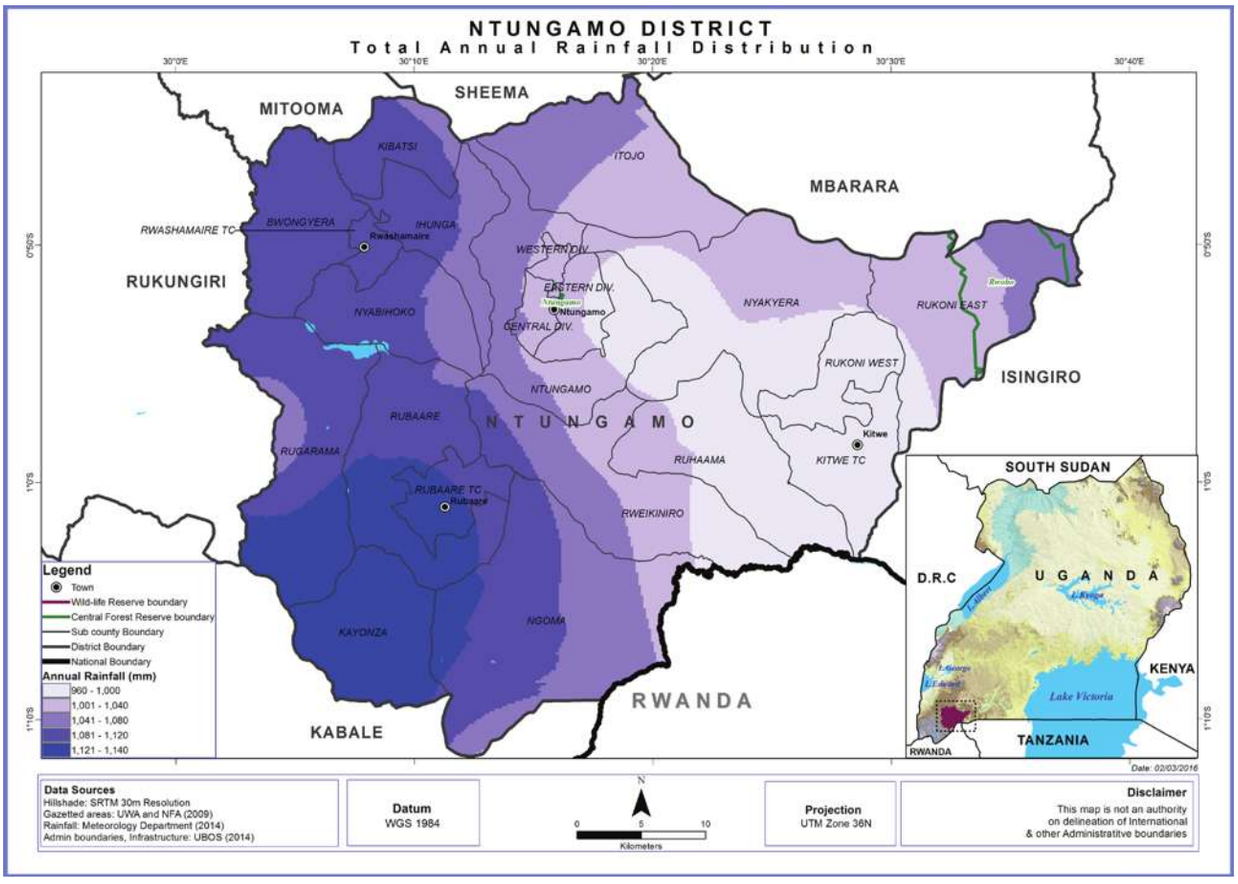


Figure 5: Total Annual Rainfall Distribution, Ntungamo District

2.1.7 Hydrology

The district is well endowed with water resources and has reliable underground aquifers which have a potential for providing water for human consumption and agricultural use though sustainability is being cast in doubt due to greater demands, due to population growth and more modern activities which require more water. The amount of water sources which can be protected is nearing capacity resulting in some protected water supplies drying for part of the year. Rainwater harvesting and other water conservation techniques are necessary to sustain the water cycle in the wake of increasing temperature rise and rainfall reduction. The more pronounced natural water resources in the District include:-

Lakes: There are two main lakes in Ntungamo district - Nyabihoko (Karengye) and Nyakiyanja adjacent to each other at the boundary of Rushenyi and Kajara counties.

Rivers: Ntungamo District has three rivers

- **River Rwizi:** Located in Itojo
- **River Kakitumba:** This forms a boundary between the Republic of Uganda and Rwanda
- **Kasharara- Nyamugoye-Kahengye River:** This River forms a boundary between Ntungamo and Rukungiri District (The name of the river changes at different points depending on the geographical location).

2.1.8 Population

According to the National Population and Housing Census (2014) provisional results, Ntungamo District had a total population of 489,323 people. Results also showed that most of the people in Ntungamo District reside in rural areas (431,261(88.1%) compared to (58,062 (11.9%) who reside in urban centers. The gender distribution was reported to be males: 234,244 (47.9%) and females: 255,079 (52.1%). About 98.7% (483,075) of the population form the household population and only 1.3% (6,248) is Non-household. Ruhaama sub-county had the highest population of 43,332 people while Western division in Ntungamo Municipality had the least population of 5,254 people (Figure 6). Table 1 shows the population distribution per sub-county for the different gender.

Table 4: Population Distribution in Ntungamo District

	HOUSEHOLDS		POPULATION		
Sub-County	**Number**	**Average Size**	**Males**	**Females**	**Total**
Bwongyera	7173	4.8	16260	18907	35167
Ihunga	5697	4.6	12316	13999	26315
Kibatsi	4871	4.0	9067	10565	19632
Nyabihoko	4387	5.0	10537	11358	21895
Rwashamaire Town Council	1742	4.0	3565	4123	7688
Central Division	23205	3.2	41107	38682	79789
Eastern Division	8175	4.0	15389	17610	32999
Itojo	4774	4.8	11290	12073	23363
Kitwe Town Council	3869	4.6	8662	9518	18180
Ntungamo	6437	4.8	15077	16219	31296
Nyakyera	7939	4.9	18360	20408	38768
Ruhaama	9446	4.6	20528	22804	43332
Rukoni East	5181	4.5	11323	12391	23714
Rukoni West	3594	4.7	7873	8999	16872
Rweikiniro	7363	5.0	17450	19170	36620
Western Division	5508	4.1	10752	12207	22959
Kayonza	11664	5.0	29359	29695	59054
Ngoma	1138	6.1	4747	3388	8135
Rubaare	5179	5.0	12905	13357	26262
Rubaare Town Council	3203	4.1	6491	6849	13340
Rugarama	6524	5.0	15912	17101	33013

Source: UBOS Census 2014

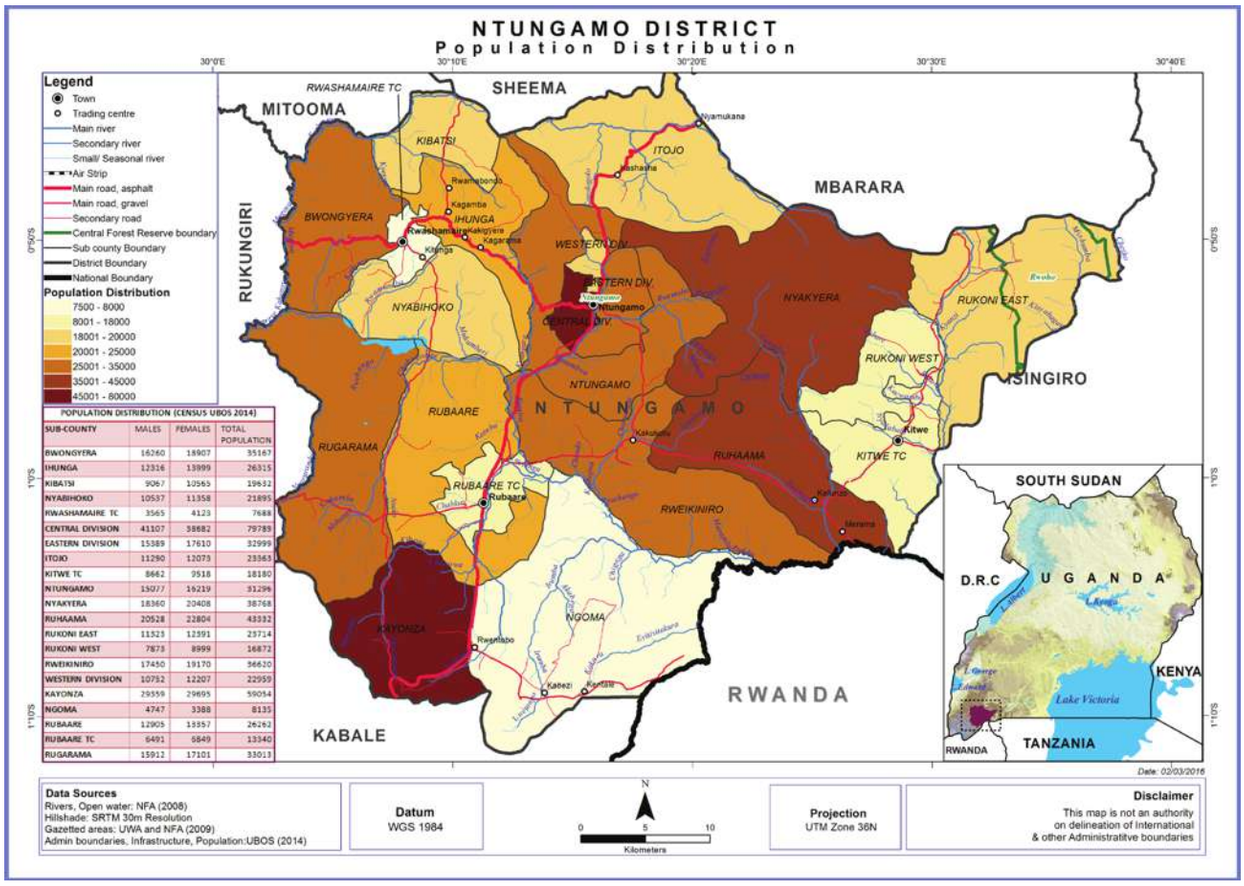


Figure 6: Population Distribution, Ntungamo District

2.1.9 Economic activities

Majority of the population in Ntungamo District engages in subsistence agriculture where cultivation of food crops such as bananas, maize, beans, finger millet, cassava, sorghum, onions and sweet potatoes are dominant. The major cash crop is Coffee. A considerable number of households practice livestock production and the animals reared are cattle, goats, sheep, pigs and chicken.

Fishing is among the economic activities in the district but dominant in Nyabihoko sub-county (Lake Nyabihoko).

METHODOLOGY

3.1 Collection and analysis of field data using GIS

3.1.1 Preliminary spatial analysis

Hazard prone areas base maps were generated using Spatial Multi-Criteria Analysis (SMCA) basing on numerical models and guidelines using existing environmental and socio-ecological spatial layers (i.e. DEM, Slope, Aspect, Flow Accumulation, Land use, vegetation cover, hydrology, soil types and soil moisture content, population, socio-economic, health facilities, accessibility, and meteorological data) in a GIS environment (ArcGIS 10.1).

3.1.2 Stakeholder engagements

Stakeholder engagements were carried out in close collaboration with OPM's DRM team and the District Disaster Management focal persons with the aim of identifying the various hazards ranging from drought, to floods, landslides, human and animal disease, pests, animal attacks, earthquakes, fires, conflicts etc. Stakeholder engagements were done through Focus Group Discussions (FGDs) and key informant interviews guided by checklist tools (Appendix I). At district level, One Key Informant Interview comprising of four respondents (District Agricultural Officer, Senior District Environment Officer and District Statistician) was held at Ntungamo District Headquarters (UTM, 30.26104; -0.87365). At sub-county level Key informants included: Sub-county and parish chiefs, community Development mobilizers and health workers.

FGDs were carried out in four purposively selected sub-counties that were ranked with highest vulnerability. FGDs comprising of an average of 12 respondents (crop farmers, local leaders, nursing officers, police officers and cattle keepers) were conducted at Itojo Sub-county (30.29611E; -0.80167S), Ihunga Sub-county (30.17945E; -0.83205S), Ngoma Sub-county (30.21567E; -1.15425S) and Kayonza Sub-county (30.12311E; -1.12194S). Each Parish of the selected Sub-counties was represented by at least one participant and the selection of participants was engendered. FGDs were conducted with utmost consideration to the various gender categories (women, men) with respect to age groups since hazards affect both men and women though in different perspectives irrespective of age. This allowed for comprehensive representation as well as provision of detailed and verifiable information.

Focus Group discussions and Key Informant Interviews were transcribed in the field for purposes of input into the NVIVO software for qualitative data analysis. Case stories and photographs were documented and captured respectfully. In order to produce age and sex disaggregated data, results from FGDs and KIIs were integrated with the district population census data. This was also input in the multi-hazard, risk and vulnerability profile maps.

3.1.3 Participatory GIS

Using Participatory GIS (PGIS), local communities were involved in identifying specific hazards prone areas on the Hazard base maps. This was done during the FGDs and participants were requested through a participatory process to develop a community hazard profile map.

3.1.4 Geo-referencing and ground-truthing

The identified hazard hotspots in the community profile maps were ground-truthed and geo-

referenced using a handheld Spectra precision Global Positioning System (GPS) unit, model: Mobile Mapper 20 set in WGS 1984 Datum. The entities captured included: hazard location, (Sub-county and parish), extent of the hazard, height above sea level, slope position, topography, neighboring land use among others (Appendix I). Hazard hot spots, potential and susceptible areas will be classified using a participatory approach on a scale of “not reported/ not prone”, “low”, “medium” and “high”. This information generated through a participatory and transect approach was used to validate modelled hazard, risk and vulnerability status of the district. The spatial extent of a hazard event was established through modelling and a participatory validation undertaken.

3.2 Develop District Specific Multi-hazard Risk and Vulnerability Profiles

3.2.1 Data analysis and integration

Data analysis and spatial modeling was done by integrating spatial layers and non-spatial attribute captured from FGDs and KIIs to generate final HRV maps at Sub-county level. Spatial analysis was done using ArcGIS 10.1 to generate specific hazard, risk and vulnerability profile for the district.

3.2.2 Data verification and validation

In collaboration with OPM, a five days regional data verification and validation workshop was organized by UNDP in Mbarara Municipality as a central place within the region. This involved key district DDMC focal persons for the purpose of creating local/district ownership of the profiles.

3.3 Preserve the Spatial data to enable future use of the maps

HRV profiles report and maps have been verified and validated, final HRV profiles inventory and geo-database have been prepared containing all GIS data in various file formats to enable future use of the maps.

RESULTS FROM MULTI-HAZARD RISK, VULNERABILITY MAPPING

4. Multi-hazards

A hazard, and the resultant disaster can have different origins: natural (geological, Hydro-meteorological and biological) or induced by human processes (environmental degradation and technological hazards). Hazards can be single, sequential or combined in their origin and effects. Each hazard is characterized by its location, intensity, frequency, probability, duration, area of extent, speed of onset, spatial dispersion and temporal spacing (Cees, 2009).

In the case of Ntungamo district, hazards were classified following main controlling factors:

i. Geomorphological or Geological hazards including; landslides, rock falls and soil erosion
ii. Climatological or Meteorological hazards including; floods, drought, hailstorms, strong winds and Lightning
iii. Ecological or Biological hazards including; crop pests and diseases, livestock pests and diseases, human epidemic diseases, vermin attacks and wildlife animal attacks,
iv. Human induced or Technological hazards including bush fires, road accidents land conflicts and soil erosion

4.1 Geomorphological and Geological Hazards

4.1.1 Landslides, rock falls and soil erosion

Results from the participatory assessments indicated that landslides, mudslides and rock falls were a rare phenomenon in Ntungamo district. Participants reported that landslides are experienced in the hilly areas during rainy seasons. It was also reported that landslides block roads and destroy crops. The sub-counties where these landslides are experienced in the district include; Rukoni east, Ihunga and Itojo. This information was integrated with the spatial modelling using socio-ecological spatial data i.e. Soil texture (data for National Agricultural Research Laboratories – Kawanda (NARL) 2014, Rainfall (Meteorology Department 2014), Digital Elevation Model (DEM), SLOPE, ASPECT (30m resolution data from SRTM Shuttle Radar Topography Mission (SRTM) to generate Land slide, rock falls and soil erosion vulnerability map (Figure 7).

Plate 1: Rock fall prone area in Kayonza Sub-county

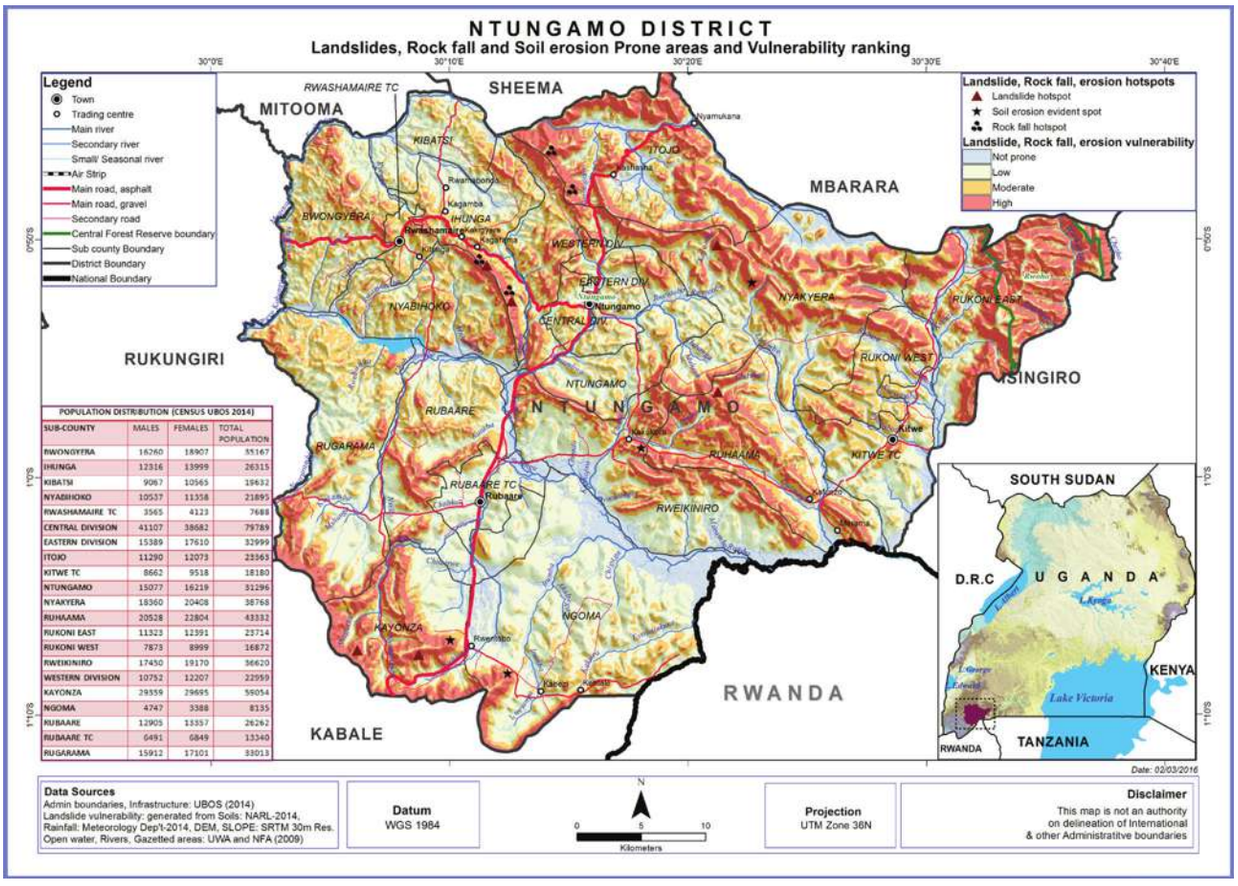


Figure 7: Landslides, Rock fall and Soil erosion Prone Areas and Vulnerability, Ntungamo District

4.1.2 Earthquakes and faults

Participants in the focus group discussions indicated that Ntungamo district experiences minor earth tremors (Figure 8). It was reported that these minor tremors do not cause any damage.

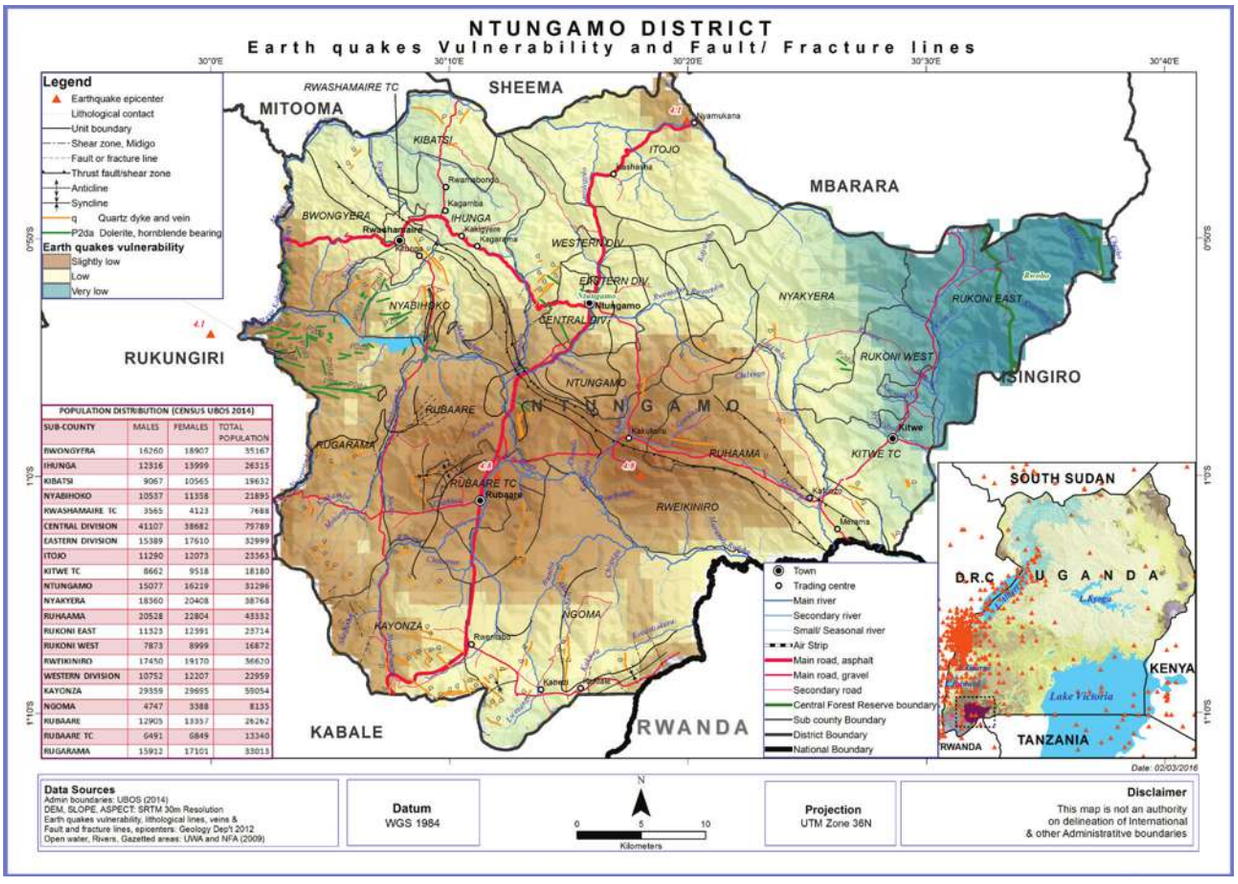


Figure 8: Earthquakes Vulnerability and Fault lines, Ntungamo District

4.2 Climatological and Meteorological Hazards

4.2.1 Floods

Participants in the focus group discussions indicated that floods are a common phenomenon in Ntungamo district during the rainy seasons. Floods in this district usually occur in low lands, wetlands and along rivers. The most notable impacts of floods were; submerging of crops, soil erosion, washing away of roads and bridges and water stagnation in the low lands. The most affected sub-counties include; Itojo, Ngoma, Kibatsi, Rweikiniro, Rukoni east,Rukoni west and eastern division. This information was integrated with the spatial modelling using socio-ecological spatial data i.e. Soil texture (data for National Agricultural Research Laboratories – Kawanda (NARL) 2014, Rainfall (Meteorology Department 2014), Digital Elevation Model (DEM), SLOPE, ASPECT (30m resolution data from SRTM Shuttle Radar Topography Mission (SRTM) to generate flood susceptibility map (Figure 9).

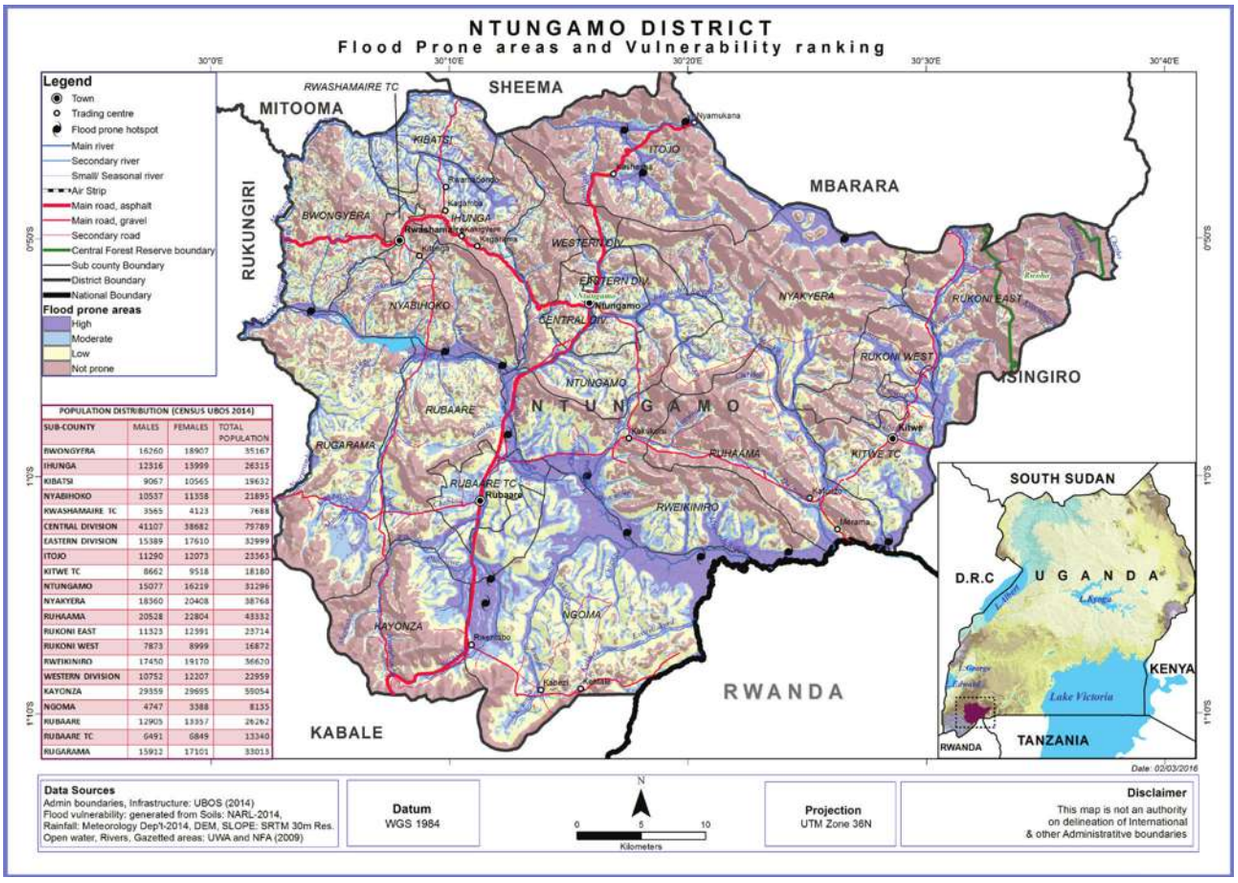


Figure 9: Flood Prone Areas and Vulnerability Ranking, Ntungamo District

4.2.2 Drought

Results from participatory assessments indicated that droughts in form of prolonged dry spells without rain were one of the most prominent hazards in Ntungamo district. Participants reported that prolonged dry spells experienced in the district cause impacts such as; water scarcity, food insecurity, shortage of pastures for livestock and increased incidences of pests and diseases. The most affected sub-counties are; Rubaare, Kitwe TC, Ruhaama, Rweikiniro, Ngoma, Kayonza and Rukoni west. This information was integrated with spatial modelling using socio-ecological spatial data i.e. Rainfall and Temperature (Uganda National Meteorological Authority, 2014) using the Standardized Precipitation Index (SPI) to generate drought vulnerability map (Figure 10).

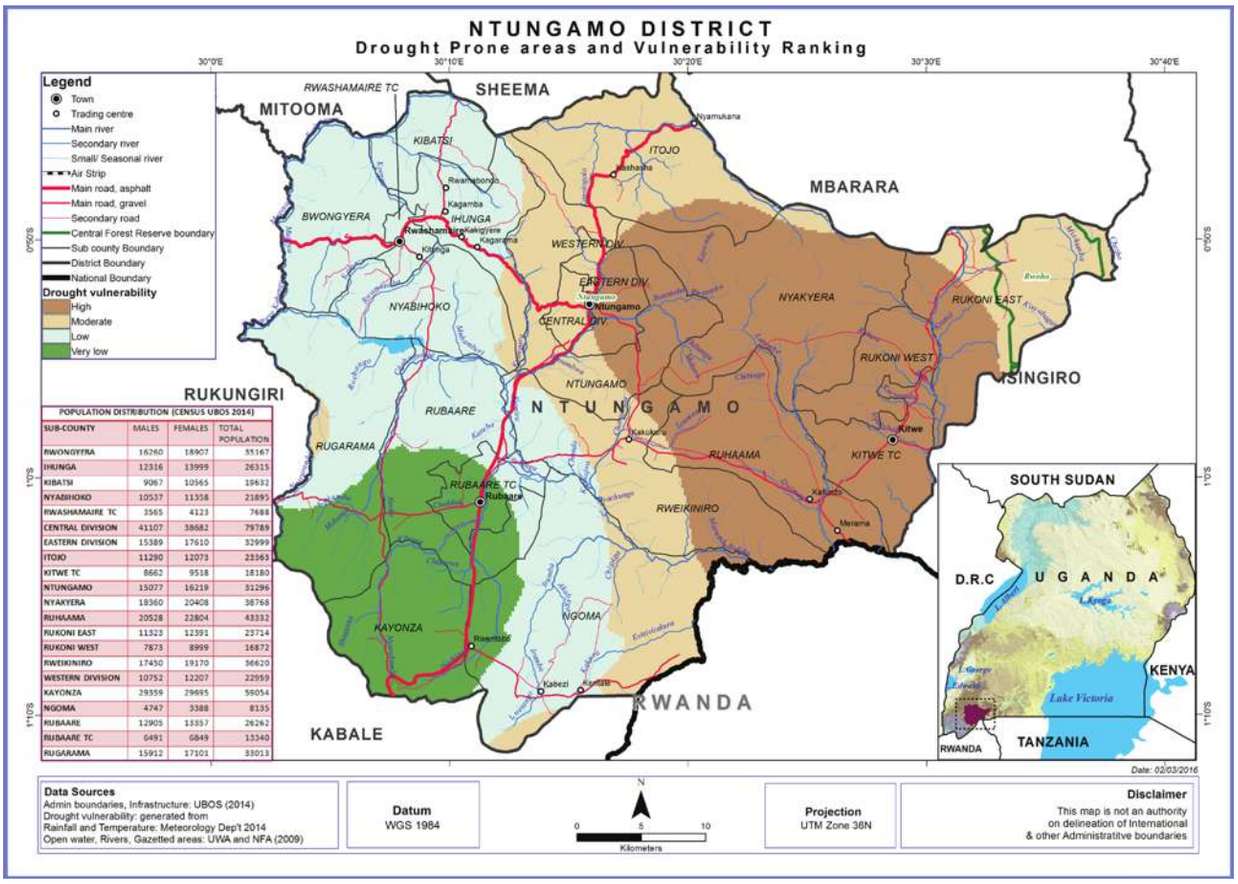


Figure 10: Drought Prone Areas and Vulnerability Ranking, Ntungamo District

4.2.3 Hailstorms

Participatory assessments through the focus group discussions indicated that hailstorms are a common occurrence in Ntungamo district during rainy seasons. Participants reported that hailstorms cause serious damage to crops such as; banana, maize, beans, cassava and sweet potatoes. The sub-counties of Ihunga, Kibatsi, Itojo, Rweikiniro, Bwongyera, Rukoni west and Ruhaama are the most affected by hailstorms (Figure 11).

4.2.4 Strong winds

Results from participatory assessments showed that strong winds were serious problem in Ntungamo district during rainy seasons. Participants reported that strong winds destroy banana plantations, blow off roof tops of houses and strip off unripe coffee beans from coffee plantations. It was also reported

that a whirlwind (Eshato) hit Kiyanja parish, Ngoma sub-county in October 2015 and destroyed crops and houses (Figure 11).

4.2.5 Lightning

Lightning is a sudden high-voltage discharge of electricity that occurs within a cloud, between clouds, or between a cloud and the ground. The distribution of lightning on Earth is far from uniform. The ideal conditions for producing lightning and associated thunderstorms occur where warm, moist air rises and mixes with cold air above. Participants in the focus group discussions mentioned that Lightning was not a common phenomenon Ntungamo district. Incidences of Lightning happened in Nyakariro parish, Ngoma sub-county where 2 cows were killed in 2010 (Figure 11).

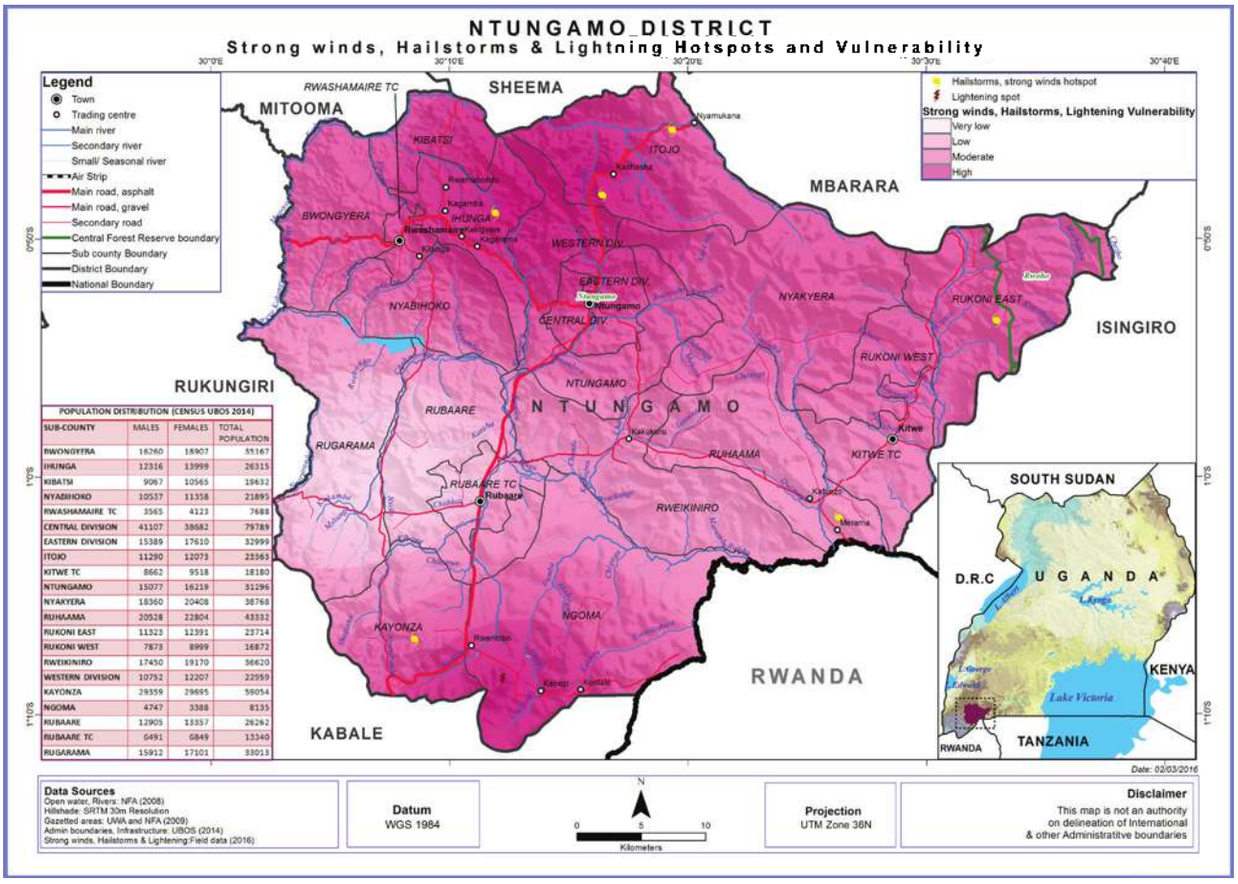


Figure 11: Strong winds, Hailstorms and Lightning Hotspots Vulnerability, Ntungamo District

4.3 Ecological and Biological Hazards

4.3.1 Crop Pests and Diseases

Results from participatory assessments indicated that crop diseases and pests were a serious problem in Ntungamo district. The most common crop pests in the district are; coffee twig borer, eucalyptus mites, tailed caterpillars (coffee), fruit flies in mangoes and banana weavil. While the most common crop diseases are; banana bacterial wilt, fusarium wilt, coffee leaf rust, Coffee wilt and cassava mosaic. Participants revealed that banana bacterial wilt was widespread in Ihunga, Itojo, Ngoma, Bwongyera, Kibatsi and Kayonza sub-counties. The entire district was seriously affected by the eucalyptus mites with exception of the municipality (Figure 12).

Plate 2: Banana plantation affected by banana bacterial wilt in Ngoma Sub-county

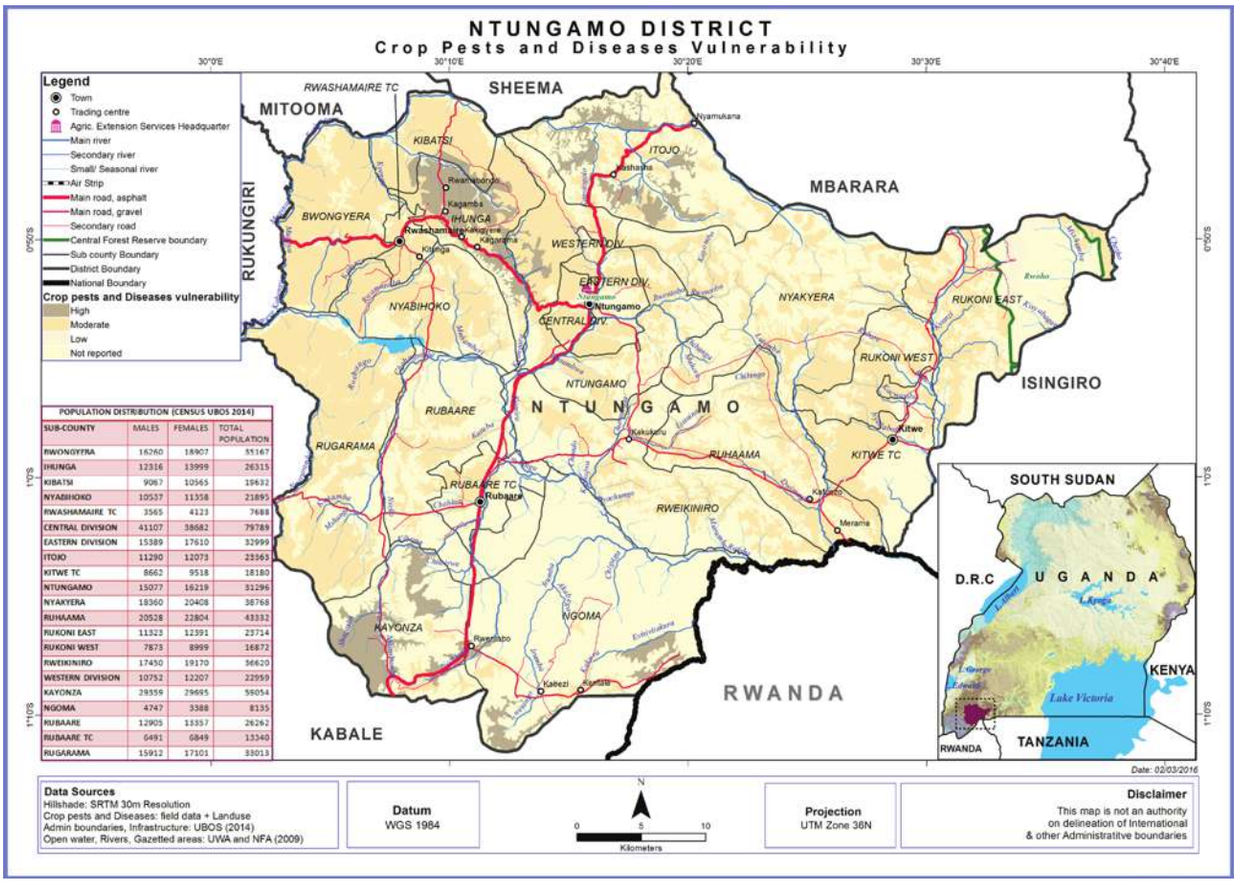


Figure 12: Crop Pests and Diseases Vulnerability, Ntungamo District

4.3.2 Livestock Pests and Diseases

Results from the focus group discussions showed that livestock pests and diseases were a common occurrence in Ntungamo district. The most common livestock diseases in the district are; foot and mouth disease, lumpy skin disease and east coast fever. Participants of the focus group discussions indicated that foot and mouth disease outbreaks are common especially in Kitwe town council which is neighboring Tanzania. It was reported that the foot and mouth disease outbreak of 2012 caused serious economic losses to cattle keepers in Kaina, Katooma, Kabasheshe, Ruhega and Kijubwe parishes in Kayonza sub-county. The other sub-counties which are most affected by foot and mouth disease are; Rweikiniro, Ruhaama and Ngoma sub counties and Kitwe Town Council (Figure 13).

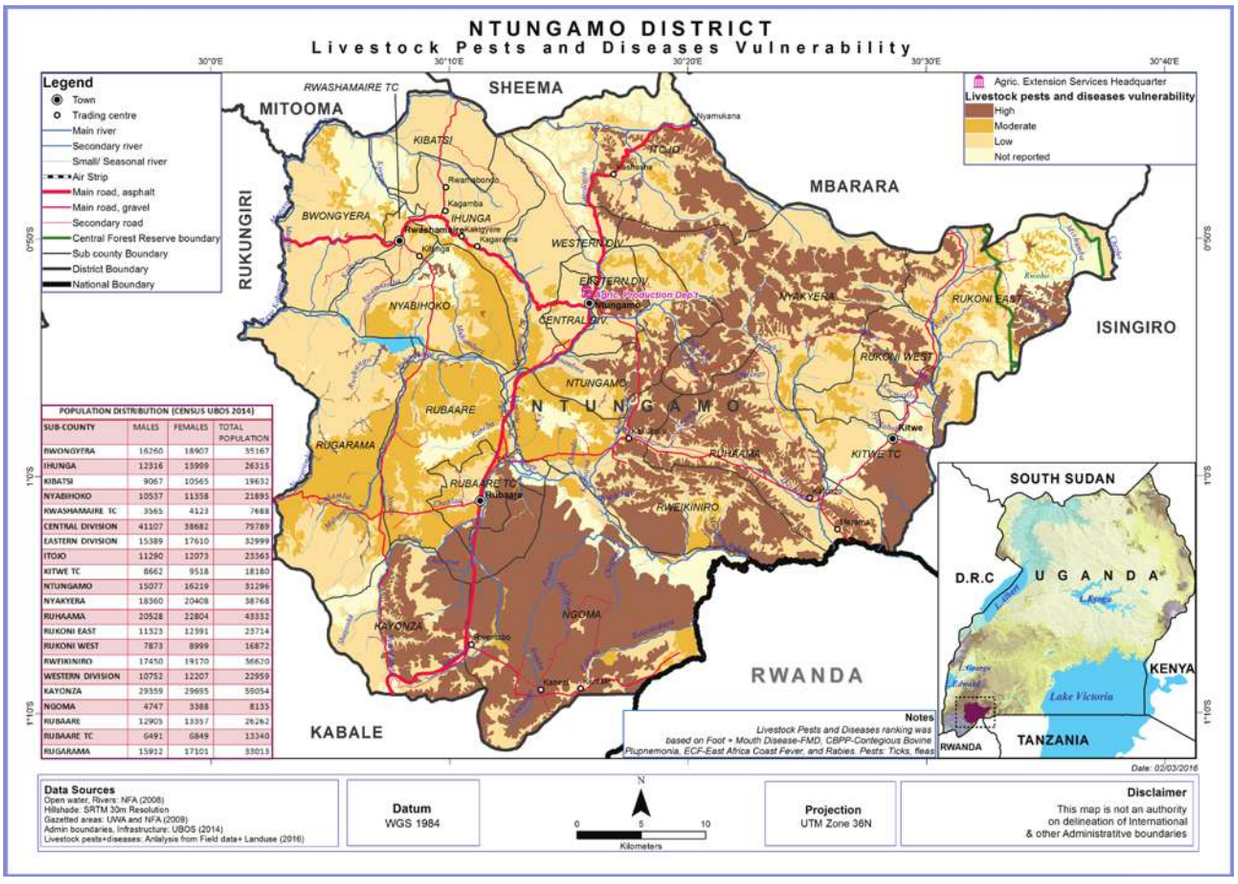


Figure 13: Livestock Pests and Diseases Vulnerability, Ntungamo District

4.3.3 Human Disease outbreaks

The most reported human diseases in Ntungamo district were; malaria, HIV/AIDS and chicken pox (Figure 14). Most urban centers such as Ntungamo Municipality, Kitwe, Rubaare and Rwashamaire town councils were reported to have high prevalence rates of HIV/AIDS. Malaria was a problem in the entire district.

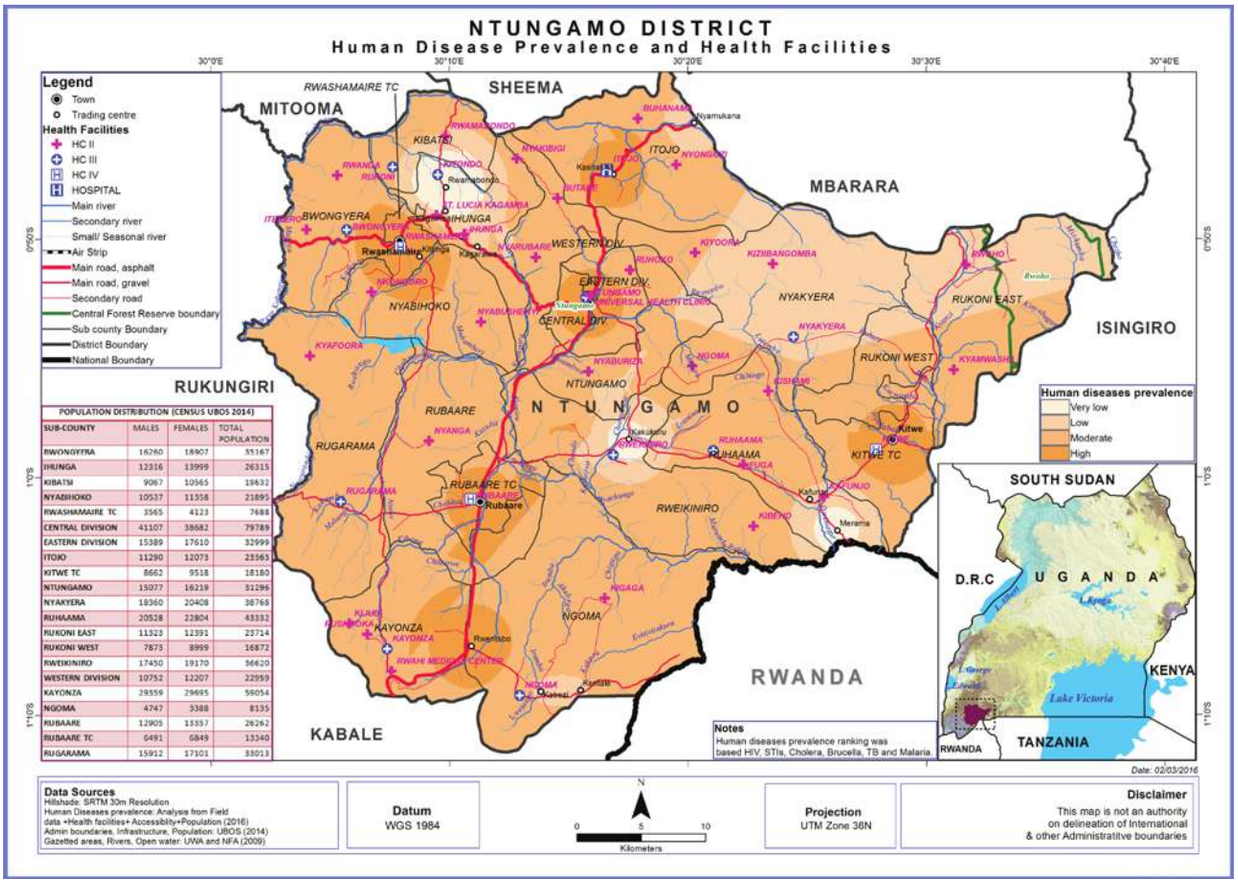


Figure 14: Human Disease Prevalence and Health Facilities, Ntungamo Distric**t**

4.3.4 Vermin and Wild-life Animal Attacks

Participatory assessments through focus group discussions revealed that vermin and wildlife animal attacks were not a serious problem in Ntungamo district. Except for a few cases where wild pigs, monkeys and squirrels destroy crops were reported near Rwoho forest reserve in Rukoni east sub-county and Nyabihoko wetland in Nyabihoko sub-county (Figure 15).

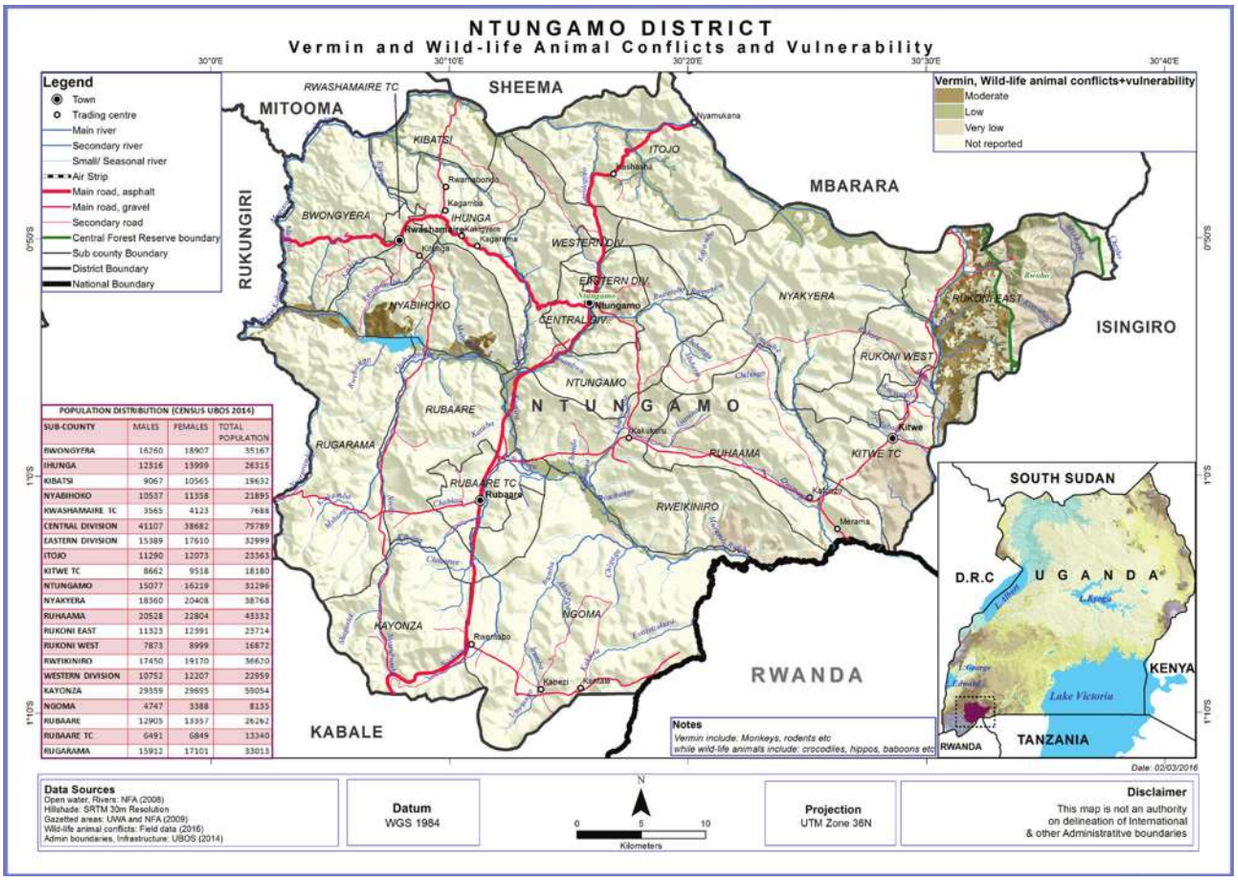


Figure 15: Vermin and Wildlife Animal Conflicts Vulnerability, Ntungamo District

4.3.5 Invasive species

The most reported invasive species in Ntungamo district are; Lantana camara and Oxalis latifolia (Figure 16). Participants of the focus group discussion reported that Lantana camara was a serious problem in Bwongyera sub-county. It was also observed that Oxalis latifolia was more dominant in banana plantations in the entire district.

Plate 3: Lantana camara in Kayonza Sub-county

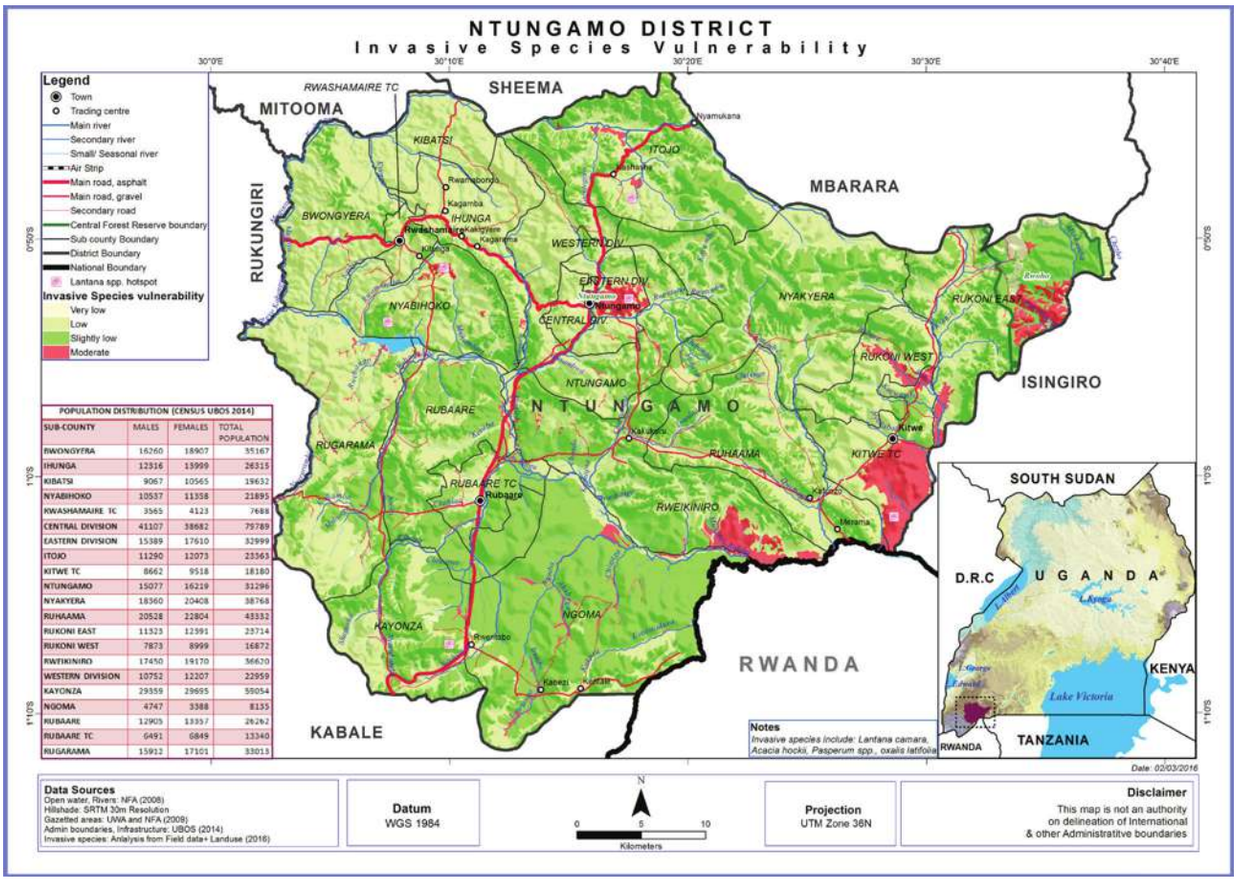


Figure 16: Invasive Species Vulnerability, Ntungamo District

4.4 Human Induced and Technological Hazards

4.4.1 Bush and forest fires

Results from participatory assessments showed that bush burning was not a serious problem in Ntungamo district. Incidences of bush fires were reported in Kijubwe, Kabasheshe and Ruhega parishes in Kayonza sub-county. Similar incidences of bush fires were common in Mugyera parish, Ngoma and Ihunga sub-county. Reports also indicated that there are forest fires in Rwoho central forest reserve in Rukoni East (Figure 17).

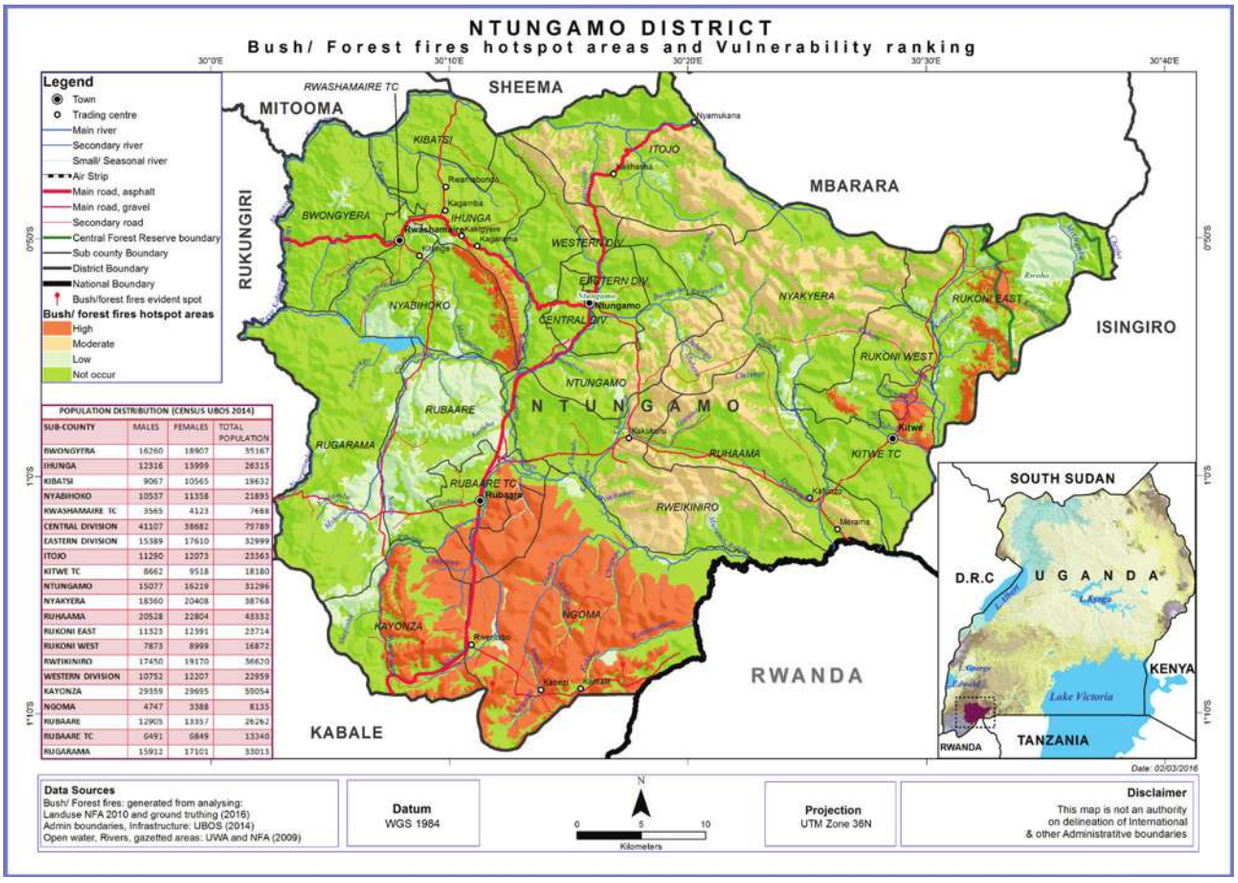
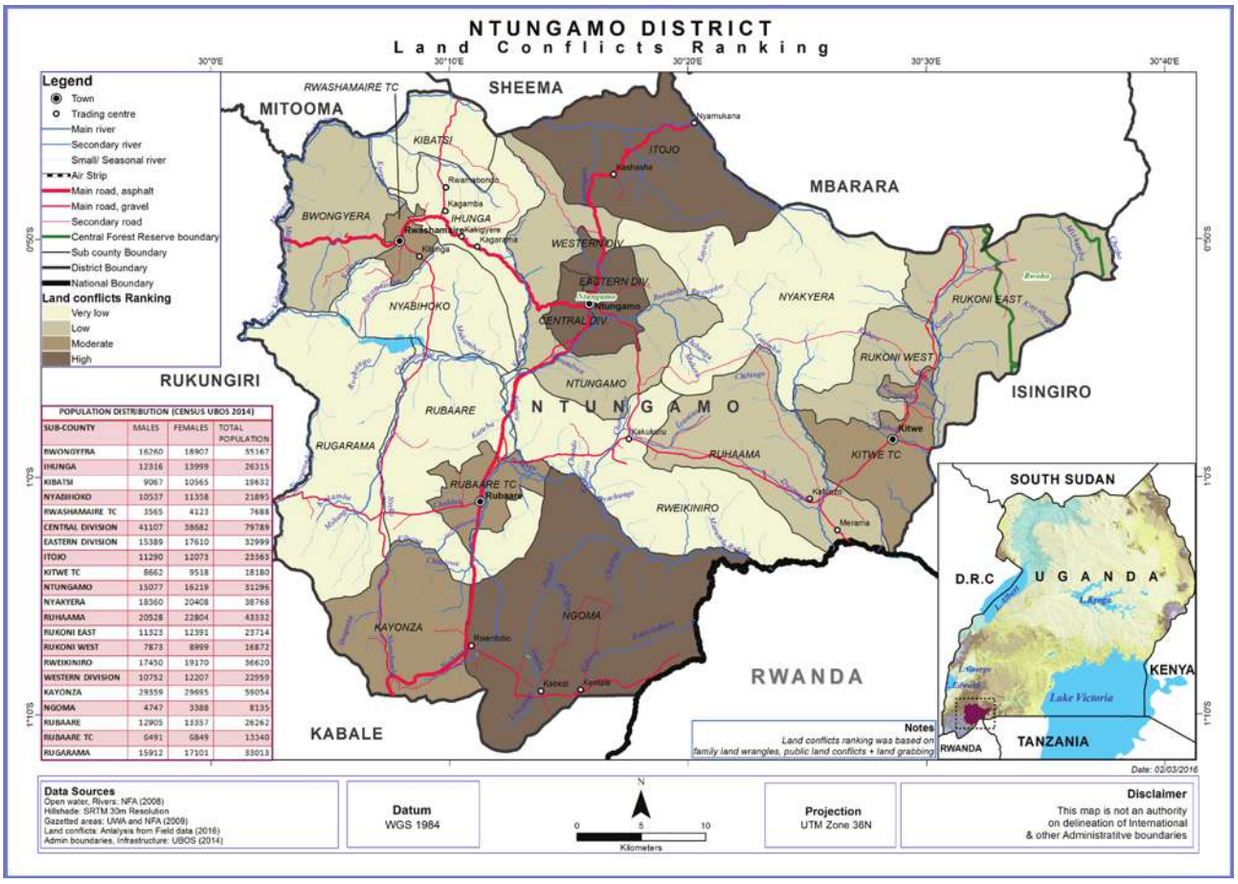


Figure 17: Bush/Forest fires Hotspot Areas and Vulnerability Ranking, Ntungamo District

4.4.2 Land conflicts

The most common land conflicts in Ntungamo district are boundary conflicts between districts i.e. Ntungamo and Kabale in Kayonza and Ngoma sub-counties, Ntungamo and Sheema in Itojo sub-county (Figure 18). Land conflicts between family members were also a serious problem in the district.



POPULATION DISTRIBUTION (CENSUS UBOS 2014)

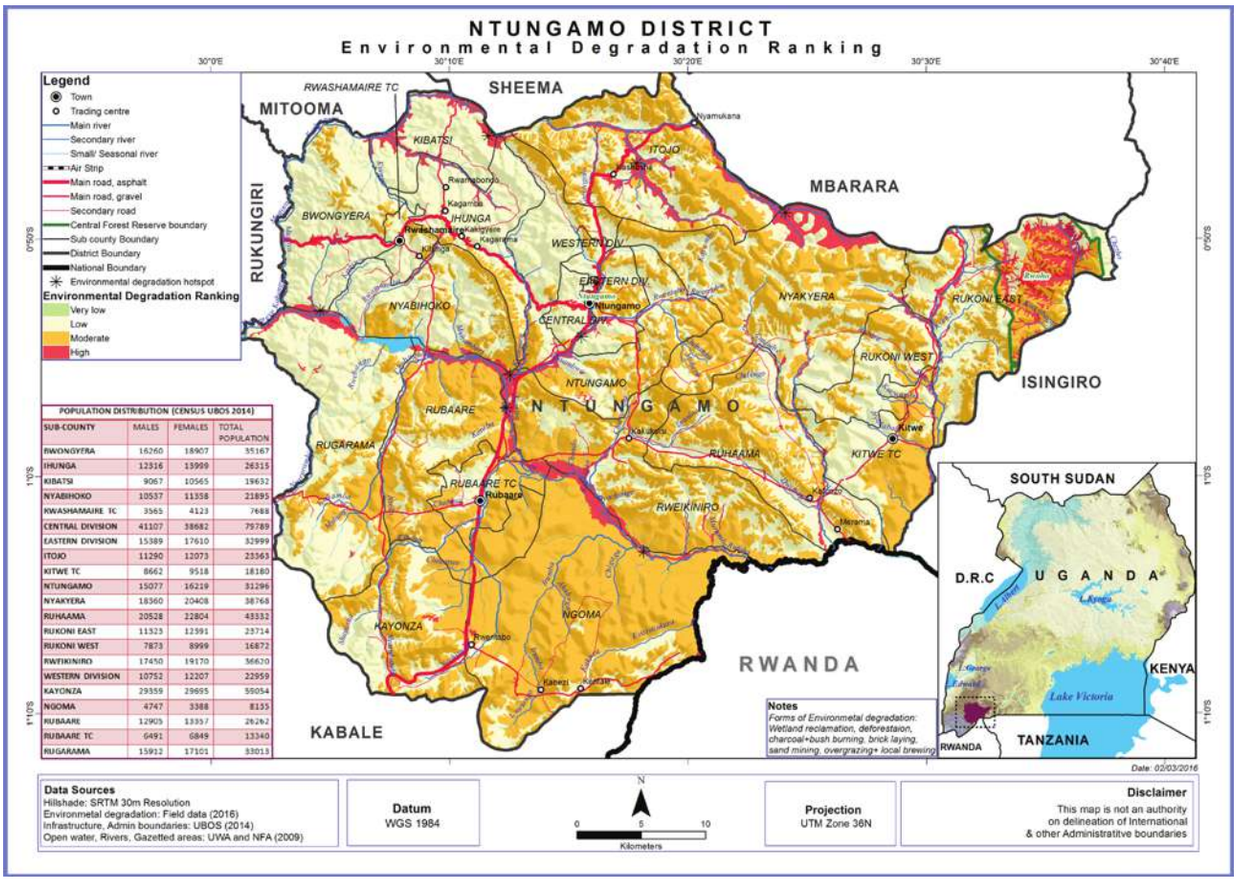
SUB-COUNTY	MALES	FEMALES	TOTAL POPULATION
RWONGYERA	16260	18907	35167
IHUNGA	12316	13999	26315
KIBATSI	9067	10565	19632
NYABIHOKO	10537	11358	21895
RWASHAMAIRE TC	3565	4123	7688
CENTRAL DIVISION	41107	38682	79789
EASTERN DIVISION	15389	17610	32999
ITOJO	11290	12073	23363
KITWE TC	8662	9518	18180
NTUNGAMO	15077	16219	31296
NYAKYERA	18360	20408	38768
RUHAAMA	20528	22804	43332
RUKONI EAST	11323	12391	23714
RUKONI WEST	7873	8959	16872
RWEIKINIRO	17450	19170	36620
WESTERN DIVISION	10752	12207	22959
KAYONZA	29359	29695	59054
NGOMA	4747	3388	8135
RUBAARE	12905	13357	26262
RUBAARE TC	6491	6849	13340
RUGARAMA	15912	17101	33013

Figure 18: Land Conflicts Ranking, Ntungamo District

4.4.3 Environmental Degradation

Participatory assessments indicated that the most common forms of environmental degradation in Ntungamo district are; conversion of wetlands into agricultural land in Kabasheshe wetland, Kayonza sub-county and Nyabihoko sub-county, Tin mining in Rugarama, Ruhaama and Nyakyera, sand mining and brick making in Bwongyera, Rweikiniro and Ngoma, Ntungamo sub-counties and Ntungamo Municipality. Other forms of environmental degradation in the district include pollution of river Muvumba in Ngoma and Rweikiniro sub-counties by rice growers in Rwanda, massive stone quarrying by SBI road Construction Company in Kaina parish, Kayonza sub-county, Central and Western Divisions, Kitwe Town Council and Nyabihoko sub-county (Figure 19).

Plate 4: SBI Stone quarry at Kaina parish, Kayonza Sub-county



POPULATION DISTRIBUTION (CENSUS UBOS 2014)

SUB-COUNTY	MALES	FEMALES	TOTAL POPULATION
RWONGYERA	16260	18907	35167
IHUNGA	12316	13999	26315
KIBATSI	9057	10565	19632
NYABIHOKO	10537	11358	21895
KWASHAMAIRE TC	3565	4123	7688
CENTRAL DIVISION	41107	38682	79789
EASTERN DIVISION	15389	17610	32999
ITOJO	11290	12073	23363
KITWE TC	8662	9518	18180
NTUNGAMO	15077	16219	31296
NYAKYERA	18360	20408	38768
RUHAAMA	20528	22804	43332
RUKONI EAST	11323	12391	23714
RUKONI WEST	7873	8999	16872
RWEIKINIRO	17450	19170	36620
WESTERN DIVISION	10752	12207	22959
KAYONZA	29359	29695	59054
NGOMA	4747	3388	8135
RUBAARE	12905	13357	26262
RUBAARE TC	6491	6849	13340
RUGARAMA	15912	17101	33013

Figure 19: Environmental Degredation Ranking, Ntungamo District

4.4.4 Road Accidents

Road accidents mostly occur on Rukungiri-Ntungamo road and Mbarara-Kabale highway due to over speeding, over loading and reckless driving (Figure 20).

Plate 5: Black spot at Rwahi trading center, Kayonza Sub-county

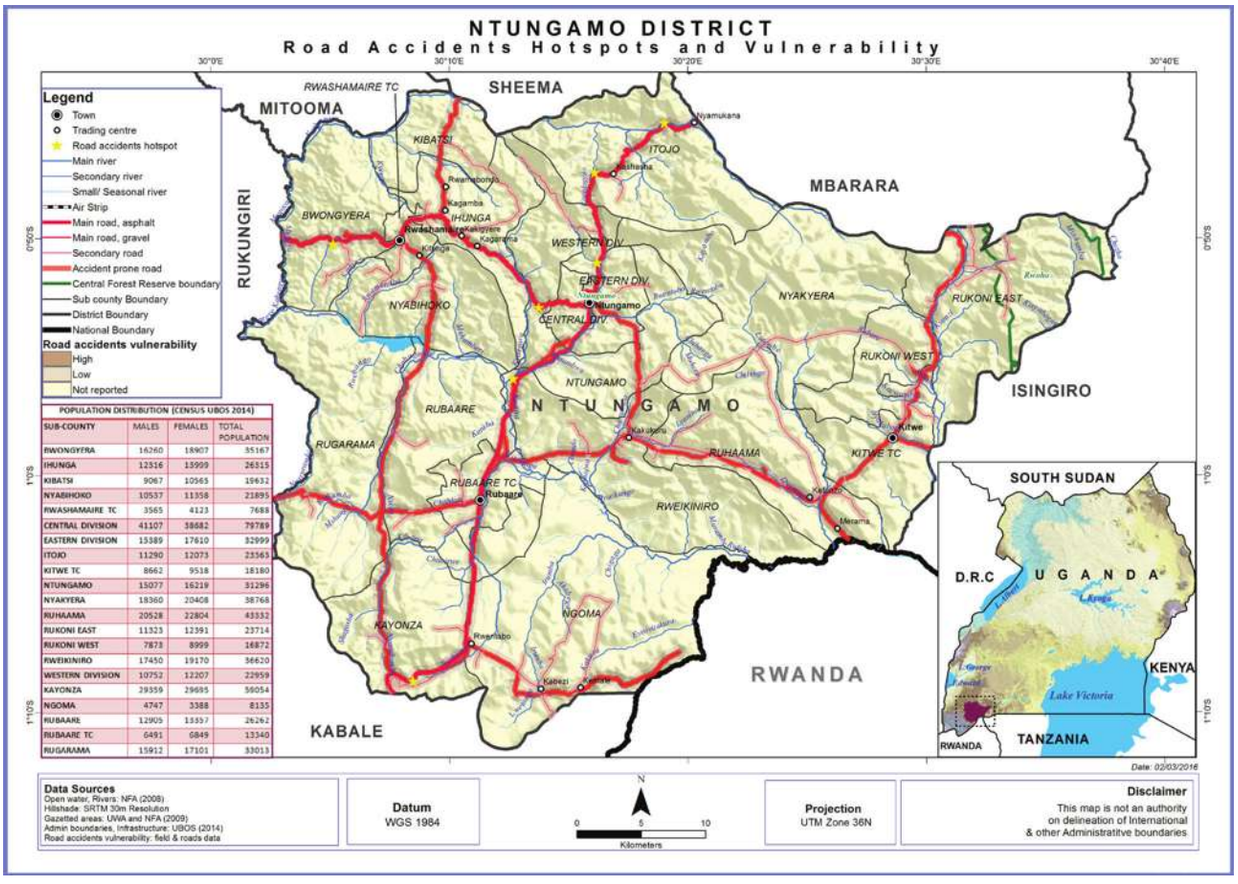


Figure 20: Road Accidents Hotspots and Vulnerability, Ntungamo District

4.5 VULNERABILITY PROFILE

Vulnerability depends on low capacity to anticipate, cope with and/or recover from a disaster and is unequally distributed in a society. The vulnerability profile of Ntungamo district were assessed based on exposure, susceptibility and adaptive capacity at community (village), parish, sub-county and district levels highlighting their sensitivity to a certain risk or phenomena. Indeed, vulnerability was divided into biophysical (or natural including environmental and physical components) and social (including social and economic components) vulnerability. Whereas the biophysical vulnerability is dependent upon the characteristics of the natural system itself, the socio-economic vulnerability is affected by economic resources, power relationships, institutions or cultural aspects of a social system. Differences in socio-economic vulnerability can often be linked to differences in socio-economic status, where a low status generally means that you are more vulnerable.

Vulnerability was assessed basing on two broad criteria i.e. socio-economic and environmental components of vulnerability. Participatory approach was employed to assess these vulnerability components by characterizing the exposure agents, including hazards, elements at risk and their spatial dimension. Participants also characterized the susceptibility of the district including identification of the potential impacts, the spatial disposition and the coping mechanisms. Participants also identified the resilience dimension at different spatial scales (Table 5).

Table 6 (Vulnerability Profile) shows the relation between hazard intensity (probability) and degree of damage (magnitude of impacts) depicted in the form of hazard intensity classes, and for each class the corresponding degree of damage (severity of impact) is given. It reveals that climatological and meteorological hazards in form of drought and hailstorms predispose the community to high vulnerability state. The occurrence of pests and diseases and Lightning, also create a moderate vulnerability profile in the community (Table 6). Table 7 shows Hazard assessment for Ntungamo District.

Table 5: Components of Vulnerability in Ntungamo District

Vulnerability	Exposure			Susceptibility			Resilience
	Hazards	**Elements at Risk**	**Geographical Scale**	**Susceptibility**	**Geographical Scale**	**Coping strategies**	**Geographical Scale**
	Landslides, Rock falls and Soil erosion	- Human and livestock adjacent to hill slopes - Crops on hill slopes - Infrastructure e.g. houses, schools, roads adjacent to hill slopes	Parish	- Loss of lives - Complete crop failure - Destruction of infrastructure e.g. homes, and schools	Parish	-Migration -Sensitization by both government and non-governmental agencies Soil and water conservation practices	Parish
	Earth quakes	- Infrastructure e.g. houses, schools	District	- Loss of lives - Destruction of Infrastructure e.g. houses, schools	District	-No much measure so far - Strong structures - Early warning systems - Appropriate housing designs	District
	Floods	- Livestock adjacent to flood plain - Crops on flood plain - Infrastructure e.g. houses, schools, roads adjacent to flood plain	Parish	- Livestock loss - Destruction of crops -Loss of lives - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain	Parish	-Migration -Sensitization on wetland conservation -Dig trenches	Parish
	Drought	- Livestock - Crops - Human population	Village	- Hunger & poverty - Livestock loss - Crop failure - Shortage of pasture - Shortage of water	Village	-Migration -Sensitization on tree planting -Planting fast and drought resistant varieties -Buy food from elsewhere Seek for Food relief from OPM -early warning systems -encourage food storage facilities	Village
	Hailstorms, strong winds and Lightning	- Human and livestock populations - Crops - Infrastructure e.g. houses, schools, health centres	Parish	- Loss of lives - Destruction of crops - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain	Parish	Buy food from else where Seek for Food relief from OPM -early warning systems Wind brakers Tree planting -encourage food storage facilities	Parish

Socio-economic component	Crop Pests and Diseases	-Crops	District	- Complete crop failure	District	- Spraying - Cut and burry affected crops -Sensitization on crop disease management	District
	Livestock Pests and Diseases	-Livestock (cattle, goats etc.)	District	- Loss of livestock - Reduced livestock productivity	District	- Vaccination - Burry and burn animals that have died from infection - Quarantine -Spraying with acaracides -Improve sanitation and hygiene	District
	Human Disease outbreaks	- Human Population	District	- Loss of lives	District	- Mass Immunization - Use of mosquito nets -senstisation - Improve sanitation and hygiene	District
	Invasive species	-indigenous species -Animals	District	- Outcompete the indigenous spp., suppress growth of indigenous spp - Loss of indigenous spp. - Complete crop Failure - suppress growth of pasture	District	- Cut uproot and burn -Sensitization on Invasive species management Spraying with herbicides	District
	Bush fires	- Livestock - Crops - Infrastructure e.g. houses, schools	Sub-county	- Loss of livestock - Shortage of pasture - Destruction of crops - Destruction of infrastructure e.g. houses, schools	Sub-county	-Sensitization -formulation of bye-laws -Enforcement -Trenching (fire lines)	Sub-county
	Road accidents	- Human population - Infrastructure adjacent to accident black spots e.g. houses, schools etc.	Sub-county	- Loss of lives - Destruction of vehicles - Destruction of Infrastructure adjacent to accident black spots e.g. houses, schools etc.	Sub-county	-Humps on roads -Signage on speed limits -Sensitization on traffic rules Construction of separate lanes in sharp corners Planting trees in road reserve	Sub-county

	Land conflicts	- Human population	Village	-Loss of lives -Family violence and break outs	Village	- Community dialogue - District court in charge of land issues -senstisation -encourage testate -revamp land tribunal	Village
	Vermin and Wildlife animal attacks	- Human population - Livestock - Crops	Parish	-Loss of lives -Livestock loss -Crop destruction	Parish	- Report to UWA - Guard gardens -Poison -Hunt and kill -Fence water collection points with Wildlife animals	Village
	Environmental degradation	- Human and livestock populations - Crops - Natural vegetation	Sub-county	-Crop failure -Shortage of pasture -Shortage of water -Decline of water quality	Sub-county	-Sensitization on wetland conservation -Sensitization on tree plating -Setting bi-laws -Enforcement -sustainable land management practices	Sub-county
	Landslides, Rock falls and Soil erosion	- Human and livestock adjacent to hill slopes - Crops on hill slopes - Infrastructure e.g. houses, schools, roads adjacent to hill slopes	Parish	- Loss of lives - Complete crop failure - Destruction of infrastructure e.g. homes, and schools	Parish	-Migration -Sensitization by both government and non-governmental agencies	
	Earth quakes	- Infrastructure e.g. houses, schools	District	- Loss of lives - Destruction of Infrastructure e.g. houses, schools	District	-No much measure so far	
	Floods	- Livestock adjacent to flood plain - Crops on flood plain - Infrastructure e.g. houses, schools, roads adjacent to flood plain	Parish	- Livestock loss - Destruction of crops - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain	Parish	-Migration -Sensitization on wetland conservation -Dig trenches	

Environmental component	Drought	- Livestock - Crops - Human population	Village	- Hunger & poverty - Livestock loss - Crop failure - Shortage of pasture - Shortage of water	Village	-Migration -Sensitization on tree planting -Buy food from elsewhere	
	Hailstorms, strong winds and Lightning	- Human and livestock populations - Crops - Infrastructure e.g. houses, schools, health centres	Parish	- Loss of lives - Destruction of crops - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain	Parish		
	Crop Pests and Diseases	-Crops	District	- Complete crop failure	District	- Spraying - Cut and burry affected crops -Sensitization on crop disease management	
	Livestock Pests and Diseases	-Livestock (cattle, goats etc.)	District	- Loss of livestock - Reduced livestock productivity	District	- Vaccination - Burry and burn animals that have died from infection - Quarantine	
	Human Disease outbreaks	- Human Population	District	- Loss of lives	District	- Mass Immunization - Use of mosquito nets	
	Invasive species	-indigenous species -Animals	District	- Outcompete the indigenous spp., suppress growth of indigenous spp - Loss of indigenous spp. - Complete crop Failure - suppress growth of pasture	District	- Cut and burn -Sensitization on Invasive species management	

	Bush fires	- Livestock - Crops - Infrastructure e.g. houses, schools	Sub-county	- Loss of livestock - Shortage of pasture - Destruction of crops - Destruction of infrastructure e.g. houses, schools	Sub-county	-Sensitization	
	Road accidents	- Human population - Infrastructure adjacent to accident black spots e.g. houses, schools etc.	Sub-county	- Loss of lives - Destruction of vehicles - Destruction of Infrastructure adjacent to accident black spots e.g. houses, schools etc.	Sub-county	-Humps on roads -Signage on speed limits -Sensitization on traffic rules	
	Land conflicts	- Human population	Village	-Loss of lives -Family violence and break outs	Village	- Community dialogue - District court in charge of land issues	
	Vermin and Wildlife animal attacks	- Human population - Livestock - Crops	Parish	-Loss of lives -Livestock loss -Crop destruction	Parish	- Report to UWA - Guard gardens -Poison -Hunt and kill -Fence water collection points with Wildlife animals	
	Environmental degradation	- Human and livestock populations - Crops - Natural vegetation	Sub-county	-Crop failure -Shortage of pasture -Shortage of water -Decline of water quality	Sub-county	-Sensitization on wetland conservation -Sensitization on tree plating -Setting bi-laws	

Table 6: Vulnerability Profile for Ntungamo District

	PROBABILITY	SEVERITY OF IMPACTS	RELATIVE RISK	VULNERABLE SUB COUNTIES
	Relative likelihood this will occur	Overall Impact (Average)	Probability x Impact Severity	
Hazards	1 = Not occur 2 = Doubtful 3 = Possible 4 = Probable 5 = Inevitable	1 = No impact 2= Low 3=medium 4 = High	0-1= Not Occur 2-10= Low 11-15=Medium 16-20= High	
Floods	4	3	12	The most affected sub-counties are; Rukoni East, Rukoni West, Rweikiniro, Ngoma and Kibatsi.
Droughts	5	4	20	The most affected sub-counties are; Ruhaama, Rukoni West, Rweikiniro, Ngoma, Kitwe TC and Rubaare town councils.
Soil erosion, rock falls and landslides	4	3	12	The most affected sub-counties are; Kayonza, Ihunga, Itojo, Nyakyera, Ruhaama, Rukoni East and Rukoni West.
Hail storms, Lightning and strong winds	4	4	16	The most affected sub-counties are; Ihunga, Itojo and Ngoma, Bwongyera and Rukoni west
Bush fires	4	3	12	The most affected sub-counties are; Ihunga, Nyakyera, Kayonza and Ngoma
Crop pests and diseases	4	4	16	The most affected sub-counties are; Ihunga, Itojo, Kayonza and Ngoma
Livestock pests and diseases	5	4	20	The most affected sub-counties are; Ruhaama, Rweikiniro, Kayonza and Ngoma
Human Diseases outbreaks	5	2	10	The most affected sub-counties are; Rwashamaire, Kitwe and Rubaare town councils and Ntungamo Mun.
Land conflicts	4	3	12	The most affected sub-counties are; Itojo, Kayonza and Ngoma.
Vermin and Wild-life animal attacks	4	3	12	The most affected sub-counties are; Nyabihoko and Rukoni East.

Earthquakes and faults	3	1	3	Entire district.
Road accidents	4	3	12	The most affected sub-counties; Ngoma, Rwashamaire TC and Ntungamo Mun.
Environmental degradation	4	4	16	The most affected sub-counties are; Bwongyera, Kibatsi, Itojo, Nyakyera, Rukoni East, Rweikiniro, Kayonza and Ngoma.
Invasive species	4	3	12	The most affected sub-counties are; Bwongyera, Ntungamo, Kitwe, Rukoni East, Nyabihoko and Rweikiniro.

Note: This table presents relative risk for hazards to which the community was able to attach probability and severity scores.

Key for Relative Risk

	High
	Medium
	Low
	Not reported/ Not prone

Table 7: Hazard Risk Assessment

Hazard	Bwongyera	Ihunga	Kibatsi	Nyabihoko	Rwashamaire T.C	Central Division	Eastern Division	Western Division	Itojo	Kitwe T.C	Ntungamo	Nyakyera	Ruhaama	Rukoni East	Rukoni West	Rweikiniro	Kayonza	Ngoma	Rubaare	Rubaare T.C	Rugarama
Floods	M	H	H	M	L	L	H	L	M	H	M	M	M	H	H	H	M	H	M	M	M
Drought	L	L	L	L	L	M	H	M	M	H	H	H	H	H	H	H	L	H	M	H	L
Landslides, Rock falls and Erosion	L	H	L	L	L	L	L	L	H	L	L	H	H	H	H	M	H	L	L	L	M
Strong winds, Hailstorms and Lightning	L	H	L	L	L	M	M	M	H	L	L	L	L	L	L	L	M	H	L	L	L
Crop pests and Diseases	M	H	M	M	M	M	M	M	H	M	M	M	M	M	M	L	H	H	M	M	M
Livestock pests and Diseases	L	L	L	M	M	L	L	L	M	H	M	M	H	M	M	H	H	H	M	M	L
Human disease outbreaks	M	M	M	M	H	H	H	H	M	H	M	M	M	M	M	M	M	M	M	H	M
Vermin and Wildlife animal attacks	L	L	M	H	L	L	L	L	L	L	L	L	L	H	L	M	L	M	L	L	L
Land conflicts	L	L	L	L	L	H	H	H	H	M	L	L	L	L	L	L	H	H	L	L	L
Bush fires	L	H	L	L	L	L	L	L	L	L	L	L	L	H	L	L	H	H	L	L	L
Environmental degradation	H	M	H	M	M	H	H	H	H	M	M	H	M	H	M	H	H	H	H	M	H
Earthquakes and faults	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Road accidents	L				H	H	H	H	H								H				
Invasive species	H	M	L	H	L	L	H	L	M	H	H	L	L	H	L	H	L	L	L	L	L

Key

H	High
M	Medium
L	Low
	Not reported/ Not prone

4.5.1 Gender and Age groups mostly affected by Hazards

Table 8: Gender and age groups mostly affected by hazards

Hazard	Gender and Age mostly affected
Drought	Affects mostly women and children since most water wells dry up increasing distance for fetching water
Erosion	All age groups and gender are affected
Hailstorms **Lightning**	All gender and age groups Children in schools are mostly affected
Crop pests and Diseases	All gender and age groups
Livestock pests and Diseases	African swine fever affects mostly women as most pigs belong to women but overall all groups are equally affected
Human disease outbreaks	Malaria mostly women and children HIV especially prominent in girl child Diarrhea and pneumonia in children
Vermin and Wildlife animal attacks	All gender and age groups
Land conflicts	All gender and age groups
Bush fires	All gender and age groups
Environmental degradation	All gender and age groups
Road accidents	All gender and age groups

4.5.2 Coping Strategies

In response to the various hazards, participants identified a range of coping strategies that the community employs to adjust to, and build resilience towards the challenges. The range of coping strategies are broad and interactive often tackling more than one hazard at a time and the focus of the communities leans towards adaptation actions and processes including social and economic frameworks within which livelihood and mitigation strategies take place; ensuring extremes are buffered irrespective of the direction of climate change and better positioning themselves to better face the adverse impacts and associated effects of climate induced and technological hazards (Table 2).

Table 9: Coping strategies to the Multi-hazards in Ntungamo District

No	Multi-Hazards		Coping strategies
1	Geomorphological or Geological	Landslides, Rock falls and Erosion	• Migration to safe areas • Terracing/ contour farming • Plant trees to control water movement on hill slopes • Mulching in banana plantations • Plant grass in banana plantations on hill slopes • Removal of stones from banana farmlands
2		Earthquakes and faults	• Designs of houses (pillars) • Early warning system • Vigilance • Sensitization • Emergency response mechanisms
3	Climatological or Meteorological	Floods	• Digging up of trenches in the flood plains • Planting trees to control water movement to flood plains • Migration to other areas • Seek for government food aid
4		Drought	• Leave wetlands as water catchments • Plant trees as climate modifiers • Buy food elsewhere in case of shortage • Buy water from the nearby areas • Food Storage especially dry grains
5		Strong winds, Hailstorms and Lightning	• Plant trees as wind breakers • Use of stakes against wind in banana plantations • Use of ropes to tire banana against wind • Installation of Lightning conductors • Stay indoors during rains • Changing building designs and roof types • Removal of destroyed crops • Request for aid from the Office of the Prime Minister • Installation of Lightning conductors on newly constructed schools
6	Ecological or Biological	Crop pests and Diseases	• Spraying pests • Cutting and burying BBW affected crops • Burning of affected crops • Vigilance
7		Livestock pests and Diseases	• Spraying pests • Vaccinations • Burying animals that have died from infection • Quarantine
8		Human epidemic Diseases	• Mass immunisation • Visiting health centres • Use of mosquito nets
9		Vermin and Wild-life animal attacks	• Guarding the gardens • Poisoning • Hunt and kill • Report to UWA • Hugo group • Mauritius thorns • Plant tea as buffer • Dig trenches • Chain link • Plant red pepper as buffer • Recommend vermin guards

10	Ecological or Biological	Invasive species	• Uproot • Spray with herbicides (e.g 2-4-D) • Biological control (e.g beetles) • Cut and burn • Sensitization on Invasive species management • Blacklisting exotic species
11	Human induced or technological	Land conflicts	• Community dialogues • Report to court • Migration • Resettlement • Surveying and titling • Strengthen Land management structures • Sensitization on land ownership • Proper demarcation (live fencing)
12		Bush fires	• Stop the fires in case of fire outbreak • Fire lines (may be constructed, cleared grass) • Fire breaks planted along gardens e.g. euphorbia spp. • Vigilance especially in dry seasons where most burning is done • Bye-laws • Sensitization on dangers of fires
13		Road accidents	• Construction of humps • Road Signage including speed limits • Separate lanes on sharp corners • Sensitisation • Widen narrow roads • Plant trees on road reserve, as road guards • Deployment of Traffic officers
14		Environmental degradation	• Leave wetlands as water catchments • Plant appropriate tree species as climate modifiers • Get Approval of the physical planning committee before construction • Sensitization • Bye-laws • Enforcement • Gazatte and demarcate wetlands • Restore wetlands and other fragile ecosystems • EIA for new developments • No land titles for wetland areas • Cancellation of existing wetland land titles • Developing land use plans and enforce them

GENERAL CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The multi-hazard vulnerability profile output from this assessment was a combination of spatial modeling using socio-ecological spatial layers (i.e. DEM, Slope, Aspect, Flow Accumulation, Land use, vegetation cover, hydrology, soil types and soil moisture content, population, socio-economic, health facilities, accessibility, and meteorological data) and information captured from District Key Informant interviews and sub-county FGDs using a participatory approach. The level of vulnerability was assessed at sub-county participatory engagements and integrated with the spatial modeling in the GIS environment.

Results from the participatory assessment indicated that Ntungamo district has over the past two decades increasingly experienced hazards including rock falls, soil erosion, floods, drought, hailstorms, strong winds, Lightning, crop pests and diseases, livestock pests and diseases, human disease outbreaks, vermin, wildlife animal attacks, invasive species, bush fires and land conflicts putting livelihoods at increased risk. Generally drought and flooding were identified as most serious problem in Ntungamo district with almost all sub-counties being vulnerable to the hazards. The limited adaptive capacity (and or/resilience) and high sensitivity of households and communities in Ntungamo district increase their vulnerability to hazard exposure necessitating urgent external support.

Hazards experienced in Ntungamo district can be classified as:

i. Geomorphological or Geological hazards including landslides, rock falls, soil erosion and earth quakes.
ii. Climatological or Meteorological hazards including floods, drought, hailstorms, strong winds and Lightning.
iii. Ecological or Biological hazards including crop pests and diseases, livestock pests and diseases, human disease outbreaks, vermin and wildlife animal attacks and invasive species.
iv. Human induced or Technological hazards including bush fires, road accidents land conflicts.

However, reducing vulnerability at community, local government and national levels should be a threefold effort hinged on:

i. Reducing the impact of the hazard where possible through mitigation, Adaptation, prediction, early warning and preparedness.
ii. Building capacities to withstand and cope with the hazards and risks.
iii. Tackling the root causes of the vulnerability such as poverty, poor governance, discrimination, inequality and inadequate access to resources and livelihood opportunities.

5.2 Policy-related Recommendations

The following recommended policy actions targeting vulnerability reduction include:

i. The government should improve enforcement of policies aimed at enhancing sustainable environmental management.
ii. The government through MAAIF should review the animal diseases control act because of low penalties given to defaulters.
iii. The government should establish systems to motivate technical staff and support of political leaders towards government initiatives and programmes aimed at disaster risk reduction.
iv. The government should increase awareness campaigns aimed at sensitizing farmers/ communities on disaster risk reduction initiatives and practices.

v. The government should revive disaster committees at district level and ensure funding of disaster and environmental related activities.
vi. The government through UNRA and the District authority should fund periodic maintenance of feeder roads to reduce on traffic accidents.
vii. The government through MAAIF and the District Production Office should promote drought and disease resistant crop seeds.
viii. The government through OPM and Meteorology Authority should increase importation of Lightning conductors and also reduce taxes on their importation.
ix. The government through OPM and Meteorology Authority should support establishment of disaster early warning systems.
x. The government through MWE increase funding and staff to monitor wetland degradation and non-genuine agro-inputs.
xi. The government through OPM should improve communication between the disaster department and local communities.
xii. The government through MWE should promote Tree planting along road reserves.
xiii. The government through MAAIF should fund and recruit extension works at sub-county level.

References

Jorn Birkmann (2006). Measuring Vulnerability to promote Disaster-Resilient Societies: Conceptual Frameworks and Definitions

MWE (2013). Water and Environment Sector Performance Report: Ministry of Water and Environment, Kampala

MWE (2012). Uganda National Climate Change Policy, Ministry of Water and Environment, Kamapla, Final version for approval, 18 July 2012, p.2

Ntungamo District Local Government (2015). District Development Plan 2015/2016-2019/2020.

UBOS (2014). National Housing Population Census 2014; Uganda Bureau of Statics, Kampala

UNDP-UNDRO (1991). Mitigation Strategies in Disaster Mitigation UN Disaster Management

Key informant interview at Ngoma Sub-county headquarters

FOCUS GROUP DISCUSSION GUIDE FOR DISTRICT DISASTER RISK MANAGEMENT FOCAL PERSONS

Interviewer Team Name(s)	District:	GPS Coordinates	
	Sub- county:	X:	
	Parish:	Y:	
	Village:	Altitude	

No.	Name of Participants	Designation	Contact	Signature

Introduction

i. You have all been requested to this session because we are interested in learning from you. We appreciate your rich experiences and hope to use them to strengthen service delivery across the district and the country as whole in a bid to improve access to information on Hazards and early warning.

ii. There is no “right” or “wrong” answers to any of the questions. As a Focus Group Discussion leader, I will try to ask all people here today to take turns speaking. If you have already spoken several times, I may call upon someone who has not said as much. I will also ask people to share their remarks with the group and not just with the person beside them, as we anxious to hear what you have to say.

iii. This session will be tape recorded so we can keep track of what is said, write it up later for our report. We are not attaching names to what you have to what is said, so whatever you say here will be anonymous and we will not quote you by name.

iv. I would not like to keep you here long; at most we should be here for 30 minutes- 1 hour.

Section A: Geomorphological or Geological Hazards (Landslides, rock falls, soil erosion and earth quakes)

1. Which crops are majorly grown in your area of jurisdiction?

2. Which domestic animals are dominant in your area of jurisdiction?

3. What challenges are faced by farmers in your area of jurisdiction?

4. Have you experienced landslides and rock falls in the past 10 years in your area of jurisdiction?

5. Which villages, parishes or sub-counties have been most affected by landslide and rock falls?

6. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?

7. Which crops are majorly affected by landslides and rock falls in your area of jurisdiction?

8. In which way are the crops affected by landslides and rock falls?

9. Which domestic animals are majorly affected by landslides and rock falls in your area of jurisdiction?

10. In which way are the domestic animals affected by landslides and rock falls?

11. Which agricultural practices are being adopted by farmers in a bid to mitigate the above challenges?

12. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?

13. Do you have any earth faults or earth cracks as lines of weakness in your area of jurisdiction?

14. Have you experienced any earth quakes in the past 10 years in your area of jurisdiction?

15. Which particular villages, parishes or sub-counties have been majorly affected by earth quakes in your area of jurisdiction?

16. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?

17. What impacts have been caused by earth quakes?

18. To what extent have the earth quakes affected livelihoods of the local communities in your area of jurisdiction?

19. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?

20. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

Section B: Meteorological or climatological hazards (Floods, Droughts, Lightning, strong winds, hailstorms)

21. Have you experienced floods in the past 10 years in your area of jurisdiction?

22. Which villages, parishes or sub-counties have been most affected by floods?

23. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?

24. Which crops are majorly affected by floods in your area of jurisdiction?

25. In which way are the crops affected by floods?

26. Which domestic animals are majorly affected by floods in your area of jurisdiction?

27. In which way are the domestic animals affected by floods?

28. Which agricultural practices are being adopted by farmers in a bid to mitigate the above challenges?

29. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?

30. Have you experienced drought in the past 10 years in your area of jurisdiction?

31. Which villages, parishes or sub-counties have been most affected by drought?

32. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?

33. Which crops are majorly affected by drought in your area of jurisdiction?

34. In which way are crops affected by drought?

35. Which domestic animals are majorly affected by drought in your area of jurisdiction?

36. In which way are the domestic animals affected by drought?

37. Which agricultural practices are being adopted by farmers in a bid to mitigate the above challenges?

38. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?

39. Have you experienced hailstorms or Lightning in the past 10 years in your area of jurisdiction?

40. Which villages, parishes or sub-counties have been most affected by hailstorms or Lightning?

41. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?

42. What impacts have been caused by hailstorms or Lightning?

43. To what extent have the hailstorms or Lightning affected livelihoods of the local communities in your area of jurisdiction?

44. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?

45. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

Section C: Biological hazards (Crop pests and diseases, Livestock pests and Diseases, Invasive species, vermin and wild-life animal attacks)

46. Have you experienced any epidemic animal disease outbreaks in the past 10 years in your area of jurisdiction?

47. Which villages, parishes or sub-counties have been most affected by epidemic animal disease outbreaks?

48. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?

49. Specify the epidemic animal disease outbreaks that have majorly affected animals in your area of jurisdiction?

50. Which domestic animals are majorly affected by epidemic animal disease outbreaks in your area of jurisdiction?

51. In which way are the domestic animals affected by epidemic animal disease outbreaks?

52. Which mitigation practices are being adopted by farmers in a bid to mitigate the above epidemic animal disease outbreaks?

53. What are the relevant government's interventions focusing at helping farmers mitigate the epidemic animal disease outbreaks mentioned?

54. Have you experienced any crop pests and disease outbreaks in the past 10 years in your area of jurisdiction?

55. Which villages, parishes or sub-counties have been most affected by epidemic animal disease outbreaks?

56. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?

57. Specify the crop pests and disease outbreaks that have majorly affected animals in your area of jurisdiction?

58. Which crops are majorly affected by crop pests and disease outbreaks in your area of jurisdiction?

59. In which way are the crops affected by crop pests and disease outbreaks?

60. Which mitigation practices are being adopted by farmers in a bid to mitigate the above crop pests and disease outbreaks?

61. What are the relevant government's interventions focusing at helping farmers mitigate the crop pests and disease outbreaks mentioned?

62. Have you experienced any epidemic human disease outbreaks in the past 10 years in your area of jurisdiction?

63. Specify the epidemic human disease outbreaks that have majorly affected animals in your area of jurisdiction?

64. In which way are the humans affected by epidemic human disease outbreaks?

65. Which mitigation measures have been adopted by local communities in a bid to mitigate the above epidemic human disease outbreaks?

66. What are the relevant government's interventions focusing at helping local communities mitigate the epidemic human disease outbreaks mentioned?

67. Do you have any national park or wildlife reserve in your area of jurisdiction?

68. Have you experienced wildlife attacks in the past 10 years in your area of jurisdiction?

69. Which particular villages, parishes or sub-counties have been majorly affected by wildlife attacks in your area of jurisdiction?

70. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?

71. What impacts have been caused by wildlife attacks?

72. To what extent have the wildlife attacks affected livelihoods of the local communities in your area of jurisdiction?

73. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?

74. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

75. Are there invasive species in your area of jurisdiction?

76. Specify the invasive species in your area of jurisdiction?

77. Which villages, parishes or sub-counties have been most affected by invasive species in your area of jurisdiction?

78. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?

79. Which crops or animals are majorly affected by invasive species in your area of jurisdiction?

80. In which way are the crops or animals affected by invasive species?

81. Which mitigation practices are being adopted by farmers in a bid to mitigate the above invasive species?

82. What are the relevant government's interventions focusing at helping farmers mitigate the invasive species mentioned?

Section D: Human induced or Technological hazards (Land conflicts, bush and forest fires, road accidents, water accidents and environmental degradation)

83. Have you experienced environmental degradation in your area of jurisdiction?

84. What forms of environmental degradation have been experienced in your area of jurisdiction?

85. Which villages, parishes or sub-counties have been most affected by environmental degradation?

86. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?

87. What impacts have been caused by environmental degradation?

88. Which measures have been adopted by local communities in a bid to mitigate the above challenges?

89. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

90. Have you experienced land conflicts in the past 10 years in your area of jurisdiction?

91. Which particular villages, parishes or sub-counties have been majorly affected by land conflicts in your area of jurisdiction?

92. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?

93. What impacts have been caused by land conflicts?

94. To what extent have the land conflicts affected livelihoods of the local communities in your area of jurisdiction?

95. Which conflict resolution measures have been adopted local communities in a bid to mitigate the above challenges?

96. What are the relevant government's interventions focusing at helping local communities mitigate

the challenges mentioned?

97. Have you experienced Road accidents in the past 20 years in your area of jurisdiction?

98. Which roads have experienced Road accidents?

99. What impacts have been caused by Road accidents?

100. To what extent have the Road accidents affected livelihoods of the local communities in your area of jurisdiction?

101. Which conflict resolution measures have been adopted local communities in a bid to mitigate the above challenges?

102. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

103. Have you experienced any serious bush and or forest fires in the past 10 years in your area of jurisdiction?

104. Which particular villages, parishes or sub-counties have been majorly affected by bush and or forest fires in your area of jurisdiction?

105. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?

106. What impacts have been caused by serious bush and or forest fires?

107. To what extent have the serious bush and or forest fires affected livelihoods of the local communities in your area of jurisdiction?

108. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?

109. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

FOCUS GROUP DISCUSSION GUIDE FOR LOCAL COMMUNITIES

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	Parish:	Y:	
	Village:	Altitude	

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3. What challenges are faced by farmers in your community?

4. Have you experienced landslides and rock falls in the past 10 years in your community?

5. Which villages and parishes have been most affected by landslide and rock falls?

6. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?

7. Which crops are majorly affected by landslides and rock falls in your community?

8. In which way are the crops affected by landslides and rock falls?

9. Which domestic animals are majorly affected by landslides and rock falls in your community?

10. In which way are the domestic animals affected by landslides and rock falls?

11. Which agricultural practices are being adopted by farmers in a bid to mitigate the above challenges?

12. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?

13. Do you have any earth faults or earth cracks as lines of weakness in your community?

14. Have you experienced any earth quakes in the past 10 years in your community?

15. Which particular villages, parishes or sub-counties have been majorly affected by earth quakes in your community?

16. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes that have been most affected?

17. What impacts have been caused by earth quakes?

18. To what extent have the earth quakes affected livelihoods of the local communities in your community?

19. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?

20. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

Section B: Meteorological or climatological hazards (Floods, Droughts, Lightning, strong winds, hailstorms)

21. Have you experienced floods in the past 10 years in your community?

22. Which villages and parishes have been most affected by floods?

23. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?

24. Which crops are majorly affected by floods in your community?

25. In which way are the crops affected by floods?

26. Which domestic animals are majorly affected by floods in your community?

27. In which way are the domestic animals affected by floods?

28. Which agricultural practices are being adopted by farmers in a bid to mitigate the above challenges?

29. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?

30. Have you experienced drought in the past 10 years in your community?

31. Which villages and parishes have been most affected by drought?

32. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?

33. Which crops are majorly affected by drought in your community?

34. In which way are crops affected by drought?

35. Which domestic animals are majorly affected by drought in your community?

36. In which way are the domestic animals affected by drought?

37. Which agricultural practices are being adopted by farmers in a bid to mitigate the above challenges?

38. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?

39. Have you experienced hailstorms or Lightning in the past 10 years in your community?

40. Which villages and parishes have been most affected by hailstorms or Lightning?

41. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?

42. What impacts have been caused by hailstorms or Lightning?

43. To what extent have the hailstorms or Lightning affected livelihoods of the local communities in your community?

44. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?

45. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

Section C: Biological hazards (Crop pests and diseases, Livestock pests and Diseases, Invasive species, vermin and wild-life animal attacks)

46. Have you experienced any epidemic animal disease outbreaks in the past 10 years in your community?

47. Which villages and parishes have been most affected by epidemic animal disease outbreaks?

48. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?

49. Specify the epidemic animal disease outbreaks that have majorly affected animals in your community?

50. Which domestic animals are majorly affected by epidemic animal disease outbreaks in your community?

51. In which way are the domestic animals affected by epidemic animal disease outbreaks?

52. Which mitigation practices are being adopted by farmers in a bid to mitigate the above epidemic animal disease outbreaks?

53. What are the relevant government's interventions focusing at helping farmers mitigate the epidemic animal disease outbreaks mentioned?

54. Have you experienced any crop pests and disease outbreaks in the past 10 years in your community?

55. Which villages and parishes have been most affected by epidemic animal disease outbreaks?

56. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?

57. Specify the crop pests and disease outbreaks that have majorly affected animals in your community?

58. Which crops are majorly affected by crop pests and disease outbreaks in your community?

59. In which way are the crops affected by crop pests and disease outbreaks?

60. Which mitigation practices are being adopted by farmers in a bid to mitigate the above crop pests and disease outbreaks?

61. What are the relevant government's interventions focusing at helping farmers mitigate the crop

pests and disease outbreaks mentioned?

62. Have you experienced any epidemic human disease outbreaks in the past 10 years in your community?

63. Specify the epidemic human disease outbreaks that have majorly affected animals in your community?

64. In which way are the humans affected by epidemic human disease outbreaks?

65. Which mitigation measures have been adopted by local communities in a bid to mitigate the above epidemic human disease outbreaks?

66. What are the relevant government's interventions focusing at helping local communities mitigate the epidemic human disease outbreaks mentioned?

67. Do you have any national park or wildlife reserve in your area of jurisdiction?

68. Have you experienced wildlife attacks in the past 10 years in your community?

69. Which particular villages and parishes have been majorly affected by wildlife attacks in your community?

70. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?

71. What impacts have been caused by wildlife attacks?

72. To what extent have the wildlife attacks affected livelihoods of the local communities in your community?

73. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?

74. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

75. Are there invasive species in your community?

76. Specify the invasive species in your community?

77. Which villages and parishes have been most affected by invasive species in your community?

78. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?

79. Which crops or animals are majorly affected by invasive species in your community?

80. In which way are the crops or animals affected by invasive species?

81. Which mitigation practices are being adopted by farmers in a bid to mitigate the above invasive species?

82. What are the relevant government's interventions focusing at helping farmers mitigate the invasive species mentioned?

Section D: Human induced or Technological hazards (Land conflicts, bush and forest fires, road accidents, water accidents and environmental degradation)

83. Have you experienced environmental degradation in your community?

84. What forms of environmental degradation have been experienced in your community?

85. Which villages and parishes have been most affected by environmental degradation?

86. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?

87. What impacts have been caused by environmental degradation?

88. Which measures have been adopted by local communities in a bid to mitigate the above challenges?

89. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

90. Have you experienced land conflicts in the past 10 years in your community?

91. Which particular villages and parishes have been majorly affected by land conflicts in your community?

92. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?

93. What impacts have been caused by land conflicts?

94. To what extent have the land conflicts affected livelihoods of the local communities in your community?

95. Which conflict resolution measures have been adopted local communities in a bid to mitigate the above challenges?

96. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

97. Have you experienced Road accidents in the past 20 years in your community?

98. Which roads have experienced Road accidents?

99. What impacts have been caused by Road accidents?

100. To what extent have the Road accidents affected livelihoods of the local communities in your community?

101. Which conflict resolution measures have been adopted local communities in a bid to mitigate the above challenges?

102. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

103. Have you experienced any serious bush and or forest fires in the past 10 years in your community?

104. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?

105. What impacts have been caused by serious bush and or forest fires?

106. To what extent have the serious bush and or forest fires affected livelihoods of the local communities in your community?

107. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?

108. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

FOCUS GROUP ATTENDANCE LIST FOR DISTRICT DISASTER RISK MANAGEMENT FOCAL PERSONS

Name of Participant	Designation	Contact
1. Mugabe Albert	Acting District Production Officer	0772886842
2. Tumwebaze Dinnah	Senior Environment Officer	0772643221
3. Ahabwe Johnson	District Statistian	0779532508
4. Atwiine Esther	District Agricultural Officer	0782963002

FOCUS GROUP DISCUSSION ATTENDANCE LIST FOR LOCAL COMMUNITIES

Name of Participant	Village/Parish	Contact
1. Basude Enock	Kagarama	0782022904
2. Tusingwire Charles	Ruhega	0772358069
3. Muhwezi Davis	Rwakitami	0788207270
4. Kukundakwe Dianah	Rwakitami	0781668174
5. Bategyereize Robinson	Rwakitami	0788337292
6. Kabandize Cyprian	Itojo	0751937532
7. Natukunda Juliet	Itojo	0701690304
8. Bashemeire Jackline	Itojo	0701365446
9. Mwesigwa Boaz	Itojo	0706943683
10. Tumwesigye Yayeli	Itojo	0757696961
11. Rushaija F.	Itojo	0788881043
12. Mwebesa Jadress	Itojo	0783451998
13. Kanabahita Tom	Itojo	0782850550

SPATIAL DATA COLLECTION SHEET FOR HAZARD VULNERABILITY AND RISK MAPPING

<table>
<tr><td colspan="2" rowspan="4">Observer Name:

Date:</td><td colspan="2" rowspan="4">District:

Sub- county:

Parish:

Village:</td><td colspan="2">Coordinates</td></tr>
<tr><td>X:</td><td></td></tr>
<tr><td>Y:</td><td></td></tr>
<tr><td>Altitude</td><td></td></tr>
<tr><td colspan="2">Slope characterization</td><td colspan="2">Bio-physical characterization</td><td colspan="2">Vegetation characterization</td><td rowspan="6">Land use type (tick)
Bush
Grassland
Wetland
Tree plantation
Natural forest
Cropland
Built-up area
Grazing land
Others</td></tr>
<tr><td>Slope degree (e.g 10, 20, …)</td><td></td><td>Soil Texture</td><td></td><td>Veg. cover (%)</td><td></td></tr>
<tr><td>Slope length (m) (e.g 5, 10, …)</td><td></td><td>Soil Moisture</td><td></td><td>Tree cover (%)</td><td></td></tr>
<tr><td>Aspect (e.g N, NE…)</td><td></td><td>Rainfall</td><td></td><td>Shrubs cover (%)</td><td></td></tr>
<tr><td>Elevation (e.g high, low…)</td><td></td><td>Drainage</td><td></td><td>Grass / Herbs cover (%)</td><td></td></tr>
<tr><td>Slope curvature (e.g concave, covex…)</td><td></td><td>Temperature</td><td></td><td>Bare land cover</td><td></td></tr>
<tr><td colspan="7">Area Description (Susceptibility ranking: landslide, mudslide, erosion, flooding, drought, hailstorms, Lightning, cattle disease outbreaks, human disease outbreaks, land conflicts, wildlife conflicts, bush fires, earthquakes, faults/ cracks, pictures, any other sensitive features)</td></tr>
</table>

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