



# Kanungu District

## Hazard, Risk and Vulnerability Profile



2016



## Acknowledgment

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.

I extend my sincere thanks to the Department of Relief, Disaster Preparedness and Management, under the leadership of the Commissioner, Mr. Martin Owor, for the oversight and management of the entire exercise.

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

Our gratitude goes to UNDP for providing funds to support the Hazard, Risk and Vulnerability Mapping. The team comprised of Mr. Steven Goldfinch – Disaster Risk Management Advisor, Mr. Gilbert Anguyo - Disaster Risk Reduction Analyst, and Mr. Ongom Alfred-Early Warning system Programmer.

My appreciation also goes to Kanungu District Team;

1. Mr. Begumya N. Eriab Deputy Chief Administrative Officer
2. Mr. Agaba George District Environment Officer
3. Dr. Tumwesigye A District Veterinary Officer
4. Mr. Turyamureeba Stephen Senior Community Development Officer
5. Mr. Atuhaire Innocent District Planner

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: Deputy Chief Administrative Officer, District Environment Officer, District Veterinary Officer, District Planner and Senior Community Development Officer 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 Kanyantorogo, Kihiihi, Mpungu 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 hazard 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 Kanungu district were classified as:**

- Geomorphological or Geological hazards including landslides, rock falls, soil erosion and earthquakes.
- 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 Kanungu 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, road accidents and land conflicts putting livelihoods at increased risk. Landslides and floods were identified as most serious problems in Kanungu district with almost all sub-counties being vulnerable to the hazards. This is due to its rugged terrain with a slope percentage rise (20+) which makes it vulnerable to landslides, 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 counteract 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, 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 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.

## TABLE OF CONTENTS

ACKNOWLEDGMENT .....	i
EXECUTIVE SUMMARY .....	ii
TABLE OF CONTENTS .....	vii
LIST OF FIGURES .....	ix
LIST OF TABLES .....	ix
LIST OF PLATES .....	ix
LIST OF ACRONYMS .....	x
DEFINITION OF KEY TERMS .....	xi
<b>INTRODUCTION .....</b>	<b>1</b>
1.1 Background .....	1
1.2 Objectives of the study .....	1
1.2.1 Main objective .....	1
1.2.3 Specific Objectives .....	1
1.3 Scope of Work .....	1
1.4 Justification .....	2
1.5 Structure of the Report .....	2
2.1 Location .....	3
2.1.1 Geomorphology .....	4
2.1.2 Geology and Soils .....	5
2.1.3 Vegetation and Land use Stratification .....	6
2.1.4 Temperature and Humidity .....	8
2.1.5 Wind .....	8
2.1.6 Rainfall .....	8
2.1.7 Hydrology .....	10
2.1.8 Population .....	10
2.1.9 Economic activities .....	11
<b>METHODOLOGY .....</b>	<b>12</b>
3.1 Collection and analysis of field data using GIS .....	12
3.1.1 Preliminary spatial analysis .....	12
3.1.2 Stakeholder engagements .....	12
3.1.3 Participatory GIS .....	12
3.1.4 Geo-referencing and ground-truthing .....	12
3.2 Develop District Specific Multi-hazard Risk and Vulnerability Profiles .....	13
3.2.1 Data analysis and integration .....	13
3.2.2 Data verification and validation .....	13
3.3 Preserve the Spatial data to enable future use of the maps .....	13
<b>RESULTS FROM MULTI-HAZARD RISK, VULNERABILITY MAPPING .....</b>	<b>14</b>
4. Multi-hazards .....	14
4.1 Geomorphological and Geological Hazards .....	14
4.1.1 Landslides, rock falls and soil erosion .....	14
4.1.2 Earthquakes and faults .....	16
4.2 Climatological and Meteorological Hazards .....	17
4.2.1 Floods .....	17
4.2.2 Drought .....	19
4.2.3 Hailstorms .....	20

4.2.4 Strong winds.....	20
4.2.5 Lightning .....	22
4.3 Ecological and Biological Hazards.....	23
4.3.1 Crop Pests and Diseases.....	23
4.3.2 Livestock Pests and Diseases.....	25
4.3.3 Human Diseases outbreaks .....	26
4.3.4 Vermin and Wild-life Animal Attacks.....	27
4.3.5 Invasive species .....	28
4.4 Human Induced and Technological Hazards .....	30
4.4.1 Bush and forest fires .....	30
4.4.2 Land conflicts .....	32
4.4.3 Environmental Degradation.....	33
4.4.4 Road Accidents .....	34
4.5 VULNERABILITY PROFILE.....	35
4.5.1 Gender and Age groups mostly affected by Hazards.....	42
4.5.2 Coping Strategies.....	43
<b>GENERAL CONCLUSIONS AND RECOMMENDATIONS .....</b>	<b>46</b>
5.1 Conclusions .....	46
5.2 Policy Related Recommendations .....	46
<b>References .....</b>	<b>48</b>
<b>APPENDIX I: DATA COLLECTION TOOLS.....</b>	<b>49</b>



## LIST OF FIGURES

Figure 1: Administrative Boundaries and Gazetted Areas .....	3
Figure 2: Geomorphology, Kanungu District.....	4
Figure 3: Geology and Lithological Structures, Kanungu District .....	5
Figure 4: Land use Stratification and Gazetted Areas, Kanungu District .....	7
Figure 5: Total Annual Rainfall Distribution, Kanungu District .....	9
Figure 6: Population Distribution, Kanungu District.....	11
Figure 7: Landslides, Rock fall and Soil erosion Prone Areas, Kanungu District .....	15
Figure 8: Earth quakes Vulnerability and Fault/Fracture lines, Kanungu District .....	16
Figure 9: Flood Prone Areas and Vulnerability Ranking, Kanungu District .....	18
Figure 10: Drought Prone Areas and Vulnerability Ranking, Kanungu District.....	19
Figure 11: Strong winds, Hailstorms and Lightning Hotspots and Vulnerability, Kanungu District.....	22
Figure 12: Crop Pests and Diseases vulnerability, Kanungu District.....	24
Figure 13: Livestock Pests and Diseases vulnerability, Kanungu District .....	25
Figure 14: Human Diseases Prevalence and Health Facilities, Kanungu District .....	26
Figure 15: Vermin and Wild-life Animal conflicts and vulnerability, Kanungu District .....	27
Figure 16: Invasive species vulnerability, Kanungu District.....	29
Figure 17: Bush/Forest fires Hotspot Areas, Kanungu District .....	31
Figure 18: Land Conflicts Ranking, Kanungu District, .....	33
Figure 19: Road Accidents Hotspots and Vulnerability, Kanungu District .....	35

## LIST OF TABLES

Table 1: Precipitation Patterns for Kanungu District 2014 .....	8
Table 2: Population Distribution in Kanungu District.....	10
Table 3: Components of Vulnerability in Kanungu District.....	36
Table 4: Vulnerability Profile for Kanungu District.....	40
Table 5: Hazard Risk Assessment.....	41
Table 6: Gender and age groups mostly affected by hazards .....	42
Table 7: Coping strategies to the Multi-hazards in Kanungu District .....	43

## LIST OF PLATES

Plate 1: Eroded road side in Kihiihi Sub-county .....	14
Plate 2: Flooding hot spot in Butogota Town Council .....	17
Plate 3: Banana plantation destroyed by hailstorm in Mpungu Sub-county .....	20
Plate 4: Matanda primary school in Kihiihi sub-county that was destroyed by strong winds.....	20
Plate 5: House that was destroyed by strong winds in Mpungu Sub-county.....	21
Plate 6: Banana plantation affected by banana bacterial wilt in Kihiihi Sub-county .....	23
Plate 7: Thickets of Lantana camara in Kateete Sub-county.....	28
Plate 8: Management bush fires in Queen Elizabeth National Park, Kihiihi Sub-county.....	30
Plate 9: Murram extraction in Kihiihi Sub-county.....	33
Plate 10: Sand mining in Kihiihi Sub-county.....	33

## LIST OF ACRONYMS

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 moving the disaster management paradigm from the traditional emergency response focus toward 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 Atlas of hazard, risk and vulnerability conditions in the country to encourage mainstreaming of disaster and climate risk management in development planning and contingency planning at national and local levels.

From 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 Kanungu 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 Kanungu 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 Kanungu 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 Kanungu district. Section 3 focuses on the methodology employed. Section 4 elaborates the Multi-hazard, Risks and Vulnerability profile and Coping strategies for Kanungu district. Section 5 describes Conclusions and policy related recommendations.

## OVERVIEW OF KANUNGU DISTRICT

### 2.1 Location

Kanungu District is located between coordinates: 0° 57' 0" S and 29° 47' 0" E in southwestern Uganda and was carved out of Rukungiri District on 1<sup>st</sup> July, 2001. Kanungu District is bordered by Rukungiri District to the north and east, Kabale District to the southeast, Kisoro District to the southwest and the Democratic Republic of the Congo to the west. The district has 13 sub-counties and 4 town councils. These include; Kambuga, Kanyantorogo, Katete, Kayonza, Kihiihi, Kinaaba, Kirima, Mpungu, Nyakinoni, Nyamirama, Nyanga, Rugyeyo and Rutenga sub-counties and Butogota, Kambuga, Kanungu and Kihiihi town councils. The District has 79 parishes and 528 villages. Figure 1 shows the Administrative boundaries and gazetted areas of Kanungu District.

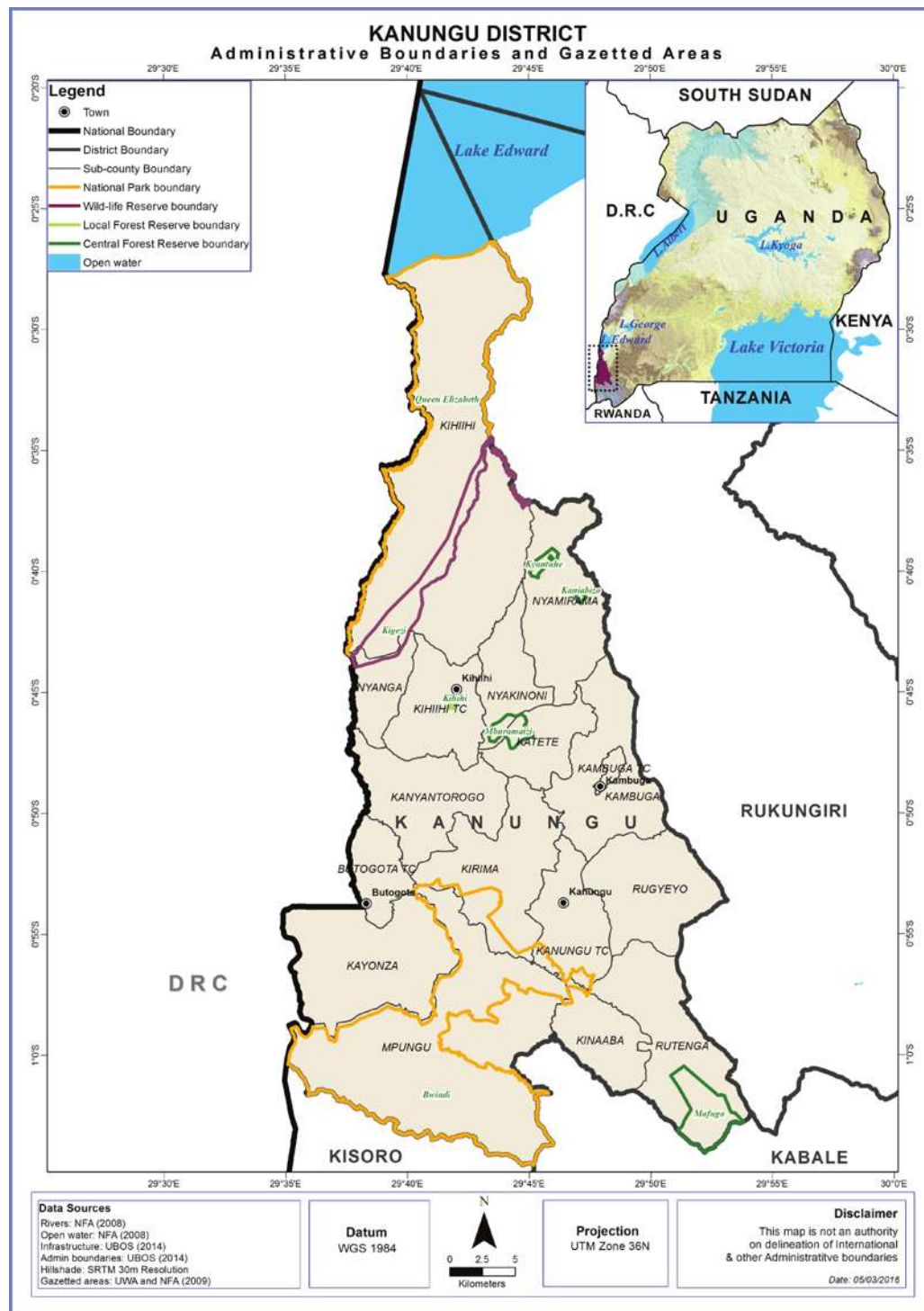


Figure 1: Administrative Boundaries and Gazetted Areas, Kanungu District

### 2.1.1 Geomorphology

Kanungu district lies in the fringes of the western rift valley with the Northern part forming part of the Rift valley with undulating plains with the middle part (sub-counties of Rugyeyo, Kirima and parts of Kanyantorogo) comprising of flat topped hills with gentle sloping sides and broad valleys. These hills gradually increase in height to the highlands of Rutenga with Burimbi peak of Mafuga being the highest at 82222ft (2503m) above sea level with some parts of Kihihi Sub County lying in the fringes of the western Eastern African rift valley. Figure 2 shows the geomorphology of Kanungu District.

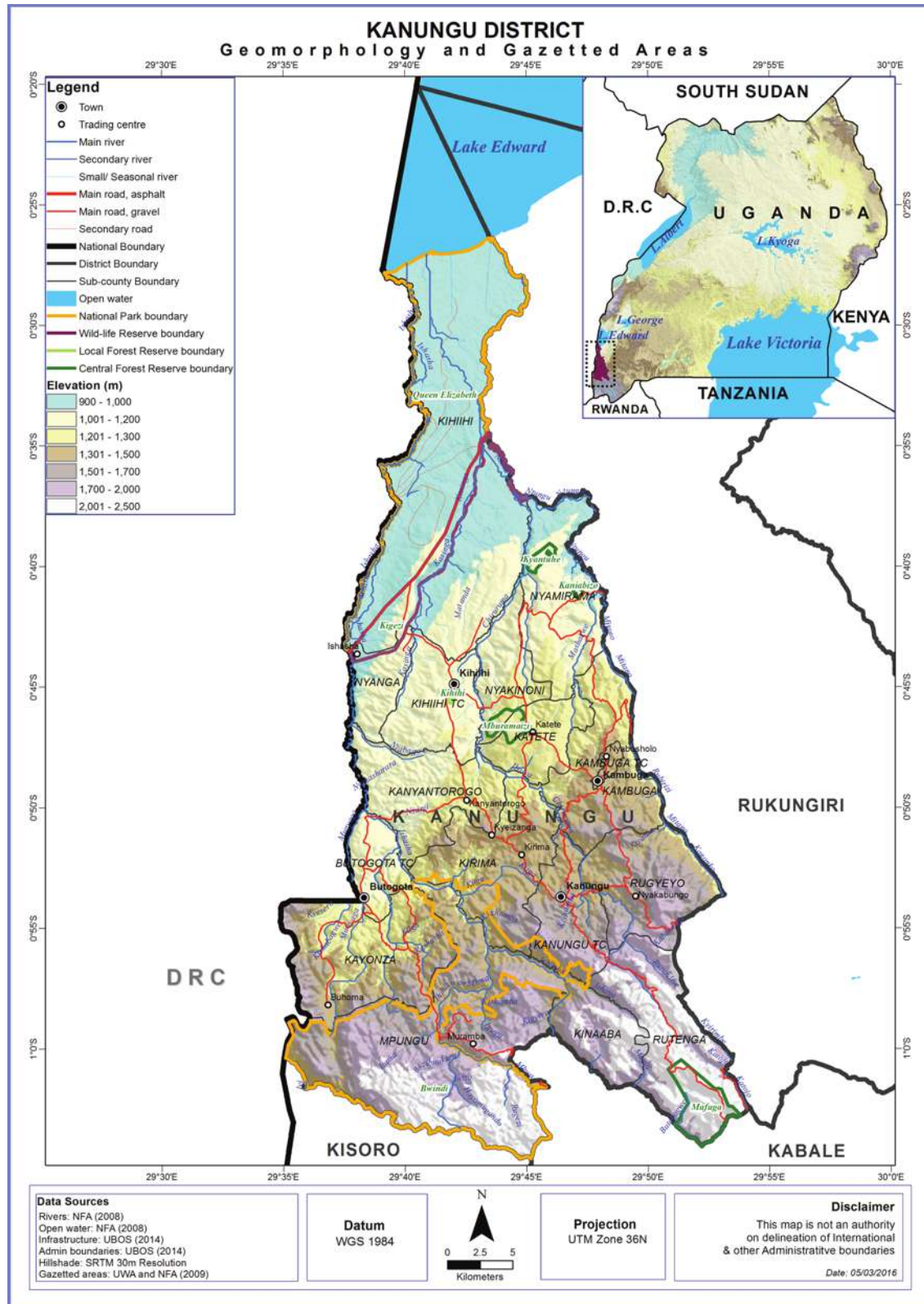


Figure 2: Geomorphology, Kanungu District

### 2.1.2 Geology and Soils

The most common types of soils are greyish brown, sandy loams and reddish brown sand (especially in Kihiihi and Nyamirama sub-counties). The geological study done by the Geology Department MoEMD Ministry of Energy and Mineral Development indicated that the northern parts of the district are dominated by rift alluvium rocks while the southern parts are dominated by mudstone, shale, slate and phyllite rocks (Figure 3).

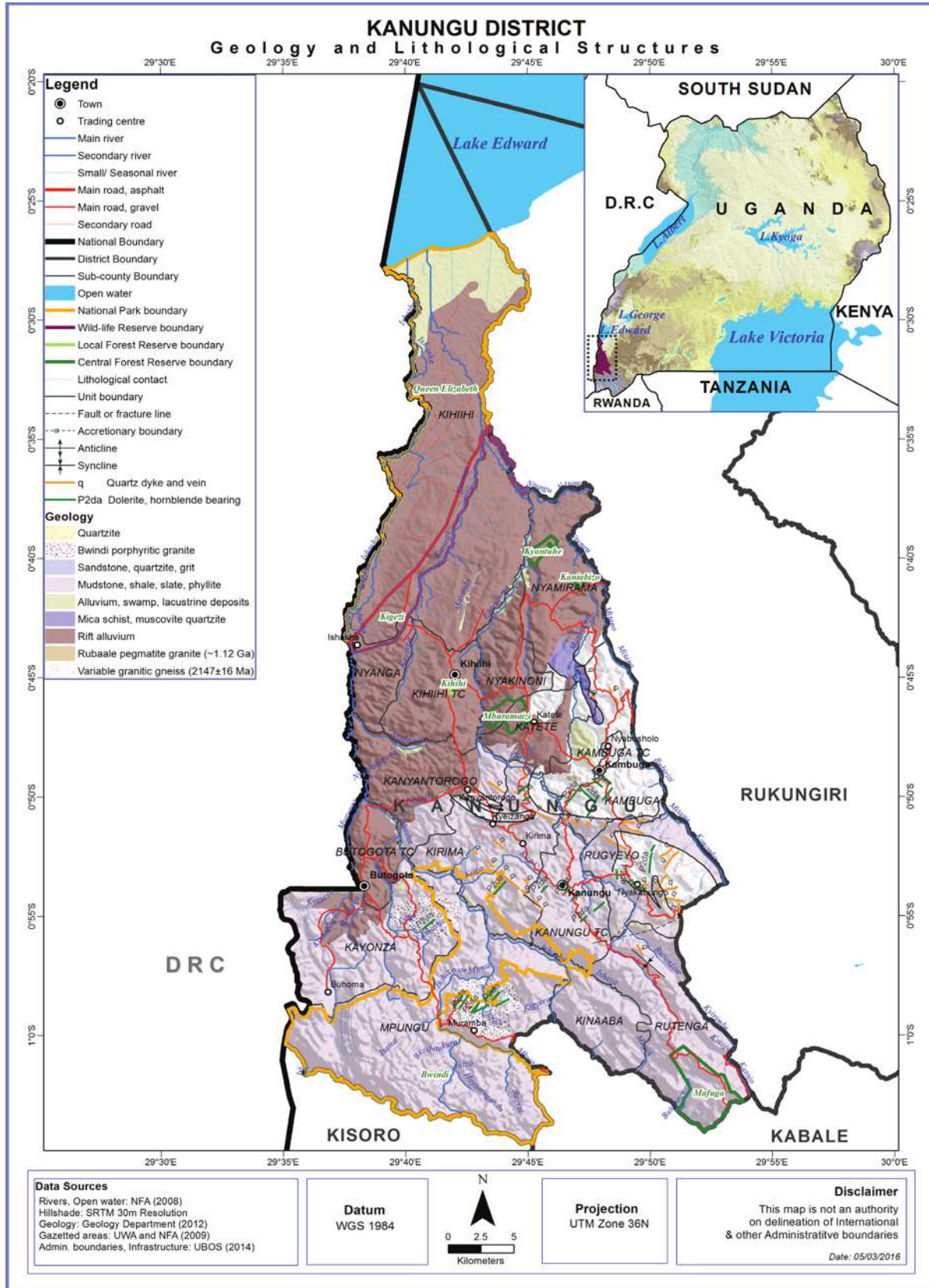


Figure 3: Geology and Lithological Structures, Kanungu District



### 2.1.3 Vegetation and Land use Stratification

Kanungu district has a total area of 1,228.28 sq. km, comprising 60percent small-scale farmland, 15% high tropical forest, 11% woodland, 9% grassland, 2% bush land, 1% open water and 2% miscellaneous mosaics. The vegetation ranges from the high tropical forests of Bwindi Impenetrable to the grasslands of Queen Elizabeth National Parks.

Agriculture is the main land use in Kanungu District and a major economic activity. The land is highly fragmented due to traditional practices of inheritance and high population density. Land is held in customary private ownership although there are few relatively well-off farmers with leasehold titles. Most of the Grazing lands are communally owned and land fragmentation is a common feature. The concept of 'land use planning' is still new and is only practiced to a limited extent in the townships, where specific areas are assigned for industries, commercial building, residential, road networks and institutional sites. Parts of the district lie in Queen Elizabeth National Park (QENP) biosphere reserve and Bwindi Impenetrable National Park (BINP) World Heritage Site.

Cultivation covers most hill tops and many wetlands have been drained, while very little of the original forest outside the parks still remains. Though much of the original forest has been cleared, a number of privately owned woodlots have been established with exotic tree species mainly eucalyptus and pines. Land shortage, coupled with intensive use for subsistence agriculture, has led to soil degradation, poor yields and ultimately poverty.

Some small-scale artisan fishing takes place within inland water bodies including wetlands and rivers. The majority of fish consumed in the district (~90%) are obtained in Lake Edward through the Rwenshama landing site in Rukungiri. Figure 4 shows the Land use Stratification and Gazetted areas of Kanungu District.

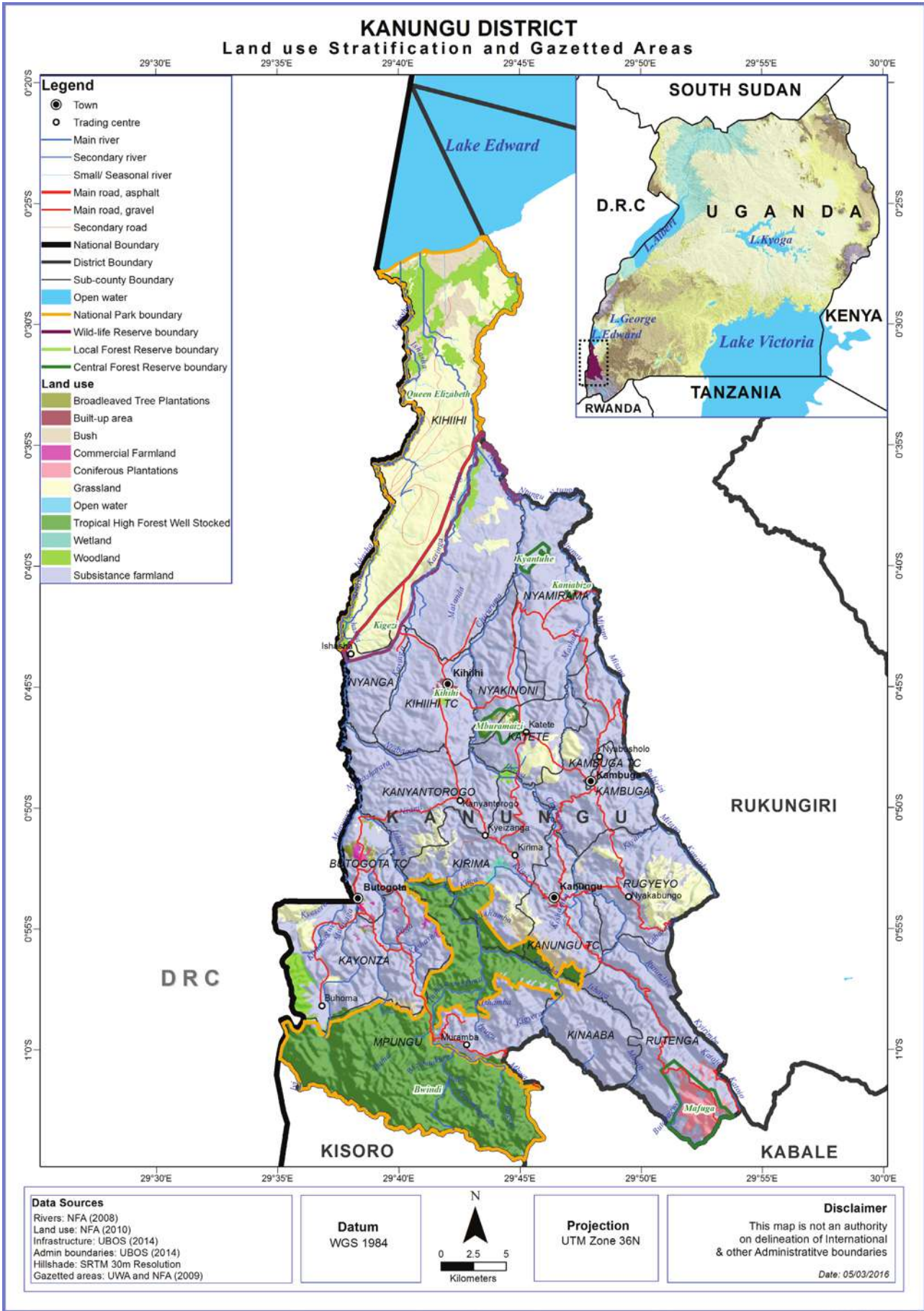


Figure 4: Land use Stratification and Gazetted Areas, Kanungu District

### 2.1.4 Temperature and Humidity

The District is generally cool with daily temperatures ranging from 15°C to 20°C.

### 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 Kanungu. 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 99 days at 0600 hours, and 27 days at 1200 hours, respectively, at Kanungu. The general conclusion from these climatic figures is that for most of the year, Kanungu district experiences moderate to strong and gusty winds, increasing in the afternoon.

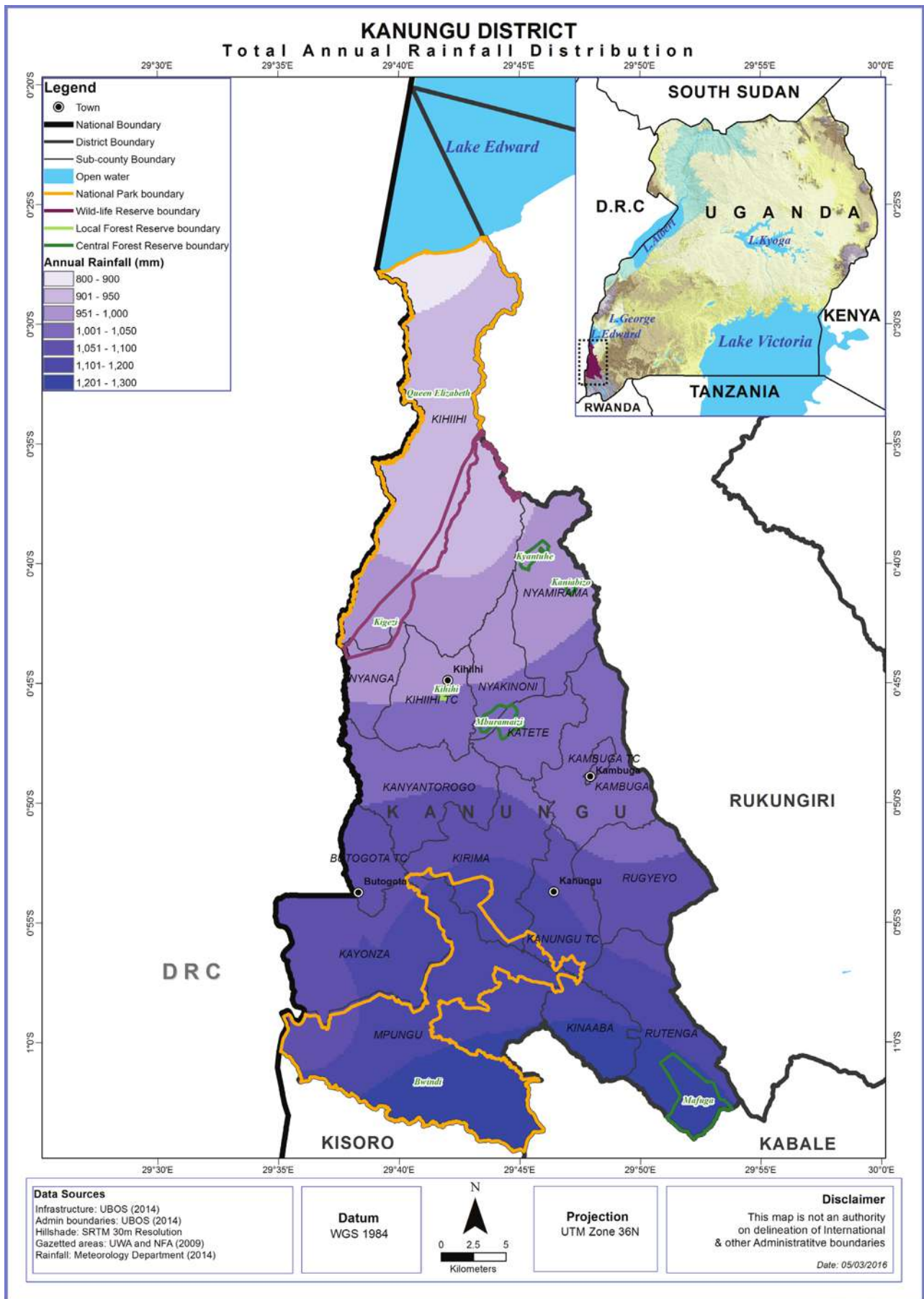
### 2.1.6 Rainfall

The District has a tropical type of climate receiving moderate and fairly well distributed annual rainfall of about 1200mm. The District receives a bimodal type of rainfall between the months of March - May and September - December. The rest of the months are relatively dry with temperatures ranging from 15°C to 20°C on average (Figure 5). Table 1 shows the Precipitation Patterns for Kanungu District, 2014.

**Table 1:** Precipitation Patterns for Kanungu District 2014

Month	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Rainfall (mm)	78.5	100.6	118.8	179.1	108.7	88.9	161.1	56.4	220.0	195.6	120.0	85.8	1513.5
Rainfall days)	10	9	15	19	10	9	10	7	21	15	21	12	161

**Source:** Department of Disaster Preparedness 2015



**Figure 5: Total Annual Rainfall Distribution, Kanungu District**

## 2.1.7 Hydrology

The district has many small rivers and streams like Ishasha, Nchwera, Kiruruma, Birara and Lake Edward and is the main source of fish in the besides fishponds. The district is also endowed with a number of wetlands both seasonal and permanent, which serve as water reservoirs and other ecological functions.

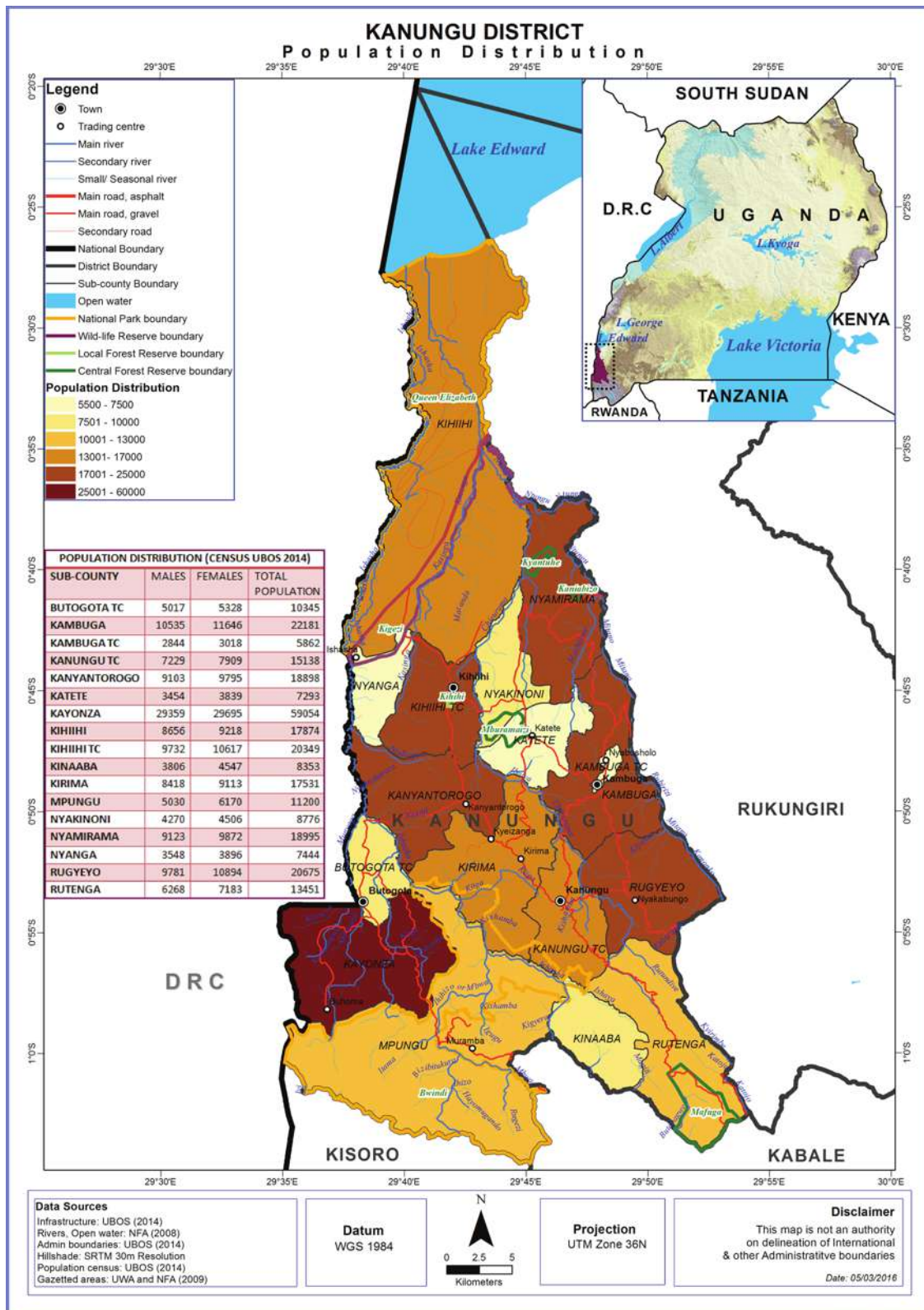
## 2.1.8 Population

According to the National Population and Housing Census (2014) provisional results, Kanungu District had a total population of 252,075 people. Results also showed that most of the people in Kanungu District reside in rural areas (200,381 (79.5%)) compared to (51,694 (20.5%)) who reside in urban centers. The gender distribution was reported to be males: 120,361 (47.7%) and females: 131,714 (52.3%). About 99.3% (250,324) of the population form the household population and only 0.7% (1,751) is Non-household. Kayonza sub-county had the highest population of 27,710 people while Kambuga town council had the least population of 5,862 people (Figure 6). Table 2 shows the population distribution per sub-county for the different gender.

**Table 2:** Population Distribution in Kanungu District

<i>Sub-County</i>	<b>HOUSEHOLDS</b>		<b>POPULATION</b>		
	<i>Number</i>	<i>Average Size</i>	<i>Males</i>	<i>Females</i>	<i>Total</i>
Butogota Town Council	2,340	4.4	5,017	5,328	10,345
Kambuga	4,869	4.6	10,535	11,646	22,181
Kambuga Town Council	1,337	4.3	2,844	3,018	5,862
Kanungu Town Council	3,543	4.1	7,229	7,909	15,138
Kanyantorogo	4,008	4.7	9,103	9,795	18,898
Katete	1,611	4.4	3,454	3,839	7,293
Kayonza	5,701	4.8	13,547	14,163	27,710
Kihiihi	3,956	4.5	8,656	9,218	17,874
Kihiihi Town Council	4,881	4.1	9,732	10,617	20,349
Kinaaba	1,918	4.4	3,806	4,547	8,353
Kirima	3,865	4.5	8,418	9,113	17,531
Mpungu	2,513	4.5	5,030	6,170	11,200
Nyakinoni	1,974	4.4	4,270	4,506	8,776
Nyamirama	4,168	4.5	9,123	9,872	18,995
Nyanga	1,675	4.4	3,548	3,896	7,444
Rugyeyo	4,777	4.3	9,781	10,894	20,675
Rutenga	3,081	4.4	6,268	7,183	13,451

**Source:** UBOS Census 2014



**Figure 6: Population Distribution, Kanungu District**

### 2.1.9 Economic activities

The main economic activity of the Kanungu District is agriculture, as the fertile soil and good climate of the district aids significantly in the produce of crops. The major crops grown include; bananas, maize, beans, peas, rice, Irish potatoes, coffee, tea, sorghum, cassava and sweet potatoes. Households in the district also keep livestock on both subsistence and commercial level and some of the animals reared include; cattle, goats, sheep, pigs and chicken.

## 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 five respondents (Deputy Chief Administrative Officer, District Environment Officer, District Veterinary Officer, District Planner and Senior Community Development Officer) was held at Kanungu District Headquarters (29.77776E; -0.89468S). 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 Kanyantorogo Sub-county (29.71557E; -0.82914S), Kihiihi Sub-county (29.71692E; -0.71223S), Mpungu Sub-county and Kayonza Sub-county (29.67715E; -0.93670S). 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 Kanungu 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.

### 4.1 Geomorphological and Geological Hazards

#### 4.1.1 Landslides, rock falls and soil erosion

Results from the participatory assessments indicated that landslides, mudslides, rock falls and soil erosion were very severe in Kanungu district. Participants emphasized that landslides occur in every rainy season. It was reported that in the occurrence of a landslide, houses and crops in the area affected are severely destroyed and roads are also cut off rendering them impassable. Participants reported that the landslides that occurred in Kinaaba and Mpungu sub-counties in October 2015, cut off the Rutenga-Kinaaba-Mpungu road, damaged a natural water source (spring) and killed 5 cows. 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). The map also shows hot spot areas where landslides, rock falls and soil erosion have occurred in the past 20 years.



Plate 1: Eroded road side in Kihiihi Sub-county

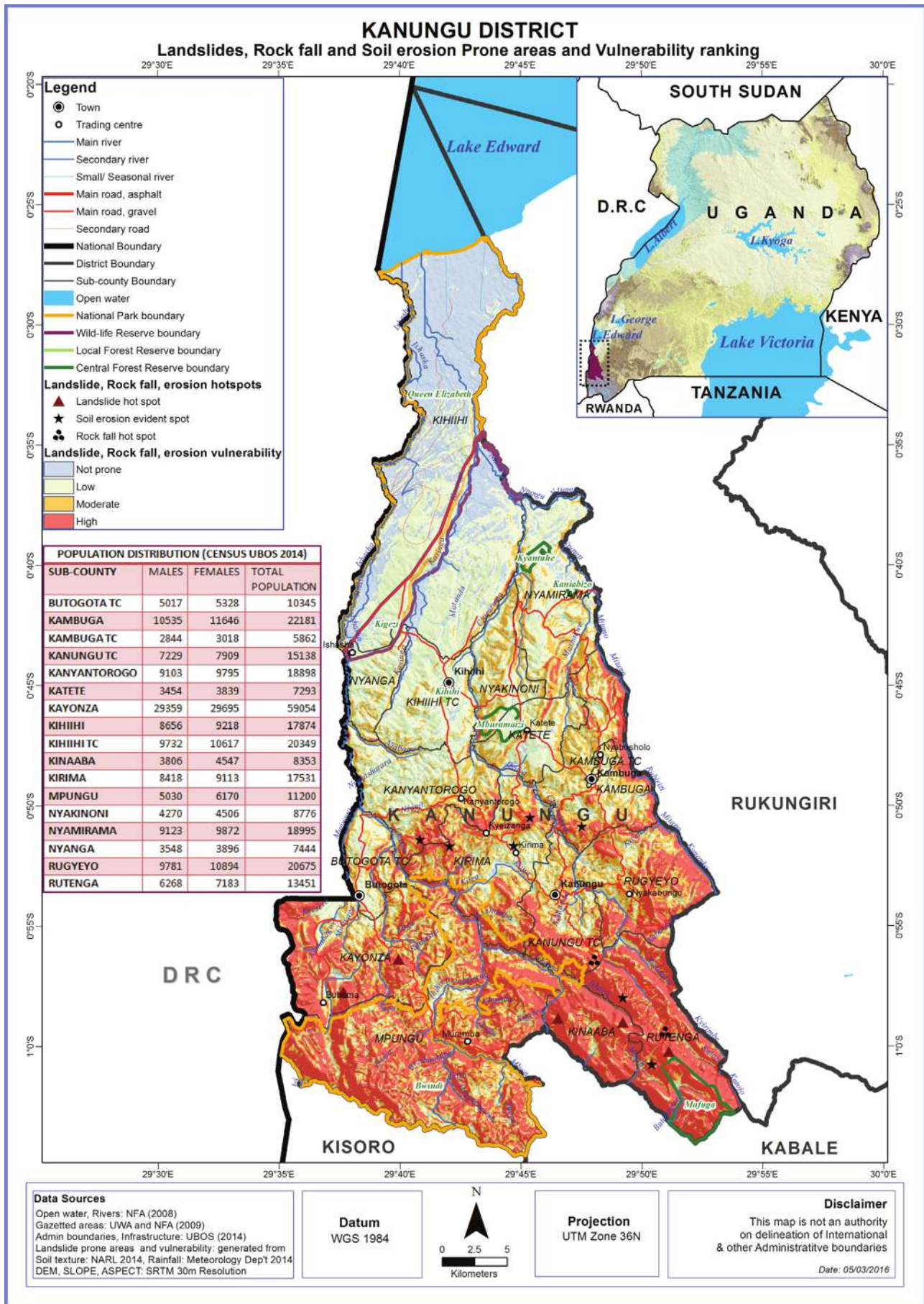


Figure 7: Landslides, Rock fall and Soil erosion Prone Areas, Kanungu District



### 4.1.2 Earthquakes and faults

Participants in the focus group discussions indicated that Kanungu district experiences earth tremors. It was observed that these earth tremors are not serious and thus do not cause any damage to houses. Figure 8 presents earth quakes epicenters that have occurred in past and their magnitude, also presents the earth quakes vulnerability and earth fault structures.

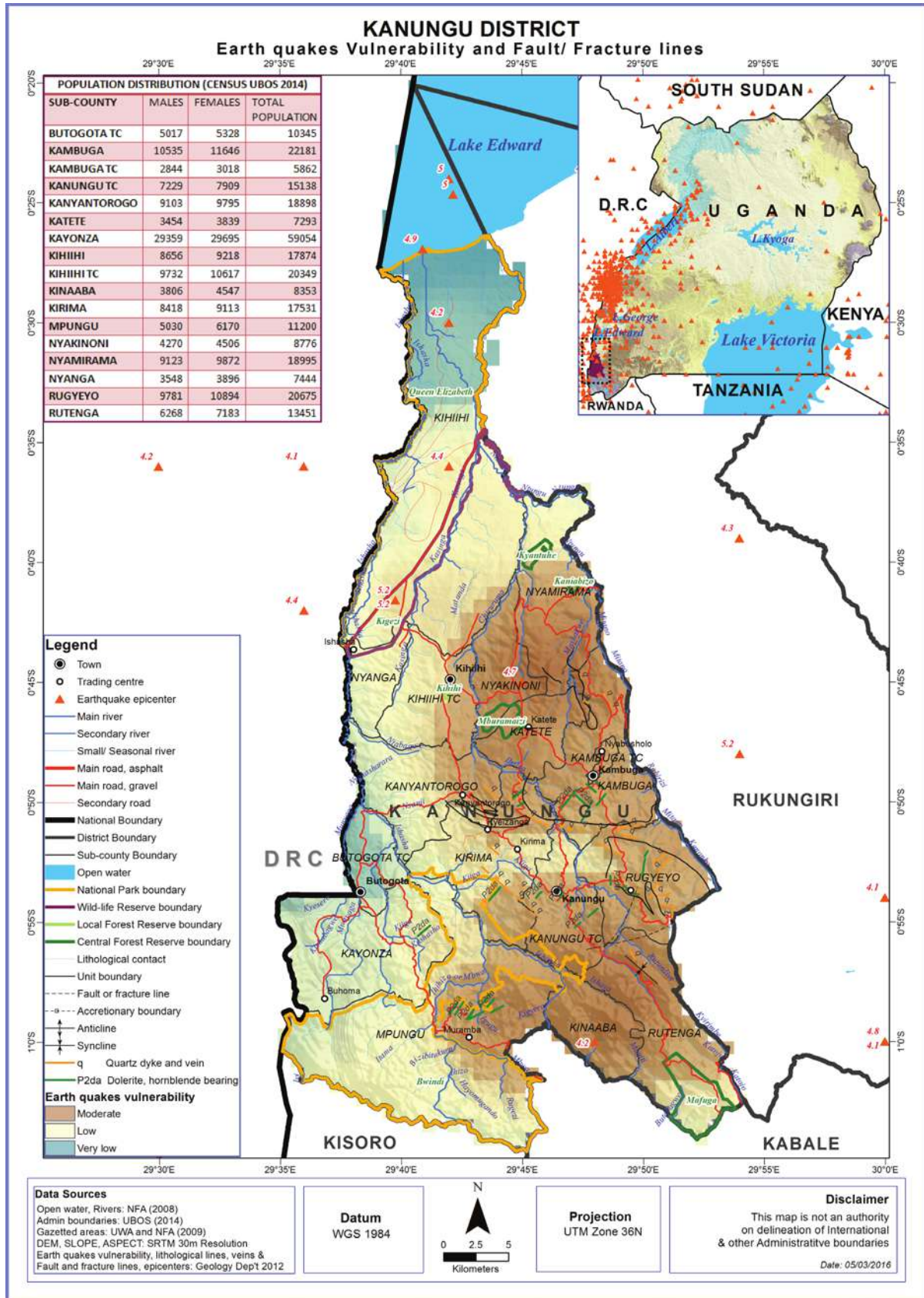


Figure 8: Earth quakes Vulnerability and Fault/Fracture lines, Kanungu District

## 4.2 Climatological and Meteorological Hazards

### 4.2.1 Floods

Participants in the focus group discussions indicated that floods are a common occurrence in Kanungu district during the rainy seasons. These floods mainly occur along rivers and down in the low land areas. It was reported that during the rainy season beginning October to December 2015, most bridges in Kanungu town council, Rugyeyo, Kambuga, Kanyantorogo and Nyamirama sub-counties flooded rendering them impassable. Other incidences of flooding were reported along Rivers R.Ntungwa and Ishasha in Queen Elizabeth National Park. Rutenga stream along Kabale-Kanungu road is also prone to flooding. 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 shows areas susceptible to floods. The map also shows hot spot areas where floods have occurred in the past 20 years.



**Plate 2:** Flooding hot spot in Butogota Town Council

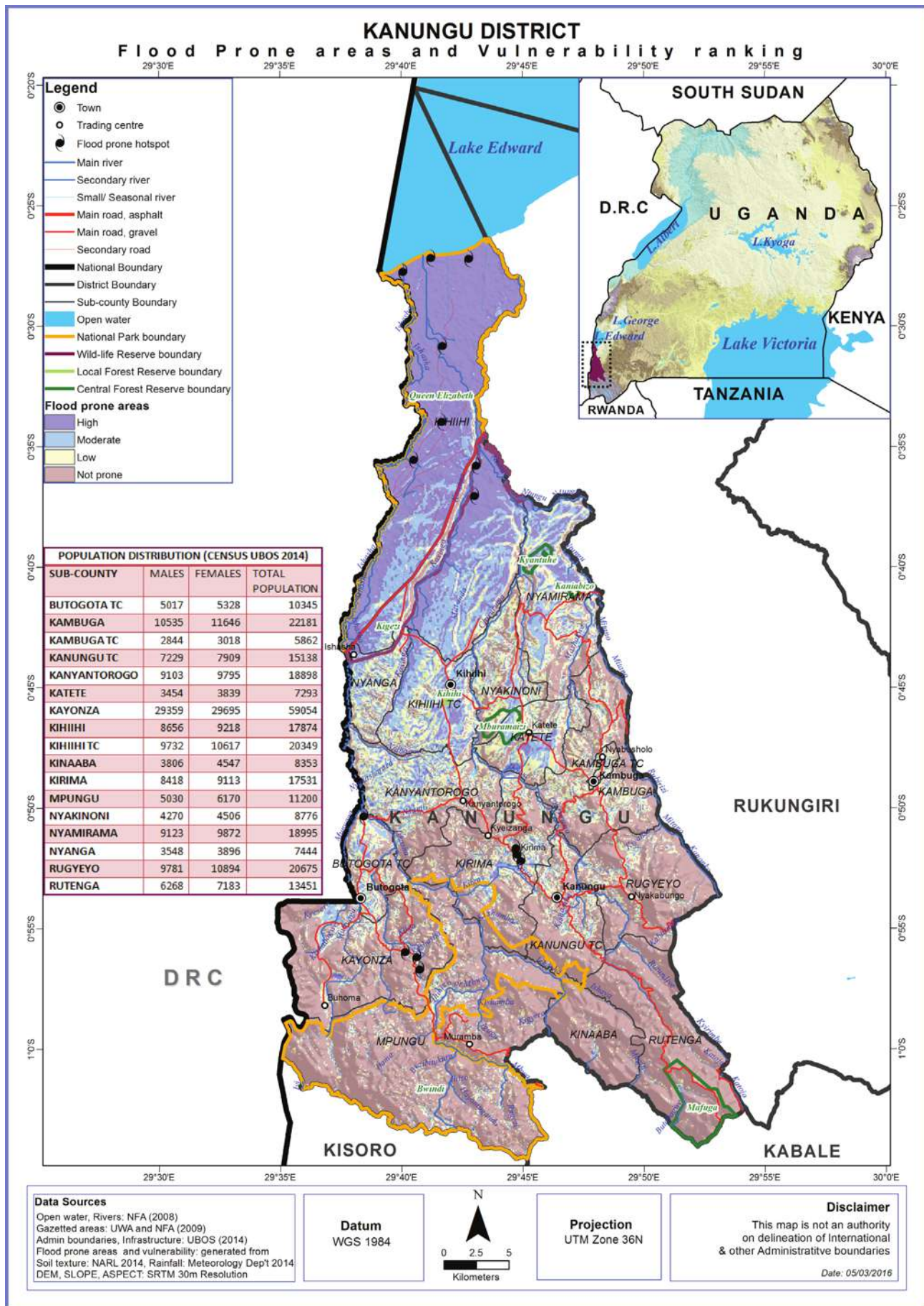


Figure 9: Flood Prone Areas and Vulnerability Ranking, Kanungu District

### 4.2.2 Drought

Results from participatory assessments indicated that droughts in form of long dry spells without rain were never a serious problem in Kanungu district. It was not until about 3 years ago that the magnitude of these long dry spells escalated in the district. Participants reported that these long dry spells mainly occur in the rift valley sub-counties of Kihiihi and Nyanga neighboring Queen Elizabeth National Park. Some of the reported impacts of long dry spells include; dry of crops like coffee, maize, beans and groundnuts. 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 shows areas that are affected by drought and their ranking.

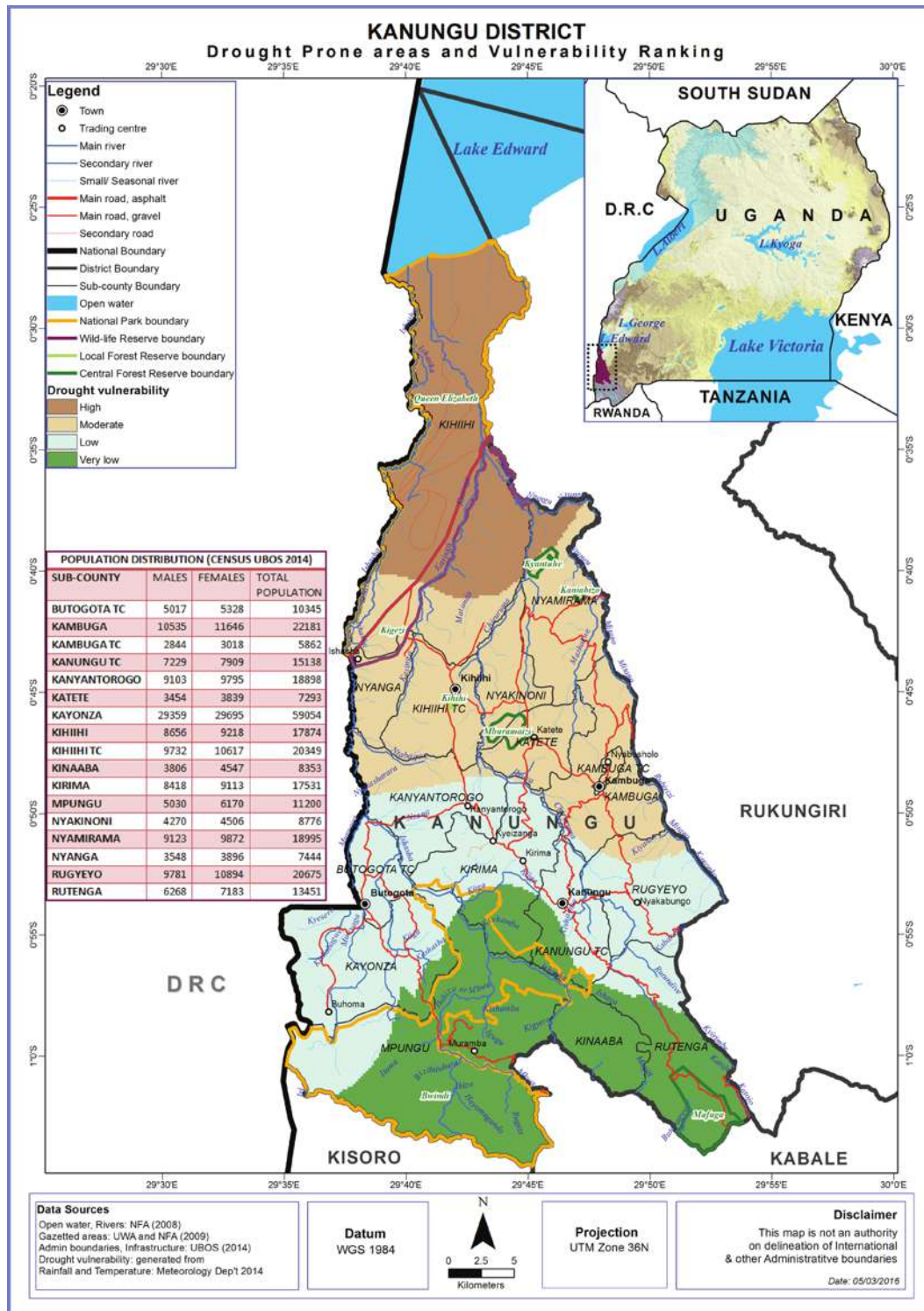


Figure 10: Drought Prone Areas and Vulnerability Ranking, Kanungu District

### 4.2.3 Hailstorms

Participatory assessments through the focus group discussions indicated that hailstorms are a common occurrence in Kanungu district and are experienced during rainy seasons. Participants reported that hailstorms usually cause serious damage to crops such as bananas, maize, beans, groundnuts, cassava and sweet potatoes. The most affected sub-counties include; Kayonza, Nyanga and Kihiihi (Figure 11).



**Plate 3:** Banana plantation destroyed by hailstorm in Mpungu Sub-county

### 4.2.4 Strong winds

Results from participatory assessments showed that strong winds were also a serious problem in the district during rainy seasons. It was reported that in 2010, the roof of district council hall was blown off. Another incident happened in July 2014 where the roof of Matanda primary school in Kihiihi sub-county was blown off. The entire district is affected by strong winds especially during the wet seasons.



**Plate 4:** Matanda primary school in Kihiihi sub-county that was destroyed by strong winds



**Plate 5:** House that was destroyed by strong winds in Mpungu Sub-county



### 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 is one of the most prominent hazards in the district. It was noted that Lightning occurrences are common every wet season. It was reported that in May 2015, 3 people were killed by Lightning in Kishayo village, Kanyantorogo sub-county.

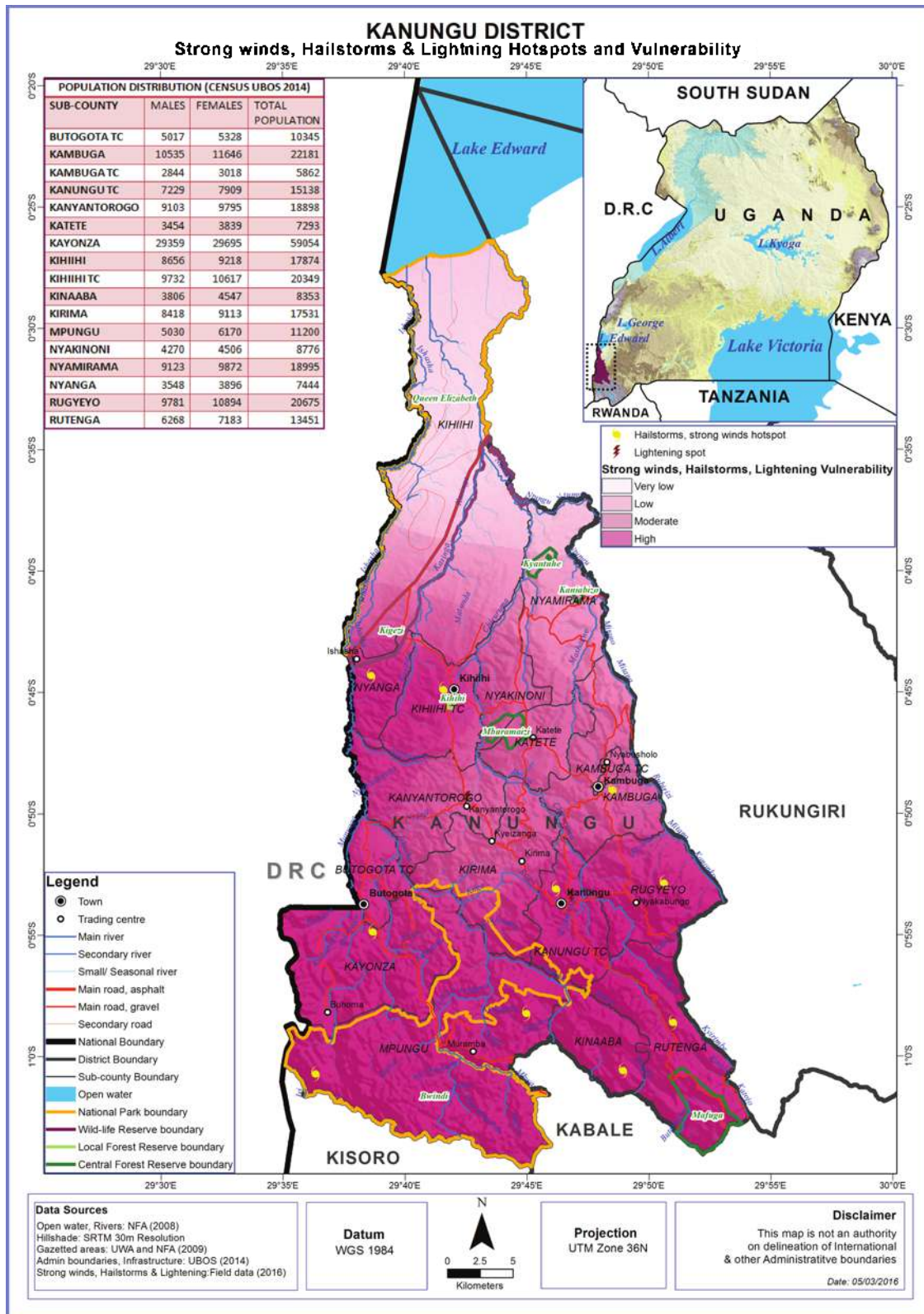


Figure 11: Strong winds, Hailstorms and Lightning Hotspots and Vulnerability, Kanungu District

### 4.3 Ecological and Biological Hazards

#### 4.3.1 Crop Pests and Diseases

Results from participatory assessments indicated that the most prominent crop diseases in Kanungu district are; Banana bacterial wilt, coffee wilt and cassava mosaic. The most mentioned crop pests included; eucalyptus mites, black coffee twig borer, aphids, variegated grasshoppers (bananas, coffee, tea and vegetables) and leaf miners. Rugyeyo and Kambuga sub-counties were the most affected by banana bacterial wilt and coffee wilt disease. It was reported that the entire district is affected by the eucalyptus mites (Figure 12).



**Plate 6:** Banana plantation affected by banana bacterial wilt in Kihiihi Sub-county

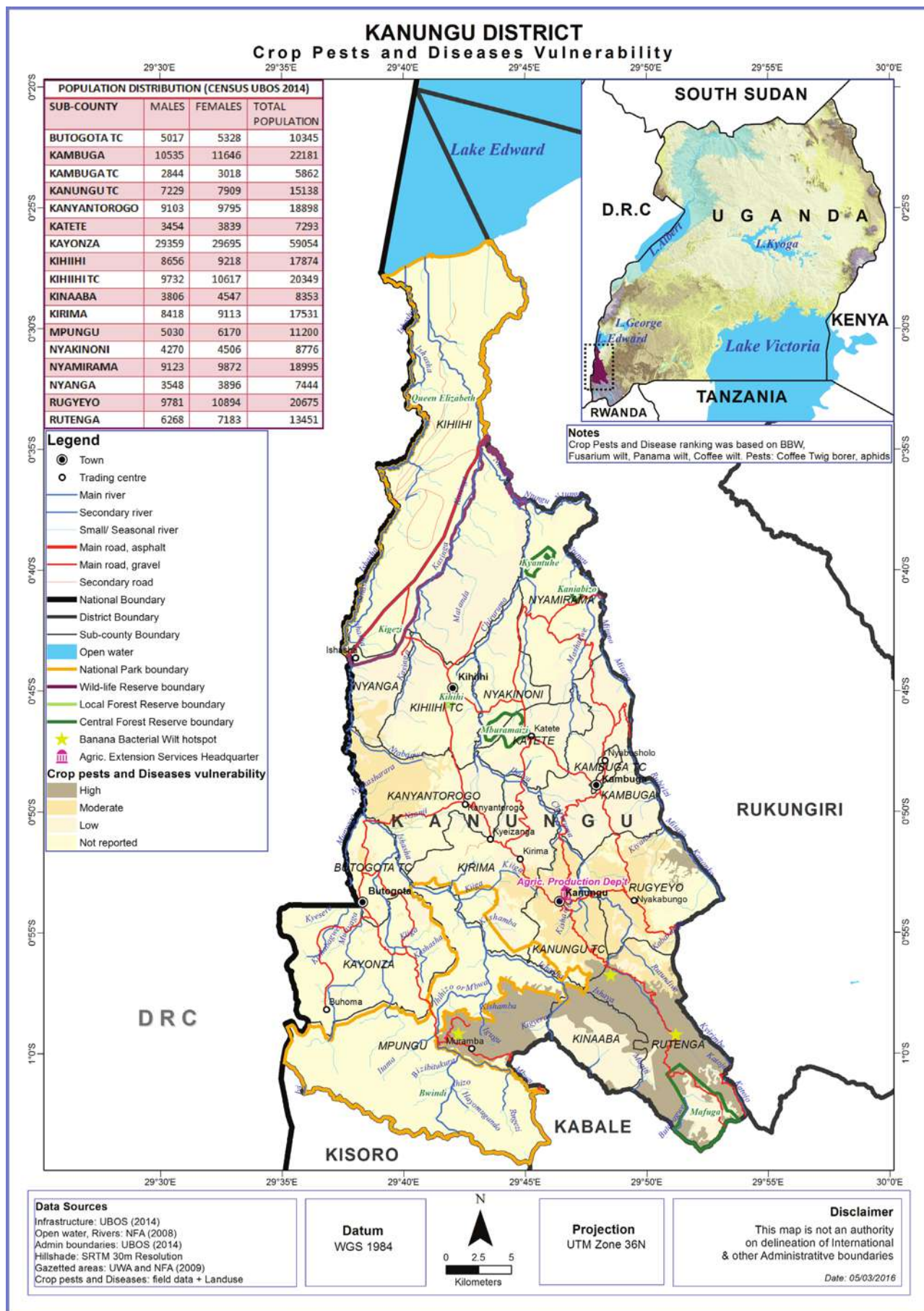


Figure 12: Crop Pests and Diseases vulnerability, Kanungu District

### 4.3.2 Livestock Pests and Diseases

Results from the focus group discussions showed that livestock pests and diseases were a common occurrence in Kanungu district. Some of the livestock diseases experienced in the district include; Anthrax which killed hippos in 2011 around Queen Elizabeth National Park in Kihiihi sub-county, brucellosis, lumpy skin disease, heart water, east coast fever, Nagana, anaplasmosis, swine fever, rabies, Newcastle and coccidiosis in poultry. The livestock pests mentioned are; ticks, burrowing mites (pigs), and tsetse flies. It was reported that in 2015, there was a serious outbreak of swine fever that killed very many pigs in Kanyantorogo sub-county (Figure 13).

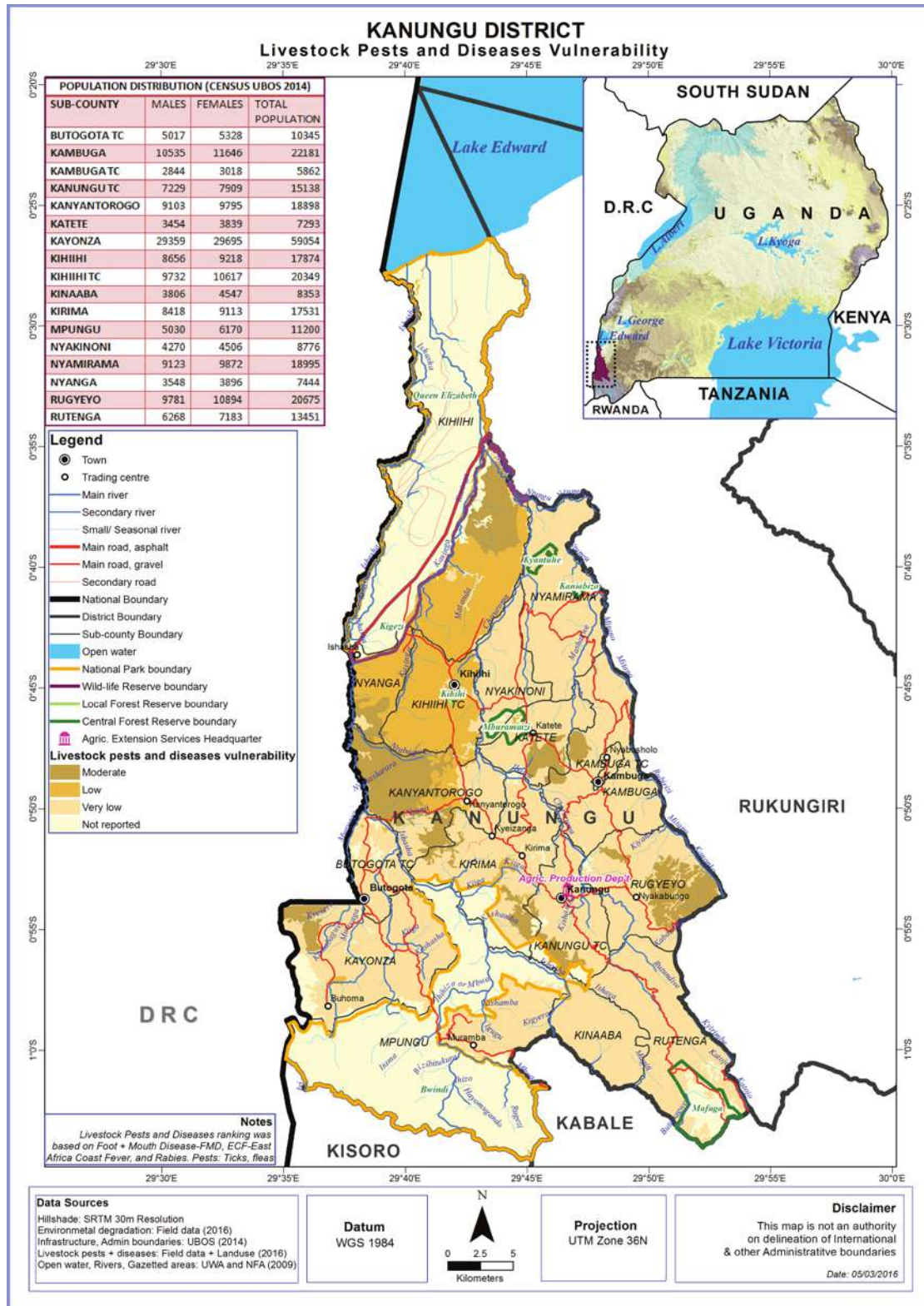


Figure 13: Livestock Pests and Diseases vulnerability, Kanungu District

### 4.3.3 Human Diseases outbreaks

The most common human diseases in Kanungu district are; malaria, typhoid, brucellosis and HIV/AIDS. The entire district was said to be affected by malaria and typhoid. It was noted that the prevalence rates of HIV/AIDS were high in Butogota, Kanungu and Kihiihi town councils (Figure 14).

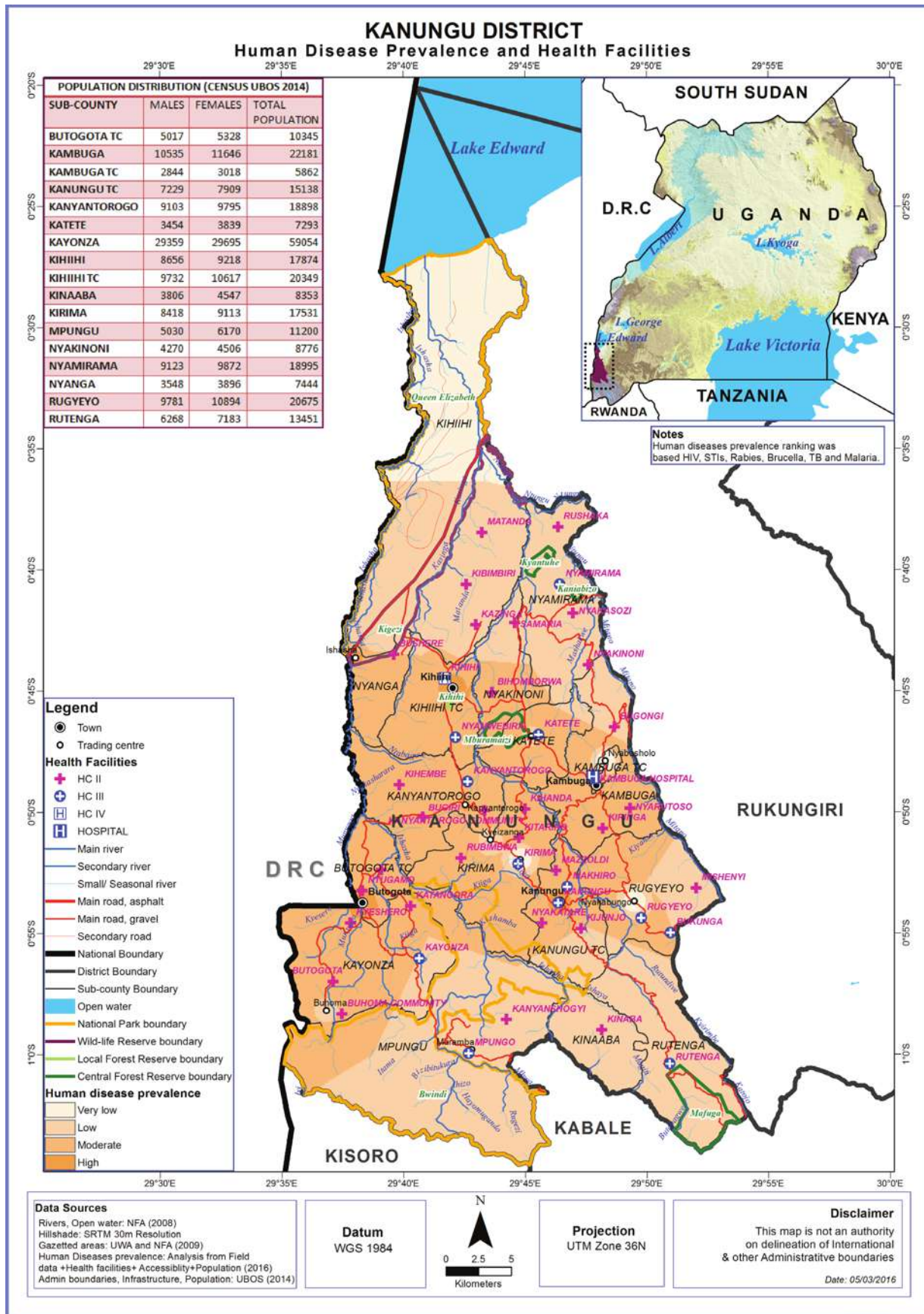


Figure 14: Human Diseases Prevalence and Health Facilities, Kanungu District

### 4.3.4 Vermin and Wild-life Animal Attacks

Human wildlife conflicts are a serious problem in the district especially for the local communities surrounding Bwindi Impenetrable and Queen Elizabeth National Parks. Participants reported that it is a common occurrence for elephants, buffaloes, antelopes, warthogs and baboons to destroy their crops yet they are not compensated. It was observed that these animal attacks on crops significantly increased food insecurity problems. The most affected sub-counties are; Mpungu, Kinaaba, Rutenga, Kayonza, Kanungu and Butogota town councils for Bwindi Impenetrable National Park and Nyanga, Kihiihi and Nyamirama for Queen Elizabeth National Park (Figure 15).

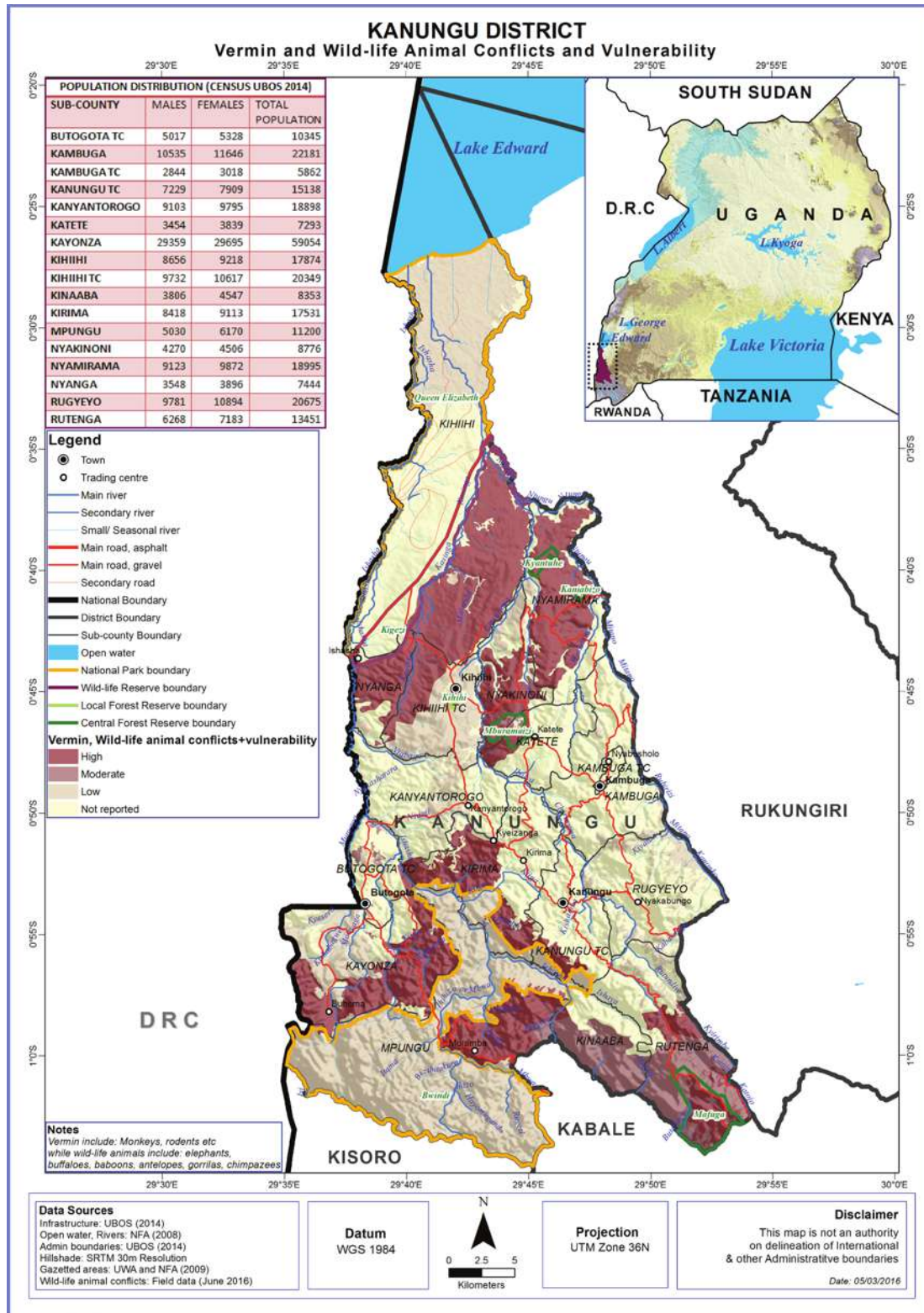


Figure 15: Vermin and Wild-life Animal conflicts and vulnerability, Kanungu District

#### 4.3.5 Invasive species

Participants reported that the most common invasive species in Kanungu district are; *Lantana camara*, *Paspalum* in Kambuga and Kateete sub counties, *Oxalis latifolia*, stranglers and *Acacia hockii*. It was observed that the entire district is affected by *Lantana camara*. *Acacia hockii* was widespread in Queen Elizabeth National Park in Kihiihi and Nyanga sub-counties (Figure 16).



**Plate 7:** Thickets of *Lantana camara* in Kateete Sub-county

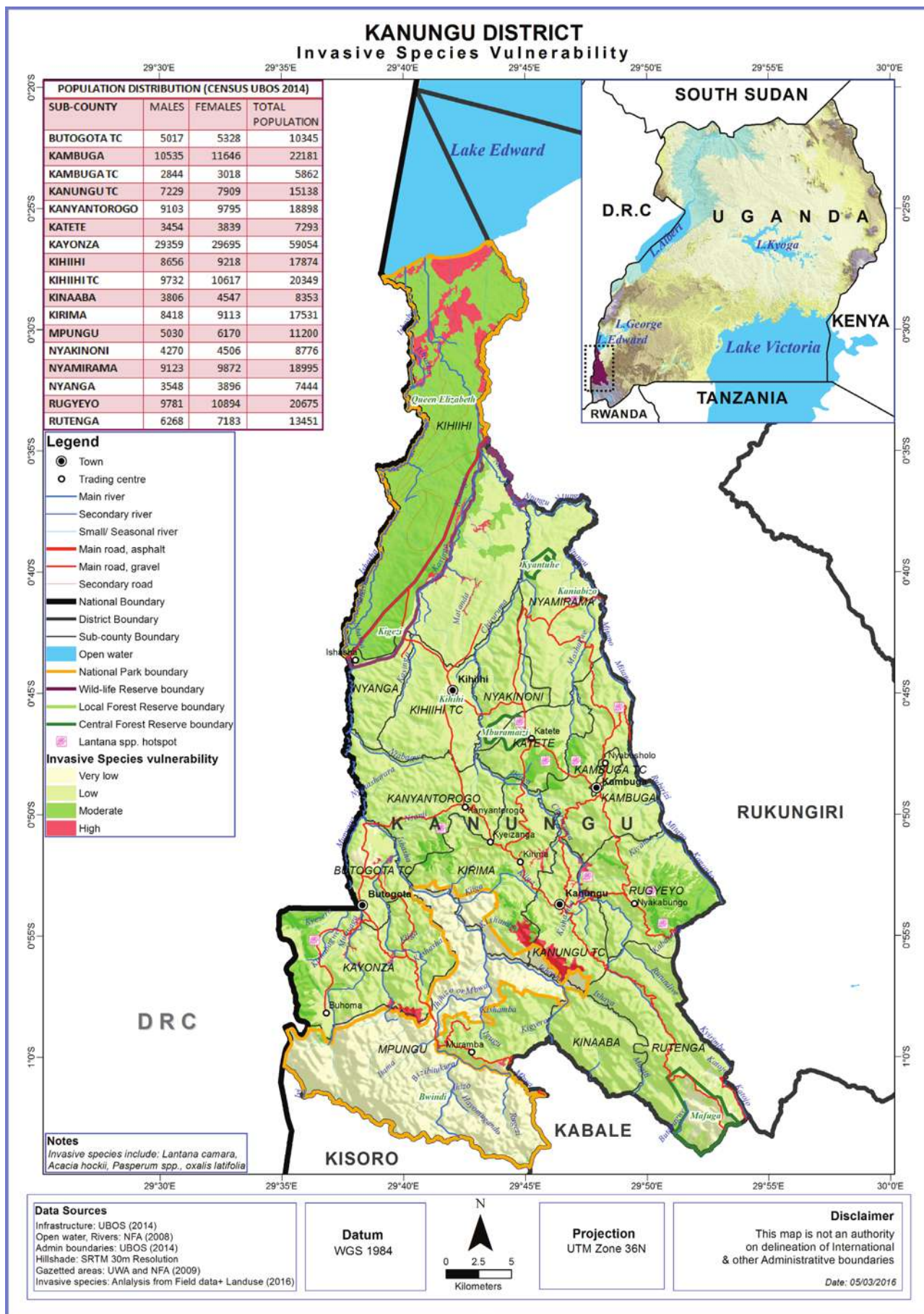


Figure 16: Invasive species vulnerability



## 4.4 Human Induced and Technological Hazards

### 4.4.1 Bush and forest fires

Participatory assessments indicated that controlled bush fires are usually practiced by the management of Queen Elizabeth National Park Ishasha sector in the dry season. Participants reported that these park bush fires at times spill over to the local communities in Kihiihi and Nyanga sub-counties thus destroying their crops and property. As a result of these fires, participants reported that buffaloes escaped from Queen Elizabeth National Park to the neighboring communities in January 2015. It was also reported that in August 2015, a pine plantation on Kirenzi hill in Burema parish, Kanyantorogo sub-county and Kyentare hill in Kanungu town council were burnt (Figure 17).



**Plate 8:** Impact of Management bush fires in Queen Elizabeth National Park, Kihiihi Sub-county

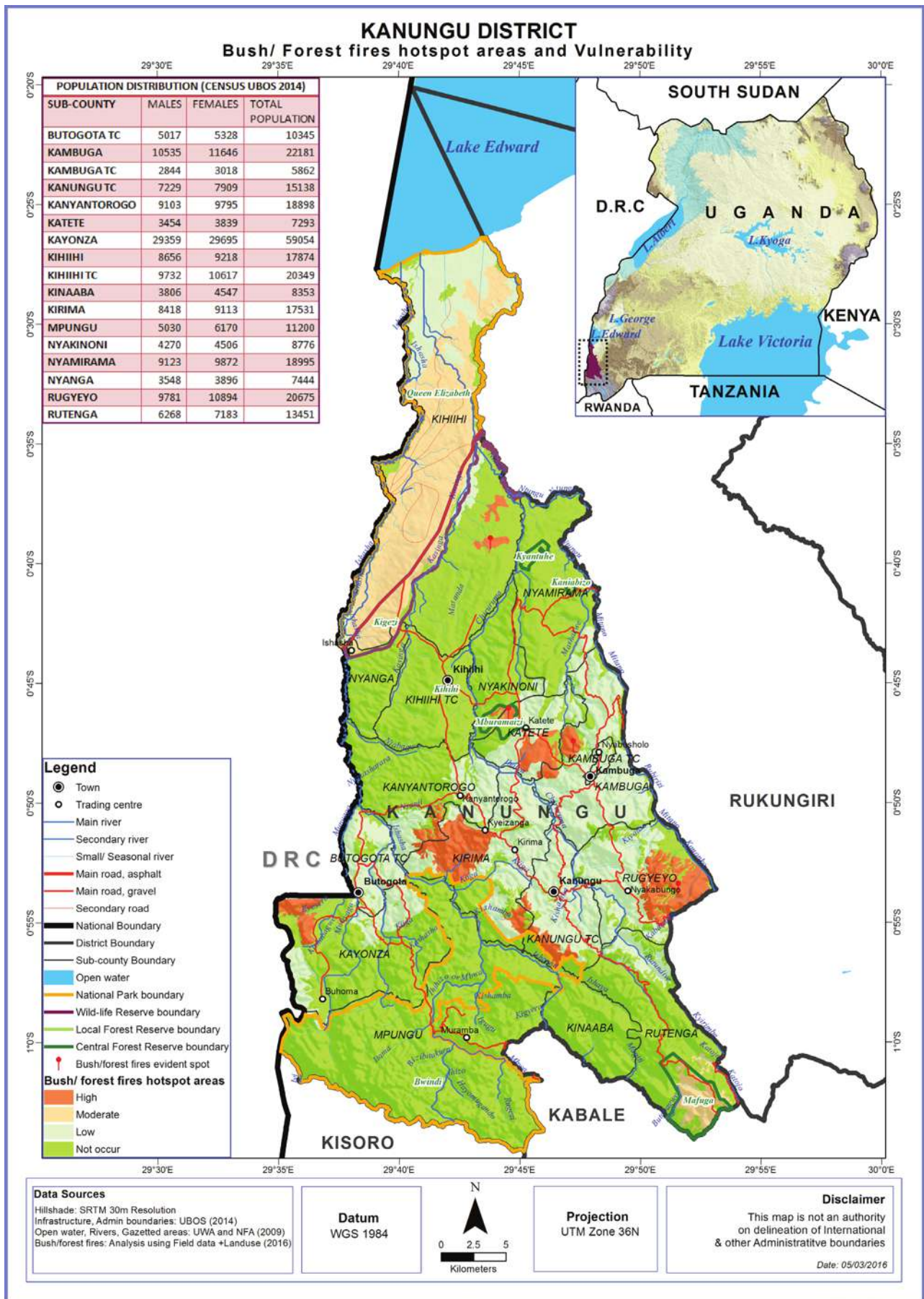


Figure 17: Bush/Forest fires Hotspot Areas, Kanungu District



#### 4.4.2 Land conflicts

Results from the participatory assessments indicated that land conflicts were a serious issue in Kanungu district. It was reported that land conflicts in the district were most times between family members and were said to be the main cause of domestic violence. The entire district is affected by land conflicts (Figure 18).

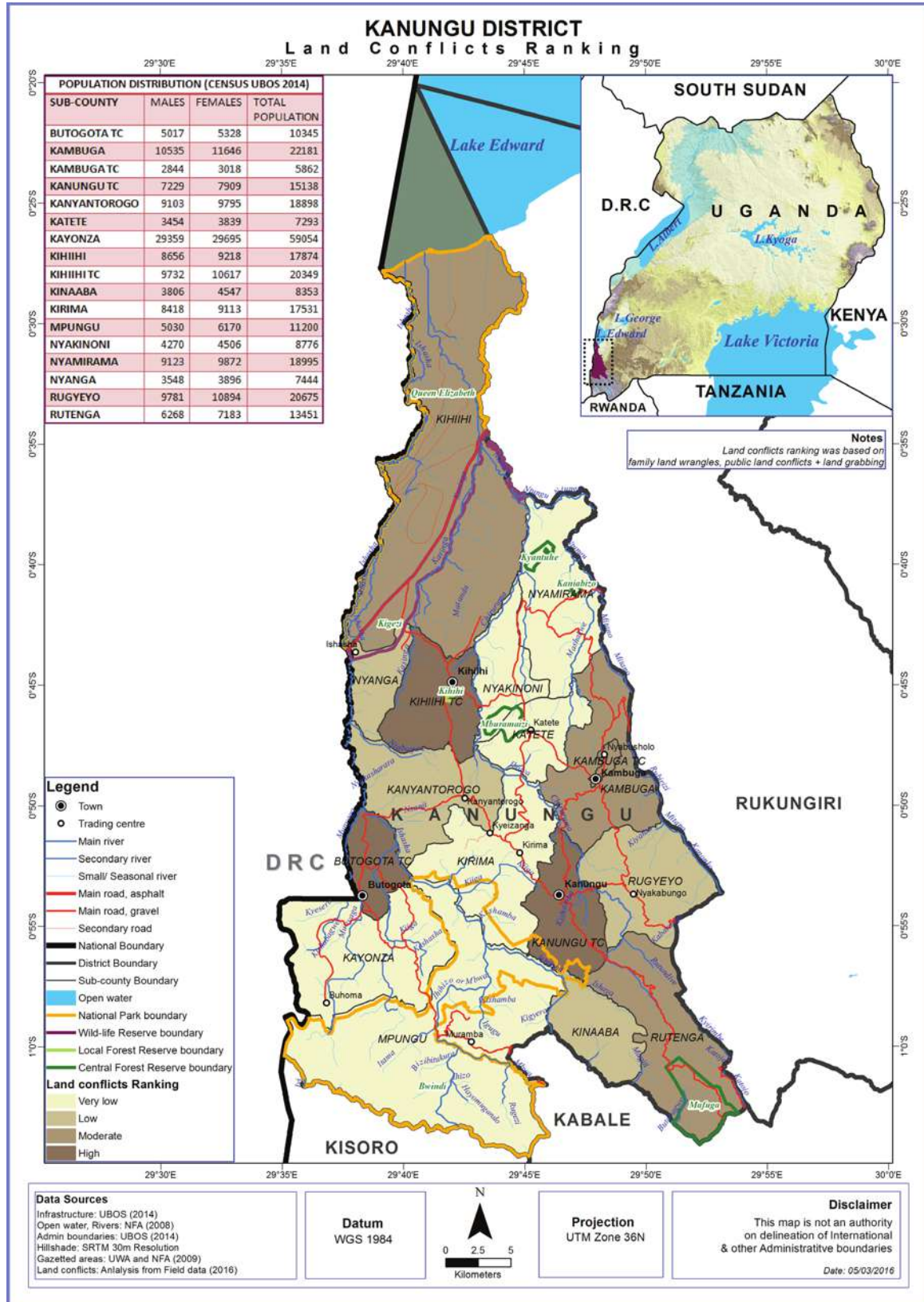


Figure 18: Land Conflicts Ranking, Kanungu District

#### 4.4.3 Environmental Degradation

Participatory assessments indicated that the most common forms of environmental degradation in Kanungu district are; sand mining activities in Kambuga, Nyakinoni and Kateete sub-counties, brick making in Kanungu town council, murram extraction in Kihiihi Sub-county, oil exploration activities in Nyanga and Kihiihi sub-counties and indiscriminate dumping of solid waste in Kanungu and Kihiihi town councils (Figure 19).



**Plate 9:** Murram extraction in Kihiihi Sub-county



**Plate 10:** Sand mining in Kihiihi Sub-county

#### 4.4.4 Road Accidents

Participants reported that the most common accidents in Kanungu district were those of boda bodas especially along Kanungu-Kihiihi road and for motor vehicles in enengo along Kanungu-Rukungiri road (Figure 19).

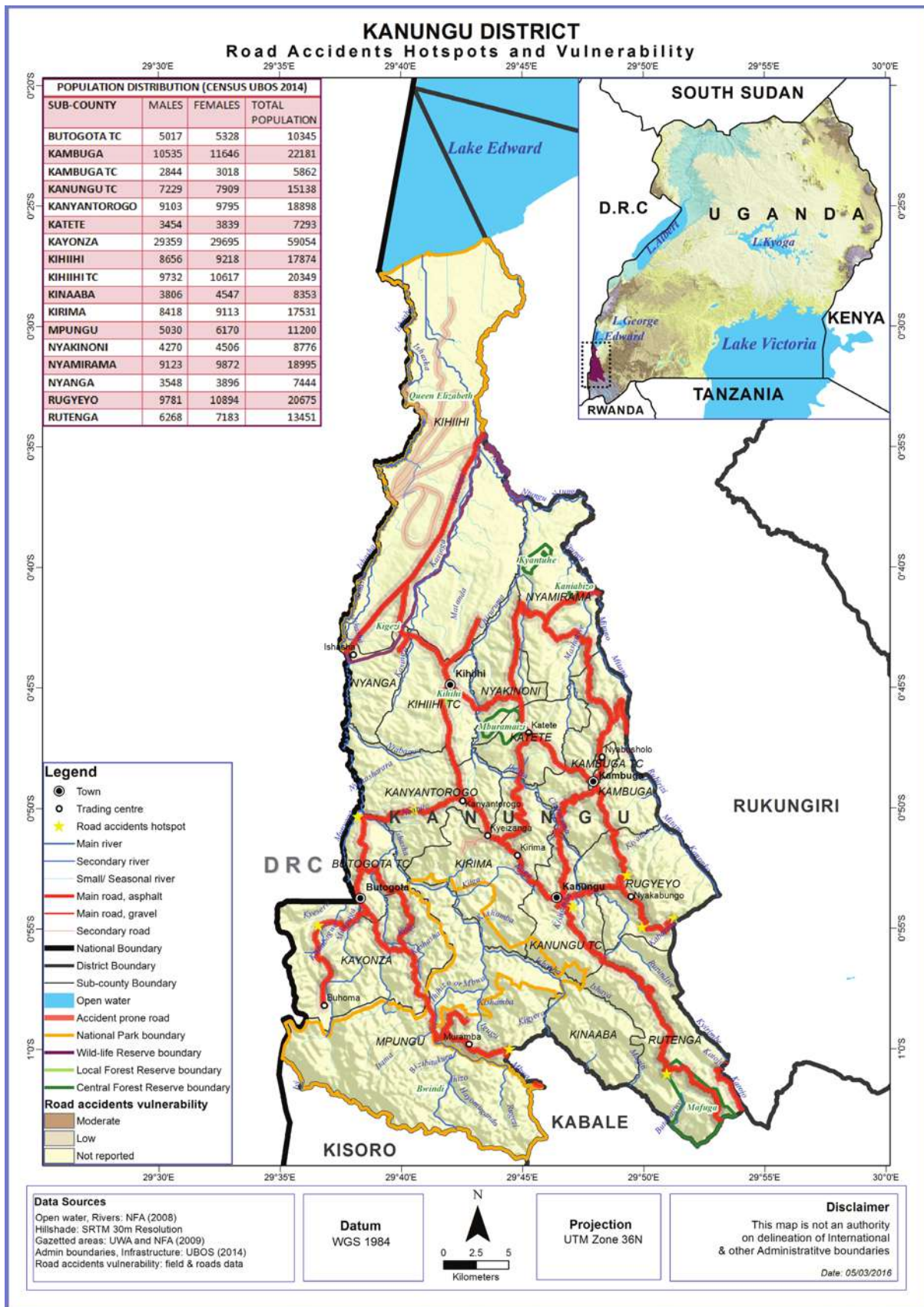


Figure 19: Road Accidents Hotspots and Vulnerability, Kanungu District

## 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 Kanungu 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 3).

Table 4 (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 4). Table 5 shows Hazard assessment for Kanungu District.

**Table 3: Components of Vulnerability in Kanungu District**

Vulnerability	Exposure			Susceptibility			Resilience	
	Hazards	Elements at Risk	Geographical Scale	Susceptibility	Geographical Scale	Coping strategies	Geographical Scale	
Landslides, Rock falls and Soil erosion	<ul style="list-style-type: none"> <li>- Human and livestock adjacent to hill slopes</li> <li>- Crops on hill slopes</li> <li>- Infrastructure e.g. houses, schools, roads adjacent to hill slopes</li> </ul>	Parish	<ul style="list-style-type: none"> <li>- Loss of lives</li> <li>- Complete crop failure</li> <li>- Destruction of infrastructure e.g. homes, and schools</li> </ul>	Parish	<ul style="list-style-type: none"> <li>- Migration</li> <li>- Sensitization by both government and non-governmental agencies</li> </ul>	Parish		
Earth quakes	<ul style="list-style-type: none"> <li>- Infrastructure e.g. houses, schools</li> </ul>	District	<ul style="list-style-type: none"> <li>- Loss of lives</li> <li>- Destruction of Infrastructure e.g. houses, schools</li> </ul>	District	- No much measure so far	District		
Floods	<ul style="list-style-type: none"> <li>- Livestock adjacent to flood plain</li> <li>- Crops on flood plain</li> <li>- Infrastructure e.g. houses, schools, roads adjacent to flood plain</li> </ul>	Parish	<ul style="list-style-type: none"> <li>- Livestock loss</li> <li>- Destruction of crops</li> <li>- Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain</li> </ul>	Parish	<ul style="list-style-type: none"> <li>- Migration</li> <li>- Sensitization on wetland conservation</li> <li>- Dig trenches</li> </ul>	Parish		
Drought	<ul style="list-style-type: none"> <li>- Livestock</li> <li>- Crops</li> <li>- Human population</li> </ul>	Village	<ul style="list-style-type: none"> <li>- Hunger &amp; poverty</li> <li>- Livestock loss</li> <li>- Crop failure</li> <li>- Shortage of pasture</li> <li>- Shortage of water</li> </ul>	Village	<ul style="list-style-type: none"> <li>- Migration</li> <li>- Sensitization on tree planting</li> <li>- Buy food from elsewhere</li> </ul>	Village		
Hailstorms, strong winds and Lightning	<ul style="list-style-type: none"> <li>- Human and livestock populations</li> <li>- Crops</li> <li>- Infrastructure e.g. houses, schools, health centres</li> </ul>	Parish	<ul style="list-style-type: none"> <li>- Loss of lives</li> <li>- Destruction of crops</li> <li>- Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain</li> </ul>	Parish		Parish		
Crop Pests and Diseases	<ul style="list-style-type: none"> <li>- Crops</li> </ul>	District	<ul style="list-style-type: none"> <li>- Complete crop failure</li> </ul>	District	<ul style="list-style-type: none"> <li>- Spraying</li> <li>- Cut and bury affected crops</li> <li>- Sensitization on crop disease management</li> </ul>	District		
Livestock Pests and Diseases	<ul style="list-style-type: none"> <li>- Livestock (cattle, goats etc.)</li> </ul>	District	<ul style="list-style-type: none"> <li>- Loss of livestock</li> <li>- Reduced livestock productivity</li> </ul>	District	<ul style="list-style-type: none"> <li>- Vaccination</li> <li>- Bury and burn animals that have died from infection</li> <li>- Quarantine</li> </ul>	District		

Socio-economic component	Human Disease outbreaks	- Human Population	District	- Loss of lives	District	- Mass Immunization - Use of mosquito nets	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 and burn -Sensitization on Invasive species management	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	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	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	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 planting -Setting bi-laws	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	
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	

Environmental component

Road accidents	<ul style="list-style-type: none"> <li>- Human population</li> <li>- Infrastructure adjacent to accident black spots e.g. houses, schools etc.</li> </ul>	Sub-county	<ul style="list-style-type: none"> <li>- Loss of lives</li> <li>- Destruction of vehicles</li> <li>- Destruction of Infrastructure adjacent to accident black spots e.g. houses, schools etc.</li> </ul>	Sub-county	<ul style="list-style-type: none"> <li>- Humps on roads</li> <li>- Signage on speed limits</li> <li>- Sensitization on traffic rules</li> </ul>	
Land conflicts	<ul style="list-style-type: none"> <li>- Human population</li> </ul>	Village	<ul style="list-style-type: none"> <li>- Loss of lives</li> <li>- Family violence and break outs</li> </ul>	Village	<ul style="list-style-type: none"> <li>- Community dialogue</li> <li>- District court in charge of land issues</li> </ul>	
Vermin and Wildlife animal attacks	<ul style="list-style-type: none"> <li>- Human population</li> <li>- Livestock</li> <li>- Crops</li> </ul>	Parish	<ul style="list-style-type: none"> <li>- Loss of lives</li> <li>- Livestock loss</li> <li>- Crop destruction</li> </ul>	Parish	<ul style="list-style-type: none"> <li>- Report to UWA</li> <li>- Guard gardens</li> <li>- Poison</li> <li>- Hunt and kill</li> <li>- Fence water collection points with Wildlife animals</li> </ul>	
Environmental degradation	<ul style="list-style-type: none"> <li>- Human and livestock populations</li> <li>- Crops</li> <li>- Natural vegetation</li> </ul>	Sub-county	<ul style="list-style-type: none"> <li>- Crop failure</li> <li>- Shortage of pasture</li> <li>- Shortage of water</li> <li>- Decline of water quality</li> </ul>	Sub-county	<ul style="list-style-type: none"> <li>- Sensitization on wetland conservation</li> <li>- Sensitization on tree planting</li> <li>- Setting bi-laws</li> </ul>	



**Table 4:** Vulnerability Profile for Kanungu District

	PROBABILITY	SEVERITY OF IMPACTS	RELATIVE RISK	VULNERABLE SUB COUNTIES
	<i>Relative likelihood this will occur</i>	<i>Overall Impact (Average)</i>	<i>Probability x Impact Severity</i>	
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	5	3	15	The most affected sub-counties are; Kihiihi, Nyanga, Nyamirama and Kihiihi T.C.
Droughts	4	3	12	The most affected sub-counties are; Kihiihi, Nyanga, Nyamirama and Kihiihi T.C.
Soil erosion, rock falls and landslides	5	3	15	The most affected sub-counties are; Rutenga, Rugyeyo, Mpungu, Kinaaba, Kayonza, Kambuga and Kanungu T.C.
Hail storms, Lightning and strong winds	4	4	16	The most affected sub-counties are; Kanungu T.C, Kihiihi, Kinaaba, Mpungu, Nyanga, Rugyeyo, kambuga and Rutenga.
Bush fires	4	3	12	The most affected sub-counties are; Kihiihi and Nyanga
Crop pests and diseases	4	3	12	The most affected sub-counties are; Mpungu, Rugyeyo and Rutenga.
Livestock pests and diseases	4	3	12	The most affected sub-counties are; Kihiihi, Kayonza, nyamirama and Kateete.
Human Diseases outbreaks	4	2	8	All sub counties
Land conflicts	4	3	12	The most affected sub-counties are; Kambuga and Kambuga tc , Butogota, Kanungu and Kihiihi TCs.
Vermin and Wild-life animal attacks	5	4	20	The most affected sub-counties are; Mpungu, Kinaaba, Rutenga, Kayonza, Nyanga, Nyamirama and Kanungu and Butogota TCs.
Earthquakes and faults	3	1	3	The most affected sub-counties are; Nyanga and Kihiihi.
Road accidents	3	2	6	The most affected sub-counties are; Kambuga, Butogota, Kanungu and Kihiihi TCs.
Environmental degradation	5	4	20	The most affected sub-counties are; Kambuga, Kateete, Kihiihi, nyakinoni, and Kanungu Tc and Kihiihi TCs.
Invasive species	3	2	6	The most affected sub-counties are; Nyanga, kanyatorongo, katete, kambuga and Kihiihi TC.

**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 5:** Hazard Risk Assessment

Hazard	Butogota T.C	Kambuga	Kambuga T.C	Kanungu T.C	Kanyantorogo	Katete	Kayonza	Kihiihi	Kihiihi T.C	Kinaaba	Kirima	Mpungu	Nyakinoni	Nyamirama	Nyanga	Rugyeoyo	Rutenga
Floods	L	L	L	M	M	L	L	H	H	L	L	L	L	H	H	L	L
Drought	L	M	M	L	L	M	L	H	M	VL	L	VL		M	M	L	VL
Landslides, Rock falls and Erosion	L	M	M	H	L	L	H	L	L	H	M	H	L	L	L	H	H
Strong winds, Hailstorms and Lightning	M	M	M	H	M	M	M	H	M	H	M	H	M	M	H	H	H
Crop pests and Diseases	M	M	M	L	M	M	M	M	M	M	M	H	M	M	M	H	H
Livestock pests and Diseases	M	M	M	M	M	H	M	H	M	M	M	L	M	M	L	L	L
Human disease outbreaks	H	M	H	H	M	M	M	M	H	M	M	M	M	M	M	M	M
Vermin and Wildlife animal attacks	H			H			H	H		H		H		H	H		H
Land conflicts	H	H	H	H	M	M	M	M	H	M	M	M	M	M	M	M	M
Bush fires	L	M	L	L	M	M	L	H	M	L	L	L	L	M	H	L	L
Environmental degradation	M	H	M	H	L	H	L	H	H	M	L	L	H		H	L	L
Earthquakes and faults	L	L	L	L	L	L	L	M					L	L	M	L	L
Road accidents			L	L				L									
Invasive species					L			H				L			H		L

**Key**

H	High
M	Medium
L	Low
VL	Very Low
	Not reported/ Not prone

#### 4.5.1 Gender and Age groups mostly affected by Hazards

**Table 6:** 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 3).

**Table 7:** Coping strategies to the Multi-hazards in Kanungu District

No	Multi-Hazards		Coping strategies
1	Geomorphological or Geological	Landslides, Rock falls and Erosion	<ul style="list-style-type: none"> <li>• Migration to safe areas</li> <li>• Terracing/ contour farming</li> <li>• Plant trees to control water movement on hill slopes</li> <li>• Mulching in banana plantations</li> <li>• Plant grass in banana plantations on hill slopes</li> <li>• Removal of stones from banana farmlands</li> <li>• Bye-law on terracing</li> </ul>
2		Earthquakes and faults	<ul style="list-style-type: none"> <li>• No action, communities think the tremors are minor</li> <li>• Designs of houses (pillars)</li> <li>• Early warning system</li> <li>• Vigilance</li> <li>• Sensitization</li> <li>• Emergency response mechanisms</li> </ul>
3	Climatological or Meteorological	Floods	<ul style="list-style-type: none"> <li>• Digging up of trenches in the flood plains</li> <li>• Planting trees to control water movement to flood plains</li> <li>• Migration to other areas</li> <li>• Seek for government food aid</li> </ul>
4		Drought	<ul style="list-style-type: none"> <li>• Leave wetlands as water catchments</li> <li>• Plant trees as climate modifiers</li> <li>• Buy food elsewhere in case of shortage</li> <li>• Buy water from the nearby areas</li> <li>• Food Storage especially dry grains</li> <li>• Planting drought tolerant crops like cassava</li> <li>• Planting of quick maturing crops/varieties like orange fleshed potatoes..</li> <li>• Design of water harvesting technologies.</li> <li>• Enforcement of the food security ordinance and policy.</li> </ul>
5		Strong winds, Hailstorms and Lightning	<ul style="list-style-type: none"> <li>• Plant trees as wind breakers</li> <li>• Use of stakes against wind in banana plantations</li> <li>• Use of ropes to tire banana against wind</li> <li>• Installation of Lightning conductors</li> <li>• Stay indoors during rains</li> <li>• Changing building designs and roof types</li> <li>• Removal of destroyed crops</li> <li>• Request for aid from the Office of the Prime Minister</li> <li>• Installation of Lightning conductors on newly constructed schools</li> </ul>

6	Ecological or Biological	Crop pests and Diseases	<ul style="list-style-type: none"> <li>• Spraying pests</li> <li>• Cutting and burying BBW affected crops</li> <li>• Burning of affected crops</li> <li>• Vigilance</li> <li>• Practicing crop rotation.</li> <li>• Planting crops that are disease/pest tolerant</li> </ul>
7		Livestock pests and Diseases	<ul style="list-style-type: none"> <li>• Spraying pests</li> <li>• Vaccinations</li> <li>• Burying animals that have died from infection</li> <li>• Quarantine</li> </ul>
8		Human epidemic Diseases	<ul style="list-style-type: none"> <li>• Mass immunisation</li> <li>• Visiting health centres</li> <li>• Use of mosquito nets</li> <li>• Sensitisation</li> <li>• Promotion of water sanitation and hygiene activities at household level</li> </ul>
9		Vermin and Wild-life animal attacks	<ul style="list-style-type: none"> <li>• Guarding the gardens</li> <li>• Hunt and kill</li> <li>• Report to UWA</li> <li>• Hugo group</li> <li>• Mauritius thorns</li> <li>• Plant tea as buffer</li> <li>• Dig trenches</li> <li>• Chain link</li> <li>• Plant red pepper as buffer</li> <li>• Recommend vermin guards</li> </ul>
10		Invasive species	<ul style="list-style-type: none"> <li>• Uproot</li> <li>• Spray with herbicides (e.g 2-4-D)</li> <li>• Biological control (e.g beetles)</li> <li>• Cut and burn</li> <li>• Sensitization on Invasive species management</li> <li>• Blacklisting exotic species</li> <li>• vigilance</li> </ul>

11		Land conflicts	<ul style="list-style-type: none"> <li>• Community dialogues</li> <li>• Report to court</li> <li>• Migration</li> <li>• Resettlement</li> <li>• Surveying and titling</li> <li>• Strengthen Land management structures</li> <li>• Sensitization on land ownership</li> <li>• Proper demarcation (live fencing)</li> </ul>
12		Bush fires	<ul style="list-style-type: none"> <li>• Stop the fires in case of fire outbreak</li> <li>• Fire lines (may be constructed, cleared grass)</li> <li>• Fire breaks planted along gardens e.g. euphorbia spp.</li> <li>• Vigilance especially in dry seasons where most burning is done</li> <li>• Bye-laws</li> <li>• Sensitization on dangers of fires</li> </ul>
13	Human induced or technological	Road accidents	<ul style="list-style-type: none"> <li>• Construction of humps</li> <li>• Road Signage including speed limits</li> <li>• Separate lanes on sharp corners</li> <li>• Sensitisation</li> <li>• Widen narrow roads</li> <li>• Plant trees on road reserve, as road guards</li> <li>• Deployment of Traffic officers</li> <li>• Pedestrian path</li> </ul>
14		Environmental degradation	<ul style="list-style-type: none"> <li>• Leave wetlands as water catchments</li> <li>• Plant appropriate tree species as climate modifiers</li> <li>• Sensitization</li> <li>• Bye-laws</li> <li>• Enforcement</li> <li>• Gazette and demarcate wetlands</li> <li>• Restore wetlands and other fragile ecosystems</li> <li>• EIA for new developments</li> <li>• No land titles for wetland areas</li> <li>• Cancellation of existing wetland land titles</li> <li>• Developing land use plans and enforce them</li> </ul>



## 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 Kanungu 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 Kanungu 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 Kanungu district increase their vulnerability to hazard exposure necessitating urgent external support.

#### **Hazards experienced in Kanungu 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, 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 health.
- 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 and support both political and technical 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 Ministry of Water and Environment MWE should promote Tree planting along road reserves.
- xiii. The government through Ministry of Agriculture Animal Industry and Fisheries 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

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

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, Kampala, Final version for approval, 18 July 2012, p.2

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

UBOS (2012). Kanungu District Local Government Statistical Abstract.

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

UNISDR (2009). UNISDR Terminology on Disaster Risk Reduction.

## APPENDIX I: DATA COLLECTION TOOLS



Key Informant interview at Kanungu district headquarters



Focus Group Discussion at Kanyantoro 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

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

No.	Name of Participants	Village/ Parish	Contact	Signature

### Introduction

- v. 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 information on Hazards and early warning.
- vi. 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.
- vii. 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.
- viii. 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 community?
2. Which domestic animals are dominant in your community?
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**

<b>Name of Participant</b>	<b>Designation</b>	<b>Contact</b>
1. Begumya Eriab	Deputy Chief Administrative Officer	0772629092
2. Agaba George	District Environment Officer	0774226928
3. Tumwesigye A	District Veterinary Officer	0775550106
4. Turyamureeba Stephen	Community Development Officer	0789040701
5. Atuhaire Innocent	District Planner	0772472568

#### **FOCUS GROUP DISCUSSION ATTENDANCE LIST FOR LOCAL COMMUNITIES**

<b>Name of Participant</b>	<b>Village/Parish</b>	<b>Contact</b>
1. Tumuhamy Kenneth	Kishayo-Kishenyi	0772853648
2. Matsiko Henry	Nyaruhanga-Burema	0783348106
3. Akandinda Gift	Nyamigoye-Nyabubare	0750445308
4. Ampereza Ronah	Burema	0781831986
5. Kyomugasho Amon	Burema	0779933919
6. Niwahereza Lovence	Kahama-Burema	0787626169
7. Mbabazi Dan	Nyamigoye	0755029807
8. Munyehamba Henry	Kashanda-Nyamigoye	0780160707
9. Namara Denis	Nyamigoye	0782337155
10. Akampurira Enock	Nyabirehe	0773458058
11. Sunday Linnet	Burema	0781710921
12. Ahabwe Philemon	Kabuga	0774523791
13. Kwizeera Obed	Kabuga	0787202055
14. Bareeba Jack	Kabuga	-
15. Tumuheirwe Sam	Kabuga	0772465645
16. Habarurema Pascal	Kabuga	0782445161
17. Kyomukama Suhail	Kabuga	0772508448
18. Bahati Swaibu	Rushoroza	0774753221

<b>Name of Participant</b>	<b>Village/Parish</b>	<b>Contact</b>
19. Imaniragaba E.	Kibimbiri	0752469443
20. Muhwezi E.	Kayembe	0782555694
21. Harima Mujuni	Rushoroza	0783624224
22. Byomugabe Annet	Rushoroza	0788136880
23. Musinguzi Bigo	Bujengwe	0784262711
24. Arineitwe Marios	Rutendere	0782711658
25. Byarugaba J.B	Rutendere	0777403472
26. Mugambagye Vennah	Rutendere	0789901312
27. Niwamanya Herbert	Rutendere	0777745719
28. Kobusingye Regina	Kishanda	0782175536
29. Biryahwaho Samuel	Bujengwe	0775476775
30. Biryēja Omega	Bujengwe	-
31. Byarugaba Gad	Bujengwe	-
32. Bazirebye Dan	Murokore	0754130393
33. Tumuhereze Vian	Murokore	0750054777
34. Makara Richard	Mpungu	-



35. Twakiire Lillian	Buremba	0755859968
36. Tumwekwase Barnabas	Ngaara	0704804960
37. Akankwasa Agnes	Muramba	0751225104
38. Ajuna Benson	Murushasha	0758537034
39. Behangana Vanance	Katunda	0782316215
40. Kyorikunda Sikora	Karambi	0750472584
41. Ampeire Julovida	Kanyashogyi	0756439539
42. Tumusiime Poora	Muramba	0756363753

### SPATIAL DATA COLLECTION SHEET FOR HAZARD VULNERABILITY AND RISK MAPPING

Observer Name:	District:	Coordinates		
	Sub- county:	X:		
Date:	Parish:	Y:		
	Village:	Altitude		
<b>Slope characterization</b>	<b>Bio-physical characterization</b>	<b>Vegetation characterization</b>		
Slope degree (e.g 10, 20, ...)	Soil Texture	Veg. cover (%)	<b>Land use type (tick)</b> Bush Grassland Wetland Tree plantation Natural forest Cropland Built-up area Grazing land Others	
Slope length (m) (e.g 5, 10, ...)	Soil Moisture	Tree cover (%)		
Aspect (e.g N, NE...)	Rainfall	Shrubs cover (%)		
Elevation (e.g high, low...)	Drainage	Grass / Herbs cover (%)		
Slope curvature (e.g concave, convex...)	Temperature	Bare land cover		
<b>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)</b>				



Available online: <http://www.necoc-opm.go.ug/>



Department of Relief, Disaster  
Preparedness and Management  
Office of the Prime Minister  
P.O.Box 371, Kampala, Uganda

**With support from:**



*Empowered lives.  
Resilient nations.*

United Nations Development Programme

Plot 11 Yusuf Lule, Road, Nakasero  
P. O. Box 7184, Kampala, Uganda  
Tel: (+256) 417 112 100  
Fax: (+256) 414 344 801  
[www.undp.org](http://www.undp.org)