THE REPUBLIC OF UGANDA

Rukungiri District
Hazard, Risk and Vulnerability Profile

2016

Acknowledgment

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: Senior District Agricultural Officer, District Natural Resources Officer and District Planner while at sub-county level Key informants included: Sub-county and parish chiefs, community Development mobilizers and health workers.

FGDs were carried out in five 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 Ruhinda, Buhunga, Bwambara, Nyakagyeme and Nyakishenyi 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-day 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 Rukungiri District were classified as:

- Geomorphological or Geological hazards including; landslides, rock falls, soil erosion and earth quakes.

- Climatological or Meteorological hazards including; floods, drought, hailstorms, strong winds and Lightning

- Ecological or Biological hazards including; crop pests and diseases, livestock pests and diseases, human disease outbreaks, vermin and wildlife animal attacks and invasive species.

- Human induced or Technological hazards including; bush fires, road accidents land conflicts.

General findings from the participatory assessment indicated that Rukungiri 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 Rukungiri 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 reduce vulnerability at community, Local Government and national levels should be a threefold effort hinged on:

- Reducing the impact of the hazard where possible through; mitigation, prediction, early warning and preparedness;

- Building capacities to withstand and cope with the hazards and risks;

- Tackling the root causes of the vulnerability such as poverty, poor governance, discrimination, inequality and inadequate access to resources and livelihood opportunities.

The following were recommended policy actions targeting vulnerability reduction:

- The Government should improve enforcement of policies aimed at enhancing sustainable environmental health.

- The Government through MAAIF should review the animal diseases control act because of low penalties given to defaulters.

- The Government should establish systems to motivate support of political leaders toward government initiatives and programmes aimed at disaster risk reduction.

- The Government should increase awareness campaigns aimed at sensitizing farmers/communities on disaster risk reduction initiatives and practices.

- The Government should revive Disaster Committees at district level and ensure funding of disaster and environmental related activities.

- The Government through UNRA and the District Authority should fund periodic maintenance of feeder roads to reduce on traffic accidents.

- The Government through MAAIF and the District Production Office should promote drought and disease resistant crop seeds.

- The Government through relevant Ministries coordinated by OPM should increase importation of Lightning conductors and also reduce taxes on their importation.

- The Government through OPM and Meteorology Authority should support establishment of disaster early warning systems.

- The Government through MWE increase funding and staff to monitor wetland degradation and non-genuine agro-inputs.

- The Government through OPM should improve communication between the disaster department and local communities.

- The Government through MWE should promote Tree planting along road reserves.

- The Government through MAAIF should fund and recruit extension workers at Sub-county level and also provide staff with necessary logistics.

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

DEFINITION OF KEY TERMS

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

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

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

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

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

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

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

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

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

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

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

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

INTRODUCTION

1.1 Background

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

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

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

This final draft report details methodological approach for HRV profiling and mapping for Rukungiri 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 Rukungiri District, Southwestern Uganda.

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

OVERVIEW OF RUKUNGIRI DISTRICT

2.1 Location

Rukungiri District is located between coordinates: 00^0 47' 21"S and 29^0 56' 30" E in Southwestern Uganda. The district is bordered by Rubirizi District to the North, Mitooma District to the East, Ntungamo District to the Southeast, Kabale District to the South, Kanungu District to the West, and the Democratic Republic of the Congo to the Northwest. This district has 9 sub-counties and 1 Municipality with 3 divisions. These include; Buyanja, Kebisoni, Nyakishenyi, Nyarushanje, Bugangari, Buhunga, Bwambara, Nyakagyeme and Ruhinda sub-counties. The divisions in Rukungiri Municipality include; Eastern, Southern and Western divisions. Figure 1 shows the Administrative boundaries and gazetted areas of Rukungiri District.
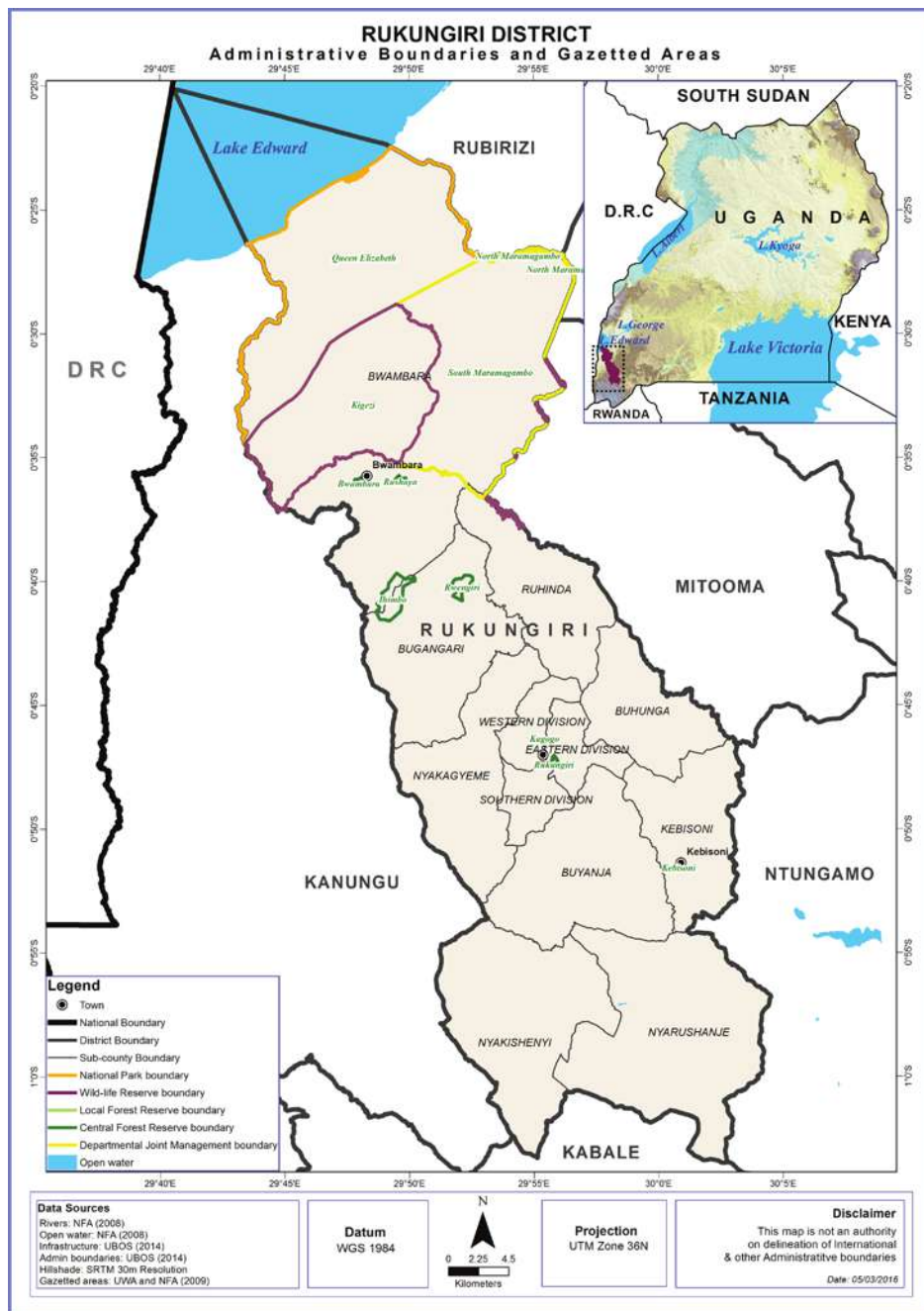
Figure 1: Administrative Boundaries and Gazetted Areas, Rukungiri District

2.1.1 Geomorphology

Rukungiri District is characterized by undulating hills, which are usually smooth in outline, with steep slopes and V shaped valleys. The hill tops continually rise to over 1846 m above sea level. The district has plateau areas, which are deeply incised particularly within the rightward drainage with local relief dropping to 615 m above sea level (Figure 2). There are three distinctive topographic zones include;

The Highland Area

This is associated with rejuvenated landscapes. It was affected by rift valley faulting. The topography is deeply incised with steep slopes, which occur along fault lines and extend considerable distances beyond in drainage basins. The hills characteristically encircle lowland embankments, which are broadly circular. This zone includes the sub-counties of Nyarushanje and Nyakishenyi.

The Plateau Area

It is associated with gently undulating plains merging into Lake Edward. This area gradually rises from 9234 m (Lake Level) to slightly over 1,169 m near the escarpment. The change in level is due to lake terracing as the water receded due to up warping during late rift movements. This zone includes the sub-counties of Kebisoni, Buyanja, Kagunga, Ruhinda, Buhunga and Nyakagyeme.

The Rift Valley Area

This is relatively flat with broad tracts of clay swamps. The elongated trough-like feature cuts across the District. It is extensive in Bwambara Sub-county especially the Queen Elizabeth National Park.

Figure 2: Geomorphology, Rukungiri District

2.1.2 Geology

The soils in the district are generally sandy clay loams. The most common soil types are grayish brown sandy loams and reddish brown sands with sandy loams: Dark brown sandy clay loam is also common. The parent rock to these soils is Rift valley sediments and volcanic ash (Figure 3). Pressure due to population increase and poor methods of soil management and the land tenure system have negatively affected the soils and degradation is rampant.
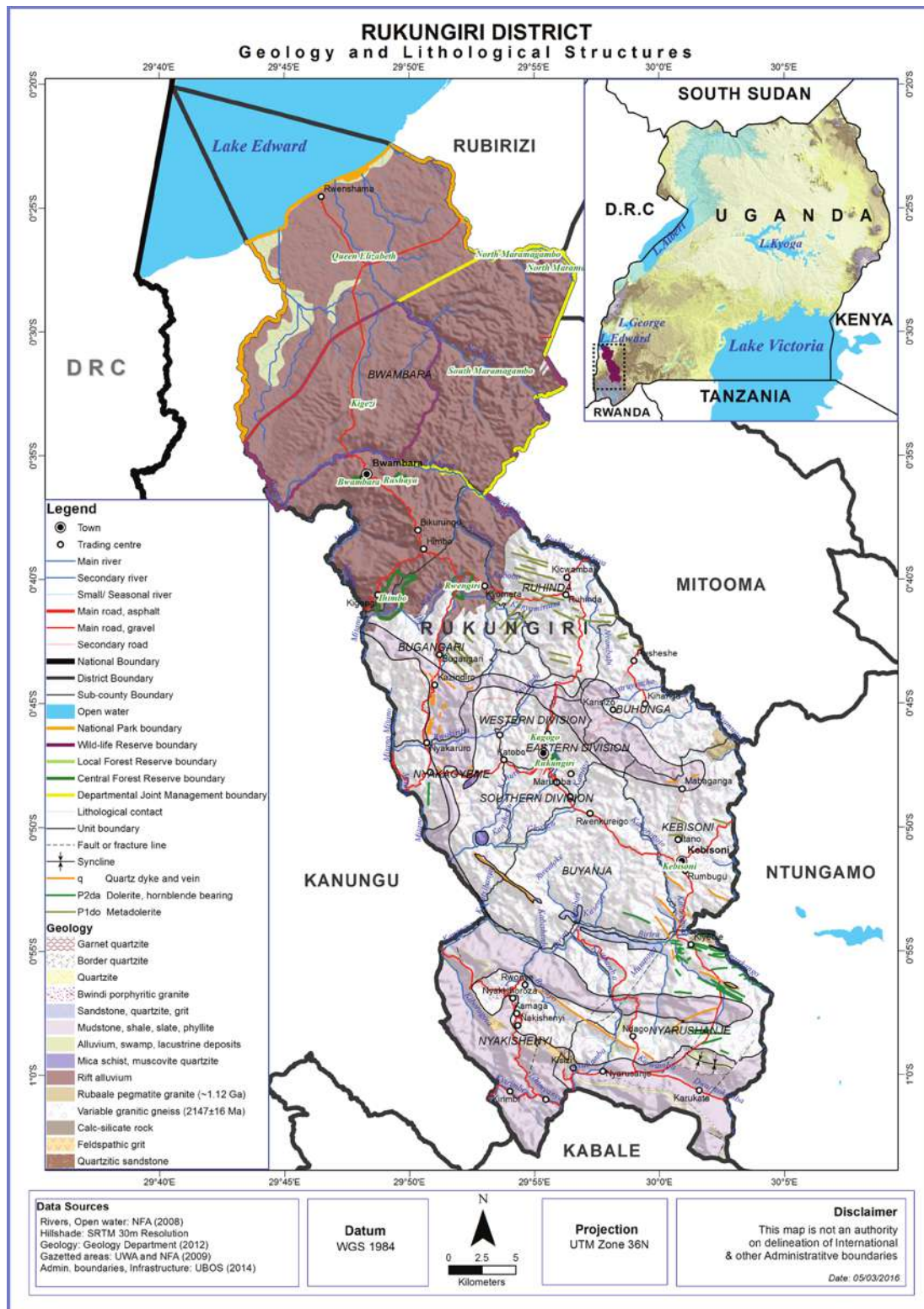
Figure 3: Geology and Lithological Structures, Rukungiri District

2.1.3 Vegetation and Land use Stratification

The District has a total area of 1,524.28 sq kms; Land area of 1445.64 sq Km, Area of water bodies 78.64 sq Km.11% of district total area comprises tropical high forests, 5.5% woodland, 2.6% bush land, 21.3% grassland, 52% farmland and 7.6% open water (Figure 4).
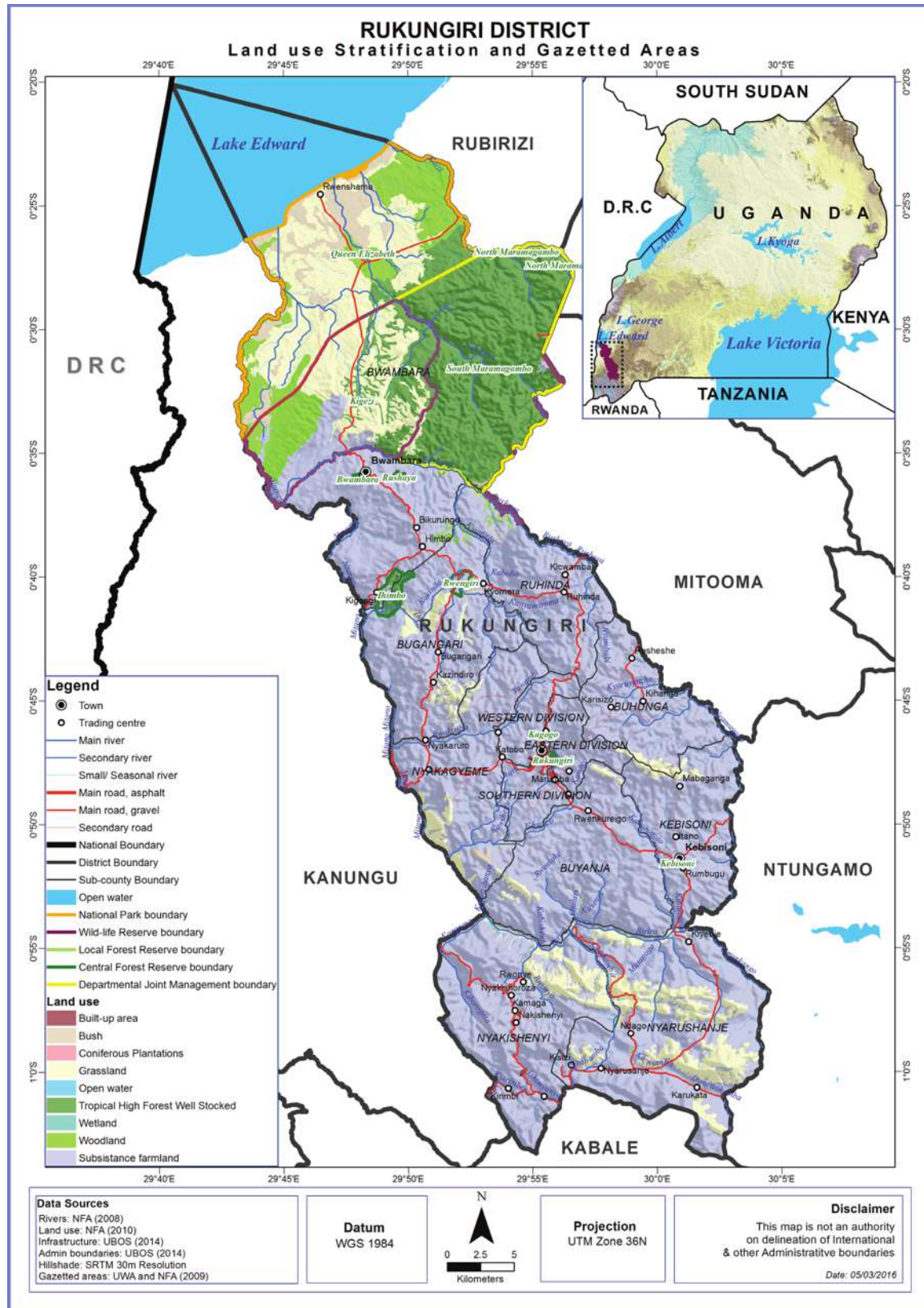
Figure 4: Land use Stratification, Rukungiri District

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 Rukungiri. The wind speed values indicated, therefore, represent conditions of moderate to strong or turbulent conditions. The average number of calms experienced in the area, are indicated to be experienced for 99days at 0600 hours, and 27 days at 1200 hours, respectively, at Rukungiri. The general conclusion from these climatic figures is that for most of the year, Rukungiri District experiences moderate to strong and gusty winds, increasing in the afternoon.

2.1.6 Rainfall

The District has bimodal rainfall with rains received from February - May and rains from August - November. The mean annual rainfall ranges between 700mm - 1200mm (Figure 5). Climatic changes have resulted into unpredictable heavy rainfall and prolonged drought.

Figure 5: Total Annual Rainfall Distribution, Rukungiri District

2.1.7 Hydrology

The district is endowed with a number of rivers and one major lake. Lake Edward is the main lake in the district where fishing activities take place at Rwenshama Fishing village. Other small lakes include Kimbugu in Nyarushanje and Lake Garubunda in Kebisoni sub-counties. The District has both permanent and temporary wetlands (approximately 78.64 sq km). They include Ntungwa (Birara) system, Nchwera system and Lake Edward margins. There are also minor wetlands that drain into Kagera system and eventually form part of Lake Victoria drainage system.

2.1.8 Population

According to the National Population and Housing Census (2014) provisional results, Rukungiri District had a total population of 320,567 people. Results also showed that most of the people in Rukungiri District reside in rural areas (284,058 (88.6%) compared to (36,509 (11.4%) who reside in urban centers. The gender distribution was reported to be males: 152,376 (47.5%) and females: 168,191 (52.5%). About 98.6% (315,943) of the population form the household population and only 1.4% (4,624) is Non-household. Nyarushanje sub-county had the highest population of 45,205 people while Southern division in Rukungiri Municipality had the least population of 9,339 people (Figure 6). Table 1 shows the population distribution per sub-county for the different gender.

Table 1: Population Distribution in Rukungiri District

	HOUSEHOLDS		POPULATION		
Sub-County	*Number*	*Average Size*	*Males*	*Females*	*Total*
Buyanja	7,668	4.7	17,458	18,520	35,978
Kebisoni	5,631	4.6	12,376	13,648	26,024
Nyakishenyi	7,906	4.3	15,934	18,487	34,421
Nyarushanje	9,695	4.6	21,059	24,146	45,205
Bugangari	6,816	4.5	14,759	16,041	30,800
Buhunga	4,937	4.5	10,400	11,894	22,294
Bwambara	6,909	4.5	15,416	15,995	31,411
Nyakagyeme	7,265	4.4	15,276	16,711	31,987
Ruhinda	5,634	4.6	12,162	13,776	25,938
Eastern Division	2,887	4.2	6,288	6,706	12,994
Southern Division	2,095	4.1	4,297	5,042	9,339
Western Division	3,410	4.1	6,951	7,225	14,176

Source: UBOS Census 2014
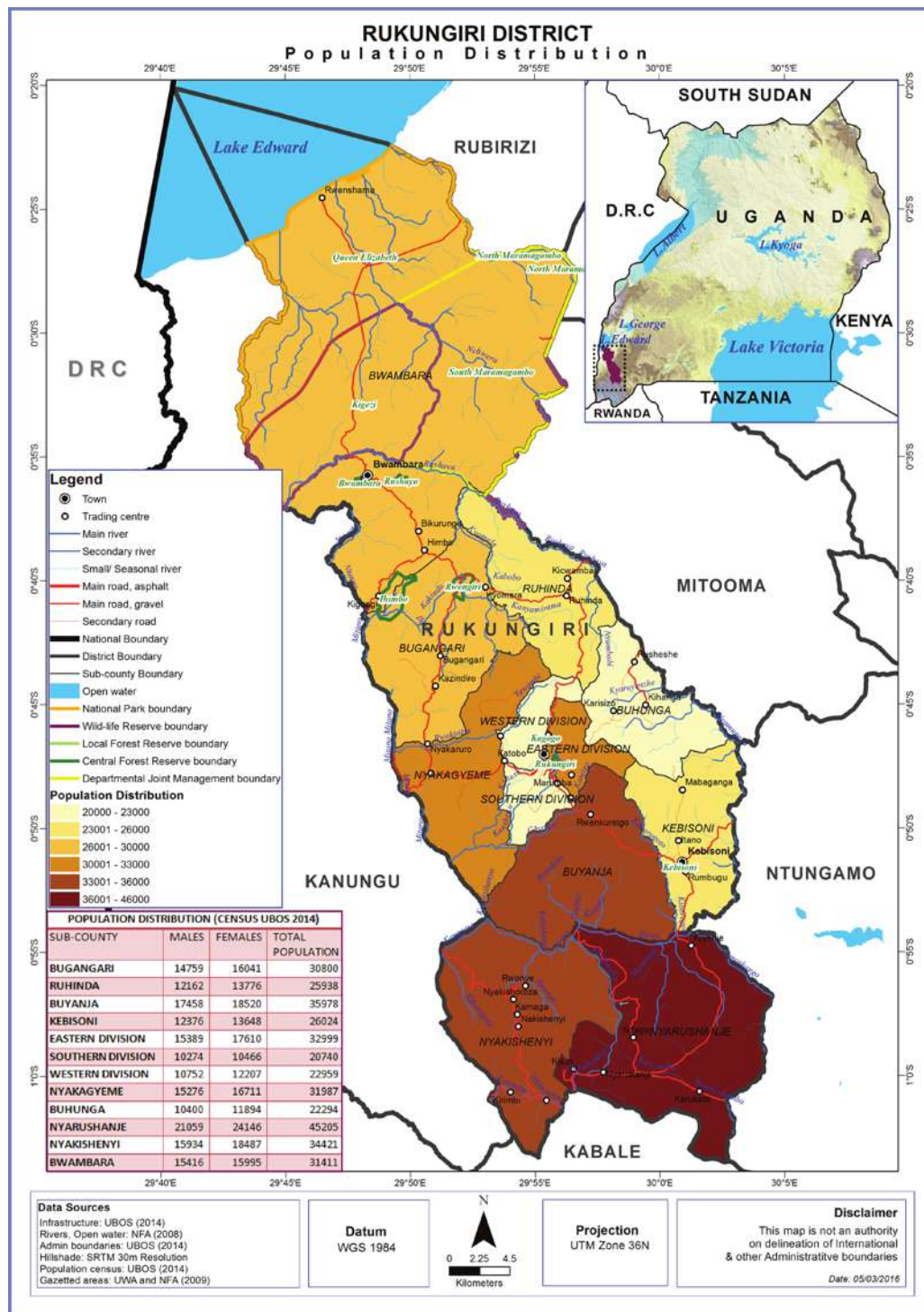
Figure 6: Population Distribution, Rukungiri District

2.1.9 Economic activities

Agriculture is the main economic activity in the district employing over 90% of the working population. Majority of farmers are small holders using traditional agriculture techniques. The major crops grown include; Bananas, beans, sweet potatoes, cassava, maize, Irish potatoes, coffee, peas, rice, sorghum and Tea. A considerable number of households are engaged in livestock farming and the animals commonly reared include: cattle, goats, sheep, pigs, chicken, ducks, turkeys and rabbits.

There are also fishing activities at Rwenshama landing site on Lake Edward where majority of fish consumed in the district are obtained.

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 three respondents (Senior District Agricultural Officer, District Natural Resources Officer and District Planner) was held at Rukungiri District Headquarters (29.92537E; -0.78438S). At Sub-county level Key informants included: Sub-county and parish chiefs, community Development mobilizers and health workers.

FGDs were carried out in five 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 Ruhinda Sub-county (29.94496E; -0.68134S), Buhunga Sub-county (29.99074E; -0.75267S), Bwambara Sub-county (29.81101E; -0.60286S), Nyakagyeme Sub-county (29.88095E; -0.79703S) and Nyakishenyi Sub-county (29.90785E; -0.96445S). 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.

3.3 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.

3.3.1 Data verification and validation

In collaboration with OPM, a five-day 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.

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 Rukungiri 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 experienced in Rukungiri District. It was observed that landslides occur in the rainy season. It was reported that when landslides occur, houses and crops are severely destroyed and roads are also blocked. Participants reported that landslides usually block the Rukungiri-Kanungu road at Enengo in Nyakagyeme Sub-county. The areas where landslides usually occur are; Katabushera hill in Bugangari, Nyarwimuka, Nyakitabire and Kichwamba parishes in Ruhinda sub-county.   The other most affected sub-counties include; Nyarushanje and Nyakishenyi. 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).
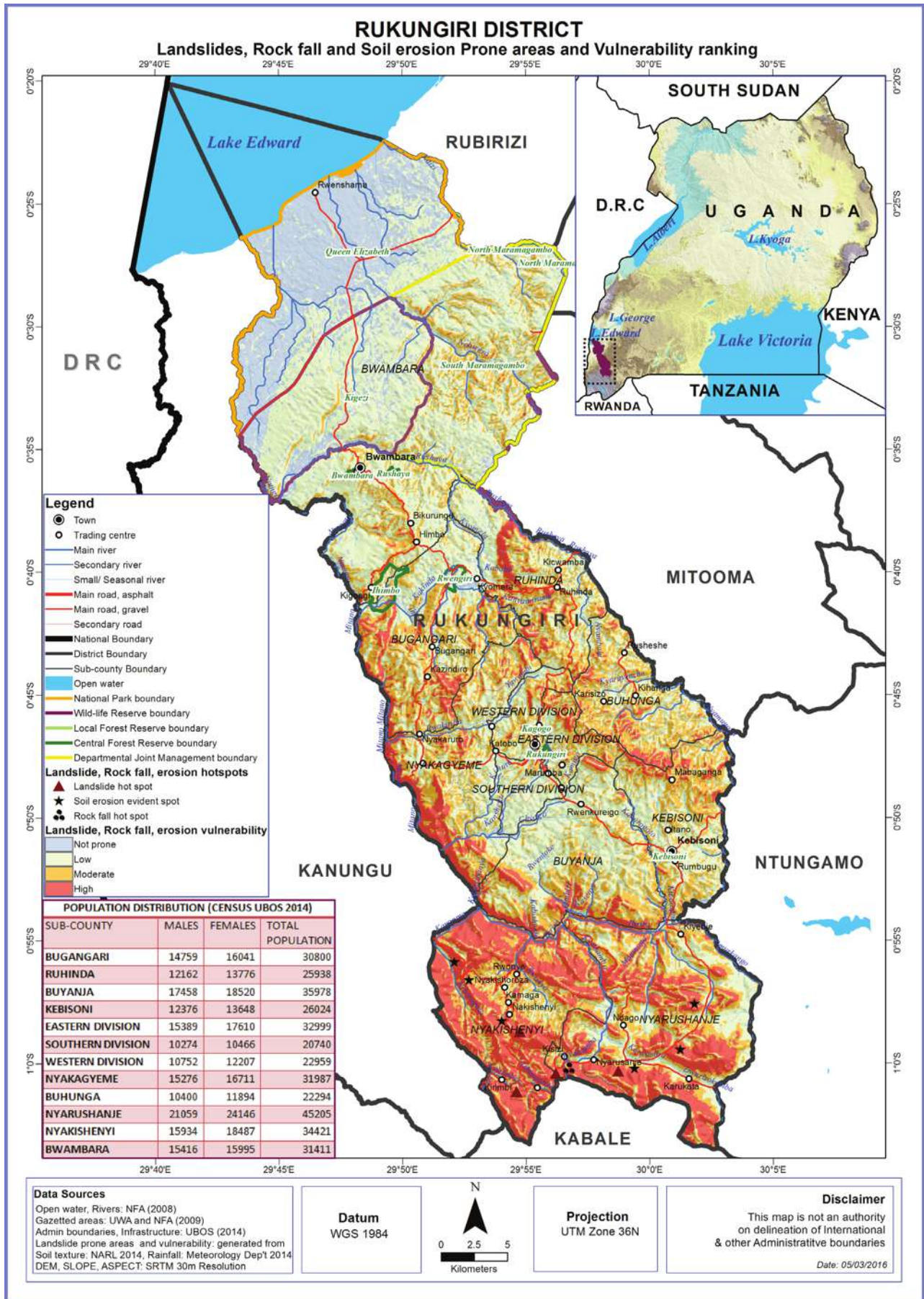
Figure 7: Landslides, Rock fall and Soil erosion Prone Areas, Rukungiri District

The map includes the following elements:

RUKUNGIRI DISTRICT
Landslides, Rock fall and Soil erosion Prone areas and Vulnerability ranking

Legend
- Town
- Trading centre
- Main river
- Secondary river
- Small/ Seasonal river
- Main road, asphalt
- Main road, gravel
- Secondary road
- National Boundary
- District Boundary
- Sub-county Boundary
- Open water
- National Park boundary
- Wild-life Reserve boundary
- Local Forest Reserve boundary
- Central Forest Reserve boundary
- Departmental Joint Management boundary

Landslide, Rock fall, erosion hotspots
- Landslide hot spot
- Soil erosion evident spot
- Rock fall hot spot

Landslide, Rock fall, erosion vulnerability
- Not prone
- Low
- Moderate
- High

POPULATION DISTRIBUTION (CENSUS UBOS 2014)

SUB-COUNTY	MALES	FEMALES	TOTAL POPULATION
BUGANGARI	14759	16041	30800
RUHINDA	12162	13776	25938
BUYANJA	17458	18520	35978
KEBISONI	12376	13648	26024
EASTERN DIVISION	15389	17610	32999
SOUTHERN DIVISION	10274	10466	20740
WESTERN DIVISION	10752	12207	22959
NYAKAGYEME	15276	16711	31987
BUHUNGA	10400	11894	22294
NYARUSHANJE	21059	24146	45205
NYAKISHENYI	15934	18487	34421
BWAMBARA	15416	15995	31411

Data Sources
Open water, Rivers: NFA (2008)
Gazetted areas: UWA and NFA (2009)
Admin boundaries, Infrastructure: UBOS (2014)
Landslide prone areas and vulnerability: generated from
Soil texture: NARL 2014, Rainfall: Meteorology Dep't 2014
DEM, SLOPE, ASPECT: SRTM 30m Resolution

Datum
WGS 1984

Projection
UTM Zone 36N

0 2.5 5 Kilometers

Disclaimer
This map is not an authority
on delineation of International
& other Administratitve boundaries

Date: 05/03/2016

4.1.2 Earthquakes and faults

Participants in the focus group discussions indicated that Rukungiri District experiences earth tremors (Figure 8). It was observed that these earth tremors are not serious and thus do not cause any damage to houses.
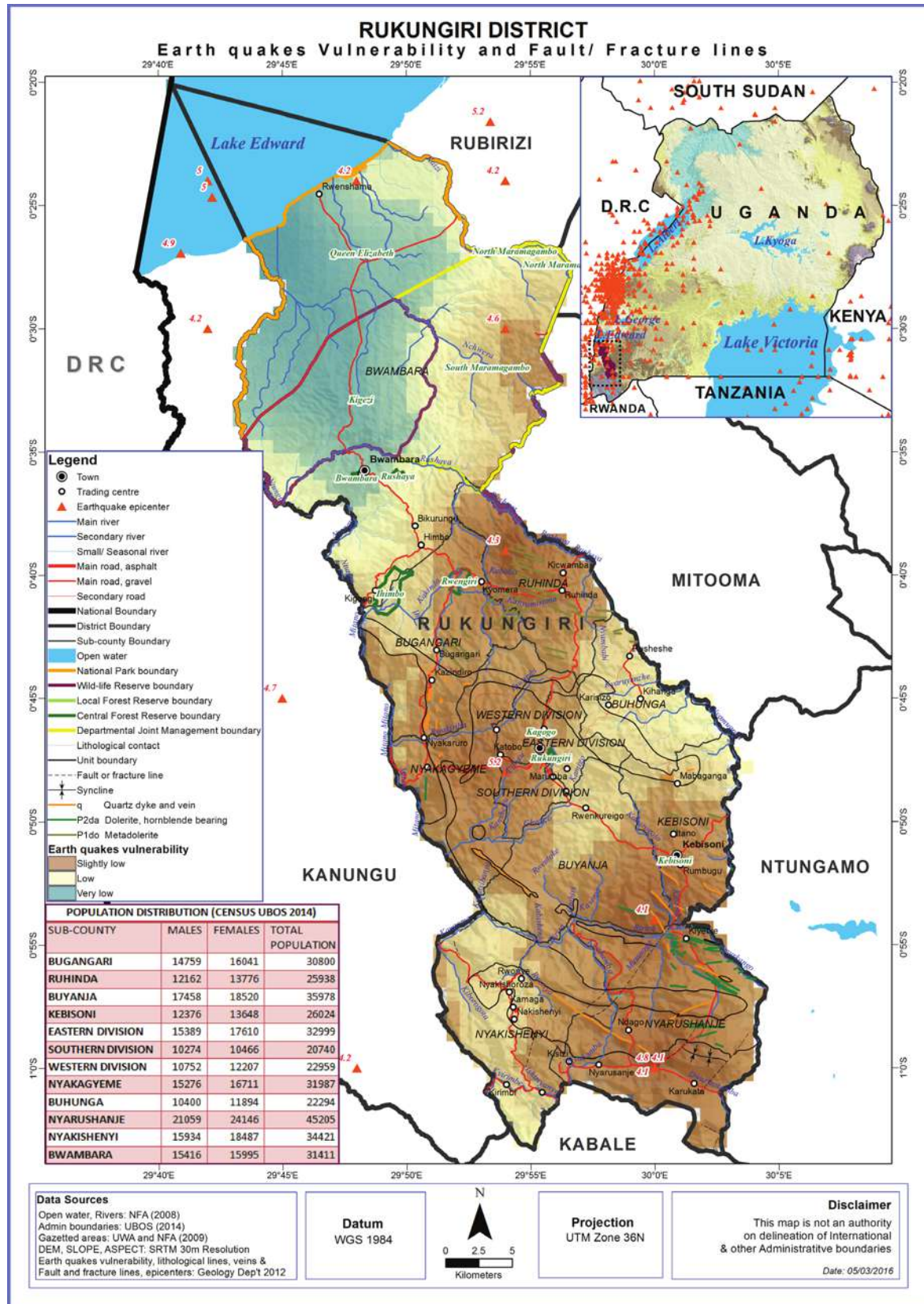
Figure 8: Earthquakes Vulnerability and Fault lines, Rukungiri District

4.2 Climatological and Meteorological Hazards

4.2.1 Floods

Participants in the focus group discussions indicated that floods are a common occurrence in Rukungiri District during the rainy seasons. It was noted that these floods mainly occur along rivers and in the low land areas. It was reported that River Kataruka in southern division at one time flooded and swept most of the gardens along it. The rivers other rivers in the district that flood are; River Ntungwa in Bugangari and Bwambara sub-counties, River Birara in Buyanja and Nyakagyeme sub-counties. Participants reported that in December 2013, Lake Edward burst its shores and displaced the entire Rwenshama fishing village. 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.

Plate 1: Impact of shore line shift at Rwenshama Landing site, Bwambara Sub-county

Plate 2: Flooding hot spot at Rwenshama Landing site, Bwambara Sub-county

Plate 3: Flooding spot at Kanyeganyege culvert crossing, Buhunga Sub-county

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

4.2.2 Drought

Results from participatory assessments indicated that droughts in form of prolonged dry spells without rain are experienced in Rukungiri District. It was reported that the entire district is affected by these prolonged dry spells. However, it was pointed out that Bwambara sub-county is the most affected by the prolonged dry spells. Some of the effects of these dry spells include; crop failures, crop raiding by wild animals, lack of water and pastures for livestock and increased incidences of pests and diseases. 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.

Plate 4: Impact of Prolonged dry spells in QENP, Bwambara Sub-county

RUKUNGIRI DISTRICT
Drought Prone areas and Vulnerability Ranking

Legend

- ◉ Town
- ○ Trading centre
- —— Main river
- —— Secondary river
- —— Small/ Seasonal river
- —— Main road, asphalt
- —— Main road, gravel
- —— Secondary road
- —— National Boundary
- —— District Boundary
- —— Sub-county Boundary
- ▭ Open water
- —— National Park boundary
- —— Wild-life Reserve boundary
- —— Local Forest Reserve boundary
- —— Central Forest Reserve boundary
- —— Departmental Joint Management boundary

Drought vulnerability

- ▭ High
- ▭ Moderate
- ▭ Low
- ▭ Very low

POPULATION DISTRIBUTION (CENSUS UBOS 2014)			
SUB-COUNTY	MALES	FEMALES	TOTAL POPULATION
BUGANGARI	14759	16041	30800
RUHINDA	12162	13776	25938
BUYANJA	17458	18520	35978
KEBISONI	12376	13648	26024
EASTERN DIVISION	15389	17610	32999
SOUTHERN DIVISION	10274	10466	20740
WESTERN DIVISION	10752	12207	22959
NYAKAGYEME	15276	16711	31987
BUHUNGA	10400	11894	22294
NYARUSHANJE	21059	24146	45205
NYAKISHENYI	15934	18487	34421
BWAMBARA	15416	15995	31411

Data Sources
Open water, Rivers: NFA (2008)
Gazetted areas: UWA and NFA (2009)
Admin boundaries, Infrastructure: UBOS (2014)
Drought vulnerability: generated from
Rainfall and Temperature: Meteorology Dep't 2014

Datum
WGS 1984

N

0   2.25   4.5
Kilometers

Projection
UTM Zone 36N

Disclaimer
This map is not an authority
on delineation of International
& other Administratitve boundaries

Date: 05/03/2016

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

4.2.3 Hailstorms

Participatory assessments through the focus group discussions indicated that hailstorms are a common occurrence in Rukungiri District and are experienced during rainy seasons. Participants reported that hailstorms usually cause serious damage to crops especially banana plantations. Though it was reported that the entire district is affected by hailstorms, the most affected Sub-counties are; Nyakishenyi, Ruhinda, Buhunga and Bwambara (Figure 11).

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 strong winds blew off the roof at Bwambara Sub-county offices in October 2015. Another incident happened in Rwagaya primary school where the roof was blown off in Burombe Parish, Ruhinda Sub-county. The other most affected sub-counties are; Nyarushanje, Kebisoni and part of Rukungiri Minicipality (Figure 11).

4.2.5 Lightning

Lightning is a sudden high-voltage discharge of electricity that occurs within a cloud, between clouds, or between a cloud and the ground. The distribution of lightning on Earth is far from uniform. The ideal conditions for producing lightning and associated thunderstorms occur where warm, moist air rises and mixes with cold air above. Participants in the focus group discussions mentioned that Lightning was a serious problem in the District. It was reported that in 2012, 10 cows were killed by Lightning in Kabingo parish, Buhunga Sub-county. At Bukurungu Parish, 2 pupils were killed at Bukurungu Centenary Primary School in 2014 (Figure 11).
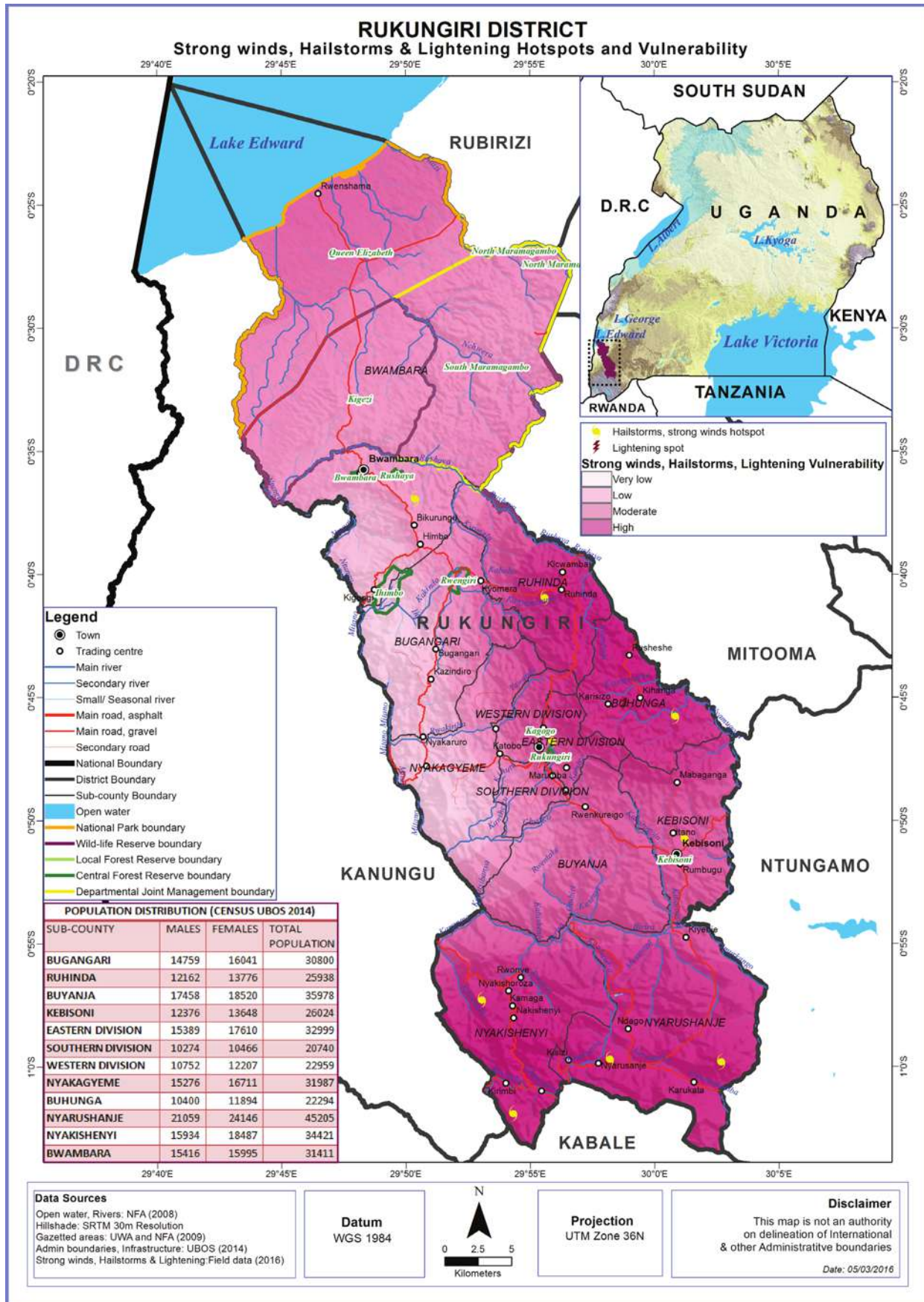
Figure 11: Strong winds, Hailstorms and Lightning Hotspots and Vulnerability, Rukungiri District

4.3 Ecological and Biological Hazards

4.3.1 Crop Pests and Diseases

Results from participatory assessments indicated that Rukungiri District is prone to crop diseases and pests (Figure 12). The most common crop pests and diseases in the district are shown in the table below;

Table 2: Common Crop diseases and pests

CROP	DISEASES	PESTS
Banana	Fusarium wilt, Banana Bacterial Wilt, Sigatoka, Banana Streak virus.	Banana weevil nematodes.
Coffee	Coffee wilt, coffee leaf rust, coffee berry, disease.	Coffee, stem borers, mealy bugs, coffee twig borers
Maize	Maize steak virus, Northern blight	Weevils
Beans	Bean root rot	Weevils, aphids
Vegetables	Blight, wilts and leaf spots	Cut worms, Boll borers, Aphids
Cassava	Viral diseases(cassava leaf mosaic)	Mites
Sweet potatoes	Viral disease	Weevils and caterpillars

Source: Department of Agriculture 2014

Plate 5: A banana plantation affected by banana bacterial wilt in Buhunga Sub-county

RUKUNGIRI DISTRICT
Crop Pests and Diseases Vulnerability

Legend
- ⊙ Town
- ○ Trading centre
- —— Main river
- —— Secondary river
- —— Small/ Seasonal river
- —— Main road, asphalt
- —— Main road, gravel
- —— Secondary road
- —— National Boundary
- —— District Boundary
- —— Sub-county Boundary
- Open water
- —— National Park boundary
- —— Wild-life Reserve boundary
- —— Local Forest Reserve boundary
- —— Central Forest Reserve boundary
- —— Departmental Joint Management boundary
- ★ Banana Bacterial Wilt hotspot
- 🏛 Agric. Extension Services Headquarter

Crop pests and Diseases vulnerability
- Moderate
- Low
- Very low
- Not reported

POPULATION DISTRIBUTION (CENSUS UBOS 2014)

SUB-COUNTY	MALES	FEMALES	TOTAL POPULATION
BUGANGARI	14759	16041	30800
RUHINDA	12162	13776	25938
BUYANJA	17458	18520	35978
KEBISONI	12376	13648	26024
EASTERN DIVISION	15389	17610	32999
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WESTERN DIVISION	10752	12207	22959
NYAKAGYEME	15276	16711	31987
BUHUNGA	10400	11894	22294
NYARUSHANJE	21059	24146	45205
NYAKISHENYI	15934	18487	34421
BWAMBARA	15416	15995	31411

Notes
Crop Pests and Disease ranking was based on BBW, Fusarium wilt, Panama wilt, Coffee wilt. Pests: Coffee Twig borer, aphids

Data Sources
Infrastructure: UBOS (2014)
Open water, Rivers: NFA (2008)
Admin boundaries: UBOS (2014)
Hillshade: SRTM 30m Resolution
Gazetted areas: UWA and NFA (2009)
Crop pests and Diseases: field data + Landuse

Datum
WGS 1984

Projection
UTM Zone 36N

0 2.5 5
Kilometers

Disclaimer
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Date: 05/03/2016

Figure 12: Crop Pests and Diseases Vulnerability, Rukungiri 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 Rukungiri District (Figure 13). The most common livestock pests and diseases in the district are shown in the table below;

Table 3: Common Livestock Diseases and Pests

LIVESTOCK	DISEASE	PESTS
Cattle Goats Sheep Pigs	Lumpy skin, Tick borne disease, pink eye trypanasomiasis (Nagana) and brucellosis, (Food and mouth Disease)	Intestinal worms, flukes, mites, ticks, nasal flies, tsetse flies, flees and nuisance flies.
Poultry	Coccidiosis, new castle disease, fowl typhoid, Gumboro	Mites
Bees	Fungal diseases	Birds, lizards, snakes, bats, moths, mites and baboons, beetles, rats, termites and ants.

Source: Department of Production 2014

RUKUNGIRI DISTRICT
Livestock Pests and Diseases Vulnerability

Legend

- ◉ Town
- ○ Trading centre
- — Main river
- — Secondary river
- — Small/ Seasonal river
- — Main road, asphalt
- — Main road, gravel
- — Secondary road
- — National Boundary
- — District Boundary
- — Sub-county Boundary
- ▬ Open water
- — National Park boundary
- — Wild-life Reserve boundary
- — Local Forest Reserve boundary
- — Central Forest Reserve boundary
- — Departmental Joint Management boundary
- 🏛 Agric. Extension Services Headquarter

Livestock pests and diseases vulnerability

- Moderate
- Low
- Very low
- Not reported

Notes
Livestock Pests and Diseases ranking was based on Foot + Mouth Disease-FMD, CBPP-Contegious Bovine Plupnemonia, ECF-East Africa Coast Fever, and Rabies. Pests: Ticks, fleas

POPULATION DISTRIBUTION (CENSUS UBOS 2014)			
SUB-COUNTY	MALES	FEMALES	TOTAL POPULATION
BUGANGARI	14759	16041	30800
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NYARUSHANJE	21059	24146	45205
NYAKISHENYI	15934	18487	34421
BWAMBARA	15416	15995	31411

Data Sources
Hillshade: SRTM 30m Resolution
Environmetal degradation: Field data (2016)
Infrastructure, Admin boundaries: UBOS (2014)
Livestock pests + diseases: Field data + Landuse (2016)
Open water, Rivers, Gazetted areas: UWA and NFA (2009)

Datum
WGS 1984

N

0 2.5 5
Kilometers

Projection
UTM Zone 36N

Disclaimer
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Date: 05/03/2016

Figure 13: Livestock Pests and Diseases Vulnerability, Rukungiri District

4.3.3 Human Diseases

The most common human diseases in Rukungiri District are; malaria, cholera, dysentery, measles, bilharzia at Rwenshama landing site, some traces of jigger infestation in Kikarara parish in Bwambara sub-county and HIV/AIDS (Figure 14). Participants reported that the prevalence rates of HIV/AIDS were high at Rwenshama landing site in Bwambara, Buhunga and Nyakagyeme Sub-counties. Incidences of cholera are usually high at Rwenshama landing site in Bwambara sub-county. It was also reported that incidences of malaria are high in the entire District.
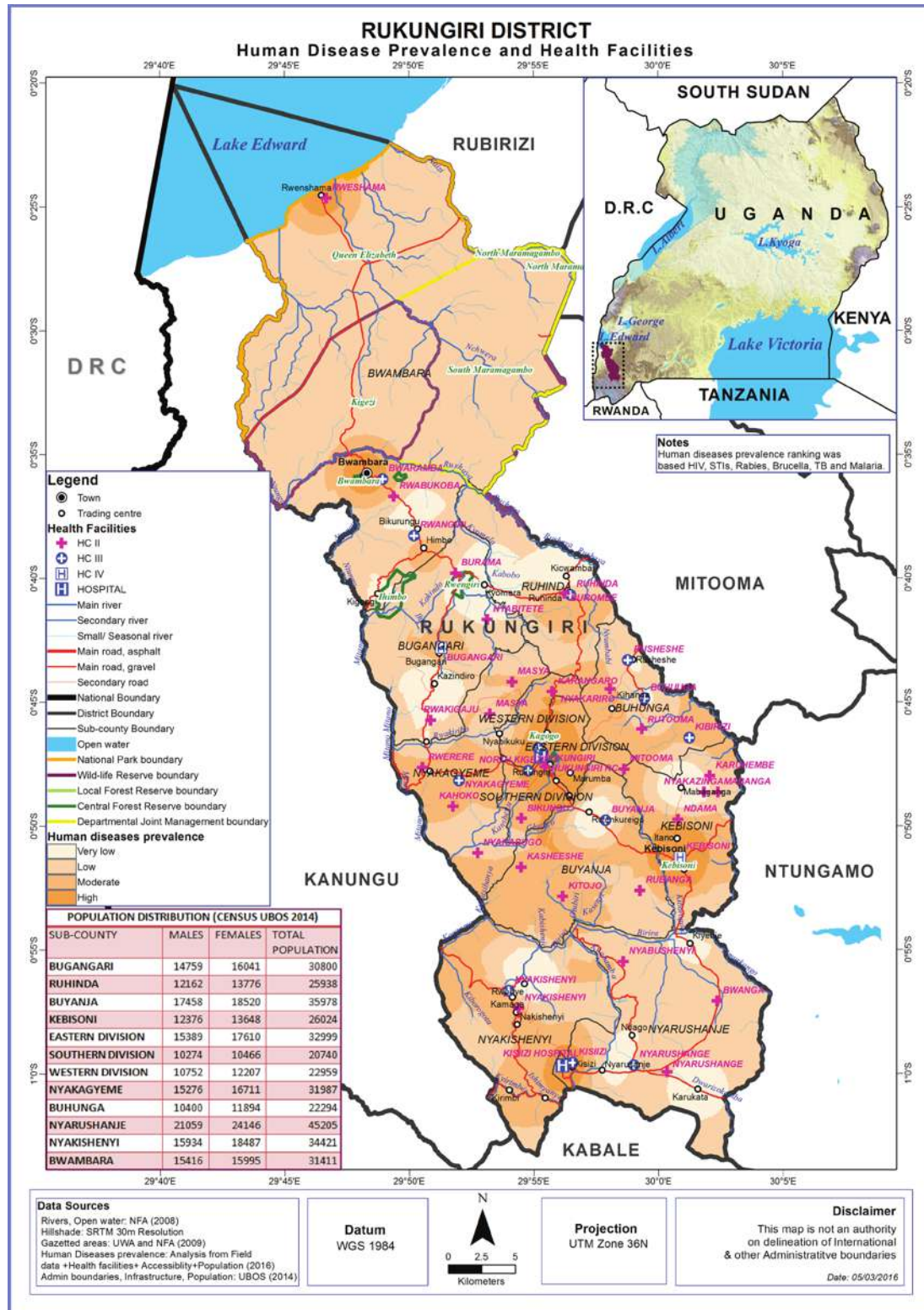
Figure 14: Human Disease Prevalence and Health Facilities, Rukungiri District

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 Queen Elizabeth National Park. Participants reported that wild animals such as bush pigs, elephants, buffaloes, monkeys and baboons raid crops in the sub-counties of Bwambara, Ruhinda and Bugangari (Figure 15). Efforts to control crop raiding have been done by Uganda Wildlife Authority and the district to control these wild animals (vermin) by constructing trenches planting live fences (Mauritius thorns) and constructing of wire mesh fences along the boundaries with Queen Elizabeth National Park.

Plate 6: Buffaloes near Rwenshama fishing village in Queen Elizabeth National Park

RUKUNGIRI DISTRICT
Vermin and Wild-life Animal Conflicts and Vulnerability

Legend

- ◉ Town
- ○ Trading centre
- —— Main river
- —— Secondary river
- —— Small/ Seasonal river
- —— Main road, asphalt
- —— Main road, gravel
- —— Secondary road
- —— National Boundary
- —— District Boundary
- —— Sub-county Boundary
- ▨ Open water
- —— National Park boundary
- —— Wild-life Reserve boundary
- —— Local Forest Reserve boundary
- —— Central Forest Reserve boundary
- —— Departmental Joint Management boundary

Vermin, Wild-life animal conflicts+vulnerability
- ▨ High
- ▨ Moderate
- ▨ Low
- ▨ Not reported

Notes
Vermin include: Monkeys, rodents etc while wild-life animals include: crocodiles, elephants, buffaloes, antelopes

POPULATION DISTRIBUTION (CENSUS UBOS 2014)			
SUB-COUNTY	MALES	FEMALES	TOTAL POPULATION
BUGANGARI	14759	16041	30800
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NYAKISHENYI	15934	18487	34421
BWAMBARA	15416	15995	31411

Data Sources
Infrastructure: UBOS (2014)
Open water, Rivers: NFA (2008)
Admin boundaries: UBOS (2014)
Hillshade: SRTM 30m Resolution
Gazetted areas: UWA and NFA (2009)
Wild-life animal conflicts: Field data (June 2016)

Datum
WGS 1984

N

0 2.5 5
Kilometers

Projection
UTM Zone 36N

Disclaimer
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Date: 05/03/2016

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

4.3.5 Invasive species

The most reported invasive species in Rukungiri District are; *Lantana camara*, *pasperum spp*., stranglers, *Oxalis latifolia* and *Parthenium hysterophorus (congress weed)* (Figure 16). Participants noted that *Lantana camara* destroys grazing land by suppressing the growth of good pastures. *Parthenium hysterophorus* usually grows out of hand and colonizes all land, stops other plants from growing, reduces crop and animal production, taints milk and meat in livestock, causes severe skin rash, bronchitis and asthma in humans.

Plate 7: *Lantana camara in Buhunga Sub-county*
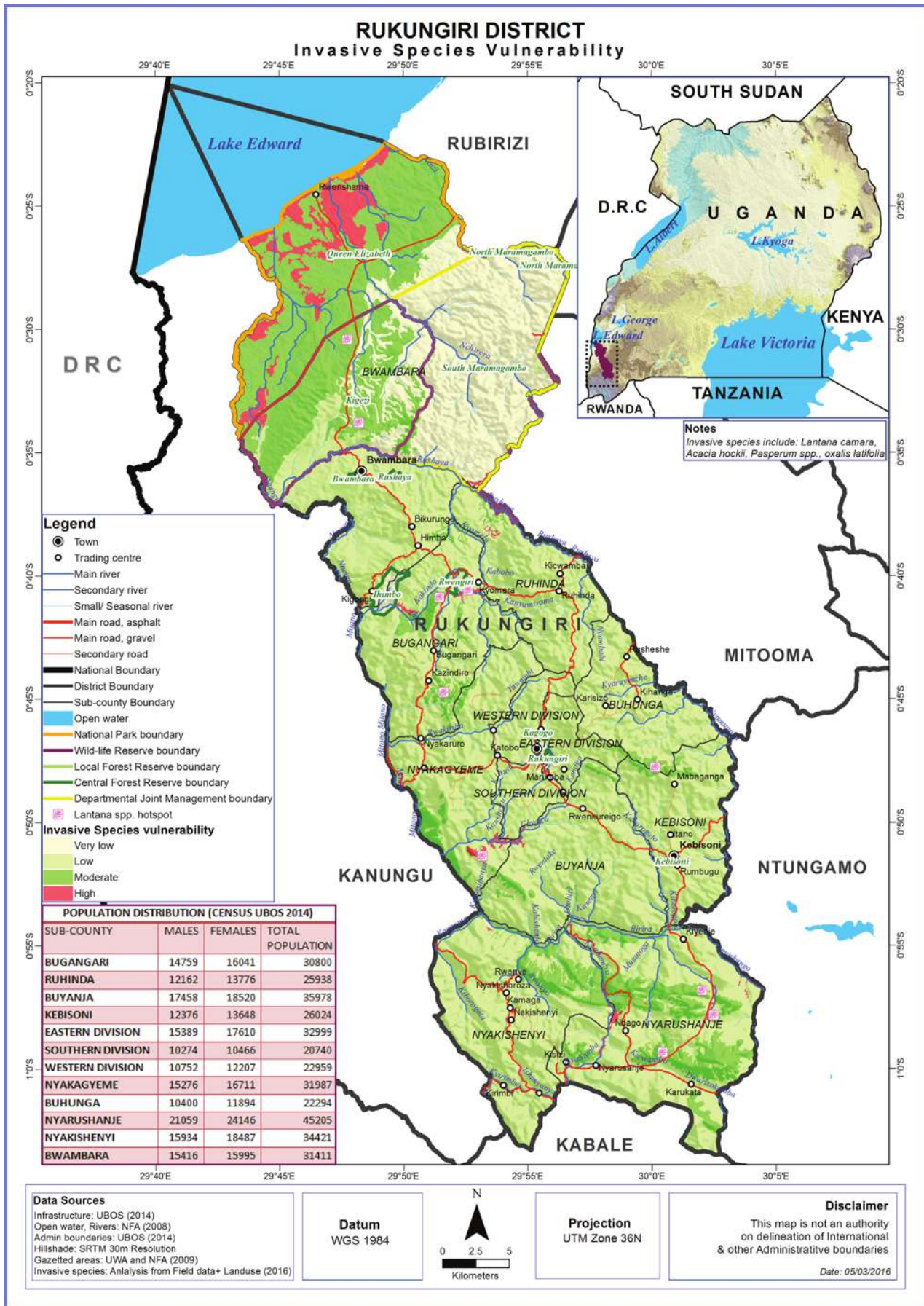
Figure 16: Invasive Species Vulnerability, Rukungiri District

4.4 Human Induced and Technological Hazards

4.4.1 Bush fires

Participants in the focus group discussions indicated that controlled bush fires are usually practiced by the management of Queen Elizabeth National Park Ishasha sector in the dry season. These management bush fires at times spill over to the local communities in Bwambara sub-county thereby destroying their crops and houses. Other incidences of bush fires were reported in Kakatenga hill where a pine plantation was burnt by charcoal burners in February 2016 (Figure 17).

Plate 8: Impact of management bush fires in Queen Elizabeth National Park, Bwambara Sub-county

Plate 9: Eucalyptus and Pine Plantation destroyed by bush fires at Rwakijubwe hill, Buhunga Sub-county

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

Within the map:

RUKUNGIRI DISTRICT
Bush/ Forest fires hotspot areas and Vulnerability

Legend
- ◉ Town
- ○ Trading centre
- Main river
- Secondary river
- Small/ Seasonal river
- Main road, asphalt
- Main road, gravel
- Secondary road
- National Boundary
- District Boundary
- Sub-county Boundary
- Open water
- National Park boundary
- Wild-life Reserve boundary
- Local Forest Reserve boundary
- Central Forest Reserve boundary
- Departmental Joint Management boundary
- Bush/forest fires evident spot

Bush/ forest fires hotspot areas
- High
- Moderate
- Low
- Not occur

POPULATION DISTRIBUTION (CENSUS UBOS 2014)

SUB-COUNTY	MALES	FEMALES	TOTAL POPULATION
BUGANGARI	14759	16041	30800
RUHINDA	12162	13776	25938
BUYANJA	17458	18520	35978
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NYAKISHENYI	15934	18487	34421
BWAMBARA	15416	15995	31411

Data Sources
Hillshade: SRTM 30m Resolution
Infrastructure, Admin boundaries: UBOS (2014)
Open water, Rivers, Gazetted areas: UWA and NFA (2009)
Bush/forest fires: Analysis using Field data +Landuse (2016)

Datum
WGS 1984

N

0 2.5 5
Kilometers

Projection
UTM Zone 36N

Disclaimer
This map is not an authority on delineation of International & other Administratitve boundaries

Date: 05/03/2016

4.4.2 Land conflicts

Results from the participatory assessments indicated that land conflicts were a serious problem in Rukungiri District. It was observed that land conflicts are the major causes of domestic violence in the entire District. It was reported that there are boundary conflicts between Rukungiri District and the newly created District of Mitooma in Kikarara and Rwenshama Parishes (Figure 18). Public/ government land has also been encroached due to lack of land titles for all Government land. Customary land conflicts are also high district wide due to succession issues.
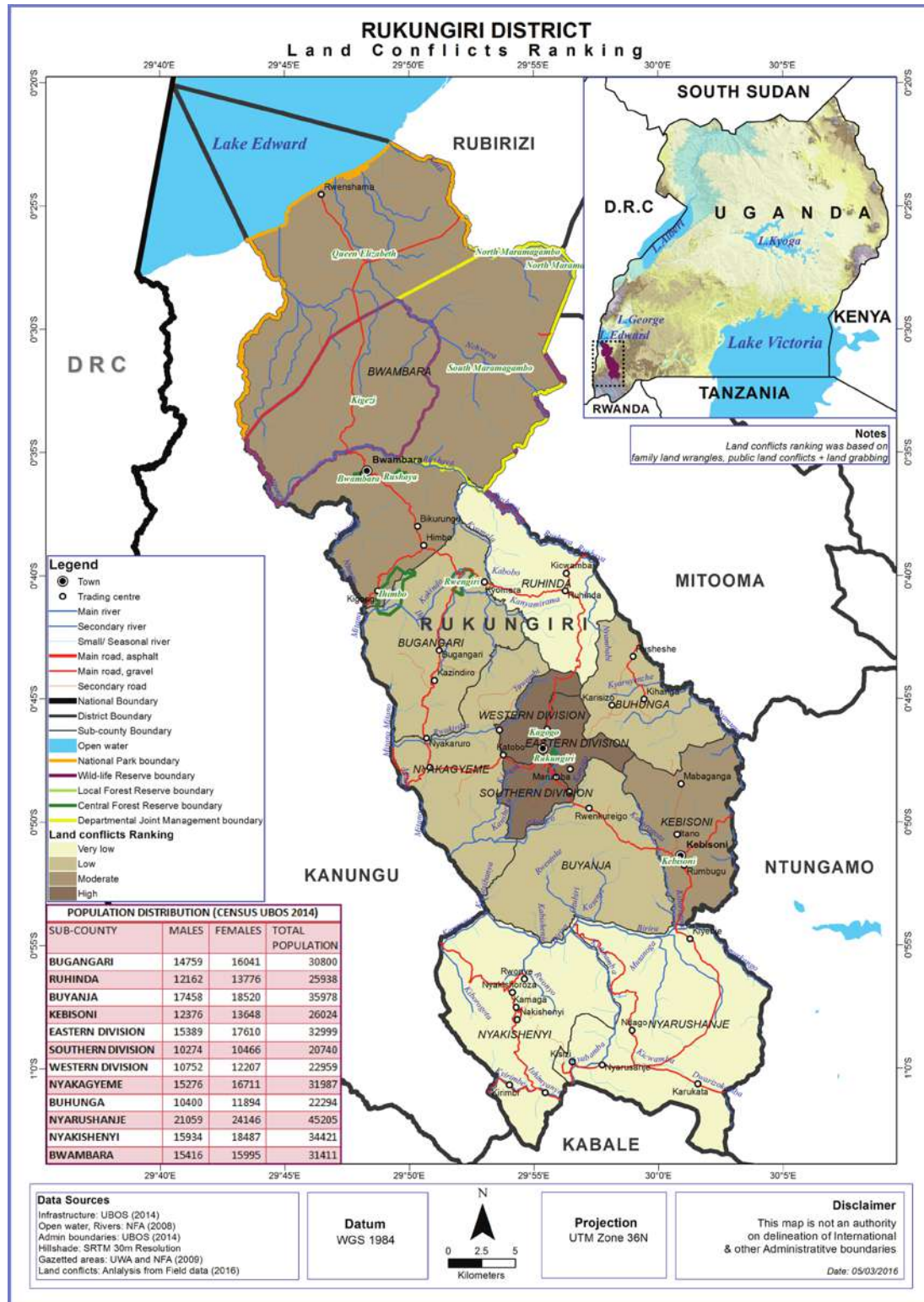
Figure 18: Land Conflicts Ranking, Rukungiri District

4.4.3 Environmental Degradation

Participatory assessments indicated that the most common forms of environmental degradation in Rukungiri District are; deforestation, planting of eucalyptus tree species near water source and wetlands, conversion of wetlands into agricultural land, sand mining, stone quarrying at Katwekamwe in Eastern division, Rukungiri Municipality, deforestation and charcoal burning in South Maramagambo, Bwambara sub-county and brick making in Rwamugoma Parish, Ruhinda Sub-county (Figure 19).

Plate 10: *Brick making pits in Ikuniro village, Buhunga Sub-county*

Plate 11: *Brick making at Ikuniro village, Buhunga Sub-county*

Plate 12: Sand mining and Waragi distillation activities at River Rushaya bridge, Bwambara Sub-county

Figure 19: Environmental Degredation Ranking, Rukungiri District

4.4.4 Road and water Accidents

It was observed that road accidents mostly occur along the Ntungamo-Rukungiri road especially at Kahengye corner (Figure 20). Water accidents are also common on Lake Edward as boats usually capsize when there are strong winds and waves on the lake.

Figure 20: Road Accidents Hotspots and Vulnerability, Rukungiri 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 Rukungiri 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 4).

Table 5 (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 5). Table 6 shows Hazard assessment for Rukungiri District.

Table 4: Components of Vulnerability in Rukungiri District

Vulnerability	Exposure		Susceptibility			Resilience
Hazards	Elements at Risk	Geographical Scale	Susceptibility	Geographical Scale	Coping strategies	Geographical Scale
Landslides, Rock falls and Soil erosion	- Human and livestock adjacent to hill slopes - Crops on hill slopes - Infrastructure e.g. houses, schools, roads adjacent to hill slopes	Parish	- Loss of lives - Complete crop failure - Destruction of infrastructure e.g. homes, and schools	Parish	-Migration -Sensitization by both government and non-governmental agencies	Parish
Earth quakes	- Infrastructure e.g. houses, schools	District	- Loss of lives - Destruction of Infrastructure e.g. houses, schools	District	-No much measure so far	District
Floods	- Livestock adjacent to flood plain - Crops on flood plain - Infrastructure e.g. houses, schools, roads adjacent to flood plain	Parish	- Livestock loss - Destruction of crops - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain	Parish	-Migration -Sensitization on wetland conservation -Dig trenches	Parish
Drought	- Livestock - Crops - Human population	Village	- Hunger & poverty - Livestock loss - Crop failure - Shortage of pasture - Shortage of water	Village	-Migration -Sensitization on tree planting -Buy food from elsewhere	Village
Hailstorms, strong winds and Lightning	- Human and livestock populations - Crops - Infrastructure e.g. houses, schools, health centres	Parish	- Loss of lives - Destruction of crops - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain	Parish		Parish
Crop Pests and Diseases	-Crops	District	- Complete crop failure	District	- Spraying - Cut and burry affected crops -Sensitization on crop disease management	District

Socio-economic component						
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	District
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 species - Loss of indigenous species. - 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

Hazard	Elements at risk	Level	Effects	Level	Coping mechanisms	Level
Environmental degradation	- Human and livestock populations - Crops - Natural vegetation	Sub-county	-Crop failure -Shortage of pasture -Shortage of water -Decline of water quality	Sub-county	-Sensitization on wetland conservation -Sensitization on tree plating -Setting bi-laws	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	Parish
Earth quakes	- Infrastructure e.g. houses, schools	District	- Loss of lives - Destruction of Infrastructure e.g. houses, schools	District	-No much measure so far	District
Floods	- Livestock adjacent to flood plain - Crops on flood plain - Infrastructure e.g. houses, schools, roads adjacent to flood plain	Parish	- Livestock loss - Destruction of crops - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain	Parish	-Migration -Sensitization on wetland conservation -Dig trenches	Parish
Drought	- Livestock - Crops - Human population	Village	- Hunger & poverty - Livestock loss - Crop failure - Shortage of pasture - Shortage of water	Village	-Migration -Sensitization on tree planting -Buy food from elsewhere	Village
Hailstorms, strong winds and Lightning	- Human and livestock populations - Crops - Infrastructure e.g. houses, schools, health centres	Parish	- Loss of lives - Destruction of crops - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain	Parish		

Environmental component	Hazard	Elements at risk	Level	Impact	Level	Intervention measures
	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 species - Loss of indigenous species. - Complete crop Failure - suppress growth of pasture	District	- Cut and burn -Sensitization on Invasive species management
	Bush fires	- Livestock - Crops - Infrastructure e.g. houses, schools	Sub-county	- Loss of livestock - Shortage of pasture - Destruction of crops - Destruction of infrastructure e.g. houses, schools	Sub-county	-Sensitization
	Road accidents	- Human population - Infrastructure adjacent to accident black spots e.g. houses, schools etc.	Sub-county	- Loss of lives - Destruction of vehicles - Destruction of Infrastructure adjacent to accident black spots e.g. houses, schools etc.	Sub-county	-Humps on roads -Signage on speed limits -Sensitization on traffic rules

Land conflicts	- Human population	Village	-Loss of lives -Family violence and break outs	Village	- Community dialogue - District court in charge of land issues
Vermin and Wildlife animal attacks	- Human population - Livestock - Crops	Parish	-Loss of lives -Livestock loss - Crop destruction	Parish	- Report to UWA - Guard gardens -Poison -Hunt and kill -Fence water collection points with Wildlife animals
Environmental degradation	- Human and livestock populations - Crops - Natural vegetation	Sub-county	-Crop failure -Shortage of pasture -Shortage of water -Decline of water quality	Sub-county	-Sensitization on wetland conservation -Sensitization on tree plating -Setting bi-laws

Table 5: Vulnerability Profile for Rukungiri District

	PROBABILITY	SEVERITY OF IMPACTS	RELATIVE RISK	VULNERABLE SUB COUNTIES
	Relative likelihood this will occur	*Overall Impact (Average)*	*Probability x Impact Severity*	
Hazards	*1 = Not occur* *2 = Doubtful* *3 = Possible* *4 = Probable* *5 = Inevitable*	*1 = No impact* *2= Low* *3=medium* *4 = High*	*0-1= Not Occur* *2-10= Low* *11-15=Medium* *16-20= High*	
Floods	5	3	15	The most affected sub-counties: Bwamabara and Southern Division
Droughts	4	4	16	The most affected sub-county: Bwambara
Soil erosion, rock falls and landslides	5	4	20	The most affected sub-counties: Nyakishenyi, Nyarushanje and Nyakagyeme
Hail storms, Lightning and strong winds	4	3	12	The most affected sub-counties: Nyakishenyi, Ruhinda, Buhunga, Bwambara, Nyarushanje, Kebisoni, Runkungir Mun.
Bush fires	4	3	12	The most affected sub-counties: Bwambara, Nyakishenyi and Nyarushanje Buhunga
Crop pests and diseases	4	3	12	All sub-counties
Livestock pests and diseases	4	3	12	The most affected sub-counties: Kebisoni, Buyanja, Nyakagyeme, Rukungiri Mun.
Human Diseases outbreaks	5	3	15	The most affected sub-counties: Bwambara, Buhunga, Nyakagyeme and Rukungiri Mun.
Land conflicts	4	3	12	All sub-counties
Vermin and Wild-life animal attacks	5	4	20	The most affected sub-counties: Bwmabara, Ruhinda and Bugangari

Earthquakes and faults	3	1	3	All sub-counties
Road accidents and Water accidents	4	2	8	The most affected sub-counties Rukungiri Mun., Kebisoni, Bwambara, Nyakagyeme
Environmental degradation	4	4	16	The most affected sub-counties Rukungiri Mun., Bwambara, Ruhinda and Buhunga
Invasive species	4	2	8	The most affected sub-counties Buhunga, Bwambara, Bugangari, Nyakagyeme, Kebisoni and Nyakishenyi

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 6: Hazard Risk Assessment

Hazard	Buyanja	Kebisoni	Nyakishenyi	Nyarushanje	Bugangari	Buhunga	Bwambara	Nyakagyeme	Ruhinda	Eastern Division	Southern Division	Western Division
Floods	L	L	L	L	L	L	H	L	L	L	M	L
Drought	VL	L	VL	VL	L	L	H	L	L	L	L	L
Landslides, Rock falls and Erosion	M	M	H	H	M	M	VL	H	M	L	VL	L
Strong winds, Hailstorms and Lightning	L	M	H	H	L	H	M	L	M	M	M	M
Crop pests and Diseases	M	M	M	M	M	M	M	M	M	M	M	M
Livestock pests and Diseases	H	H	L	L	L	L	H	M	L	M	M	M
Human disease outbreaks	L	L	L	L	L	M	H	M	L	H	H	H
Vermin and Wild-life animal attacks					H		H		H			
Land conflicts	M	M	M	M	M	M	M	M	M	M	M	M
Bush fires		L	M	M	L	L	H	L	L			
Environmental degradation	M	M	M	M	M	H	H	M	H	H	H	H
Earthquakes and faults	VL	VL	VL	VL	VL	VL	VL	VL	VL	VL	VL	VL
Road and Water accidents	M	M					M	M		M	M	M
Invasive species	L	M	M	M	M	M	H		L	L	L	L

Key

VH	Very high
H	High
M	Medium
L	Low
	Not reported/ Not prone

4.5.1 Gender and Age groups mostly affected by Hazards

Table 7: Gender and age groups mostly affected by hazards

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

4.5.2 Coping Strategies

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

Table 8: Coping strategies to the Multi-hazards in Rukungiri District

No	Multi-Hazards		Coping strategies
1	Geomorphological or Geological	Landslides, Rock falls and Erosion	• Migration to safe areas • Terracing/ contour farming • Plant trees to control water movement on hill slopes • Mulching in banana plantations • Plant grass in banana plantations on hill slopes • Removal of stones from banana farmlands
2		Earthquakes and faults	• No action, communities think the tremors are minor • Designs of houses (pillars) • Early warning system • Vigilance • Sensitization • Emergency response mechanisms
3	Climatological or Meteorological	Floods	• Digging up of trenches in the flood plains • Planting trees to control water movement to flood plains • Migration to other areas • Seek for government food aid
4		Drought	• Leave wetlands as water catchments • Plant trees as climate modifiers • Buy food elsewhere in case of shortage • Buy water from the nearby areas • Food Storage especially dry grains and processing
5		Strong winds, Hailstorms and Lightning	• Plant trees as wind breakers • Use of stakes against wind in banana plantations • Use of ropes to tire banana against wind • Installation of Lightning conductors • Stay indoors during rains • Changing building designs and roof types • Removal of destroyed crops • Request for aid from the Office of the Prime Minister • Installation of Lightning conductors on newly constructed schools
6	Ecological or Biological	Crop pests and Diseases	• Spraying pests • Cutting and burying BBW affected crops • Burning of affected crops • Vigilance
7		Livestock pests and Diseases	• Spraying pests • Vaccinations • Burying animals that have died from infection • Quarantine

8	Ecological or Biological	Human epidemic Diseases	• Mass immunisation • Visiting health centres • Use of mosquito nets
9		Vermin and Wild-life animal attacks	• Guarding the gardens • Poisoning • Hunt and kill • Report to UWA • Hugo group • Mauritius thorns • Plant tea as buffer • Dig trenches • Chain link • Plant red pepper as buffer • Recommend vermin guards • Elect / construct electric fences
10		Invasive species	• Uproot • Spray with herbicides (e.g 2-4-D) • Biological control (e.g beetles) • Cut and burn • Sensitization on Invasive species management • Blacklisting exotic species
11	Human induced or technological	Land conflicts	• Community dialogues • Report to court • Migration • Resettlement • Surveying and titling • Strengthen Land management structures • Sensitization on land ownership • Proper demarcation (live fencing)
12		Bush fires	• Stop the fires in case of fire outbreak • Fire lines (may be constructed, cleared grass) • Fire breaks planted along gardens e.g. euphorbia spp. • Vigilance especially in dry seasons where most burning is done • Bye-laws • Sensitization on dangers of fires
13		Road accidents	• Construction of humps • Road Signage including speed limits • Separate lanes on sharp corners • Sensitisation • Widen narrow roads • Plant trees on road reserve, as road guards • Deployment of Traffic officers
14		Environmental degradation	• Leave wetlands as water catchments • Plant appropriate tree species as climate modifiers • Sensitization • Bye-laws • Enforcement • Gazatte and demarcate wetlands • Restore wetlands and other fragile ecosystems • EIA for new developments • No land titles for wetland areas • Cancellation of existing wetland land titles • Developing land use plans and enforce them

GENERAL CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

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 Rukungiri 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 landslides and flooding were identified as most serious problem in Rukungiri 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 Rukungiri District increase their vulnerability to hazard exposure necessitating urgent external support.

Hazards experienced in Rukungiri 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 support of political leaders toward 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. Government should increase funding to the road sector to districts and decentralize most roads in the district to district for ease of maintenance.

viii. Government should speed up the process of acquiring the new road equipment to the District.

ix. The Government through MAAIF and the District Production Office should promote drought and disease resistant crop seeds.

x. The Government through relevant Ministries should increase importation of lightning conductors and also reduce taxes on their importation.

xi. The Government through OPM and Meteorology Authority should support establishment of disaster early warning systems.

xii. The Government through MWE increase funding and staff to monitor wetland degradation and non-genuine agro-inputs.

xiii. The Government through OPM should improve communication between the disaster department and local communities.

xiv. The Government through MWE should promote Tree planting along road reserves.

xv. The Government through MAAIF should fund and recruit extension works at Sub-county level

xvi. To fund research on drought and disease resistant crops

xvii. Government should conduct elections for LCI and LCII's to handle cases of customary land conflicts as courts of first instance.

xviii. There should be special conditional grant handle acquisition of land titles for all Government lands

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Key informant interview at Rukungiri district headquarters

Focus group discussion at Bwambara 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.

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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

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

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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)

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

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

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

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

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

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

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

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

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

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

34. In which way are crops affected by drought?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

community?

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

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

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

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

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

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

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

71. What impacts have been caused by wildlife attacks?

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

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

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

75. Are there invasive species in your community?

76. Specify the invasive species in your community?

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

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

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

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

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

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

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

83. Have you experienced environmental degradation in your community?

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

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

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

87. What impacts have been caused by environmental degradation?

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

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

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

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

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

93. What impacts have been caused by land conflicts?

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

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

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

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

98. Which roads have experienced Road accidents?

99. What impacts have been caused by Road accidents?

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

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

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

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

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

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

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

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

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

FOCUS GROUP ATTENDANCE LIST FOR DISTRICT DISASTER RISK MANAGEMENT FOCAL PERSONS

Name of Participant	Designation	Contact
1. Oneck Pius Kwesiga	Senior Agricultural Officer	0782385669
2. Rukwago Severino	District Natural Resources Officer	0772567817
3. Kwizera Godie	District Planner	0777398066

FOCUS GROUP DISCUSSION ATTENDANCE LIST FOR LOCAL COMMUNITIES

Name of Participant	Village/Parish	Contact
1. Kemigisha Sylivia	Buhunga	0779098224
2. Kangye Toppie	Buhunga	0772186024
3. Byamukama Jackson	Buhunga	0752558434
4. Byamugisha Rauben	Buhunga	0778484994
5. Kobutungi Evas	Ruhinda	0785350102
6. Ndyamuba Nathan	Ruhinda	0774298500
7. Kwesiga John	Ndere	0782324600
8. Byamukama Precious	Ruhinda	0776516178
9. Mugabe Lawrence	Ruhinda	0775204429
10. Betambira Godfrey	Ruhinda	0787905582
11. Mugabe Emmanuel	Ruhinda	0782337597
12. Nahabwe Ronald	Ruhinda	0783872181
13. Monday Fulgence	Ruhinda	0756258891
14. Kahumuza Nicholas	Bwambara	0775265757
15. Nyesiga Ivan	Bwambara	0785006127
16. Twinamatsiko Henry	Kikongi	0782445332
17. Arihoona Brace	Rwenshama	0785426687
18. Buhungiro Hans	Bwambara	0772324680
19. Nayebare Wilber	Bikurungu	0782585068
20. Nuwagaba Wenston	Nyabubare	0782053742
21. Biryatwita Bonny	Iterero	0779282266
22. Byarugaba Prosper	Iterero	0782843874
23. Kamusiime Hildah	Iterero	0783062921
24. Muhoozi Stephen	Iterero	0773848033

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26. Bariyo Gariho	Nyarurambi	0780804498
27. Garahweza H.	Kacence	0774231659

Name of Participant	**Village/Parish**	**Contact**
28. Ahimbisibwe Mark	Kacence	0772672440
29. Natukunda Naome	Kacence	0782506268
30. Musiimenta Wilson	Kacence	0713880958
31. Mwesigwa Jones	Nyarugando	0772562627
32. Keshaaha Adrine	Nyakagyeme	0772389243
33. Gumoshabe Wilson	Kigaga	0774415258
34. Kamagara Crescent	Kigaga	0784662565
35. Arinaitwe Arthur	Kigaga	0788998773
36. Tumwebaze Jesper	Kigaga	0703919621
37. Komugabe Phionah	Kigaga	0775353609
38. Tumusiime Jenifer	Kigaga	0772557439
39. Byooma Joseph	Kigaga	0789250442
40. Kasigwa Gideon	Nyakagyeme	0773269523

SPATIAL DATA COLLECTION SHEET FOR HAZARD VULNERABILITY AND RISK MAPPING

Observer Name: Date:	District: Sub- county: Parish: Village:	Coordinates	
		X:	
		Y:	
		Altitude	

Slope characterization		**Bio-physical characterization**		**Vegetation characterization**		
Slope degree (e.g 10, 20, …)		Soil Texture		Veg. cover (%)		**Land use type (tick)** Bush
Slope length (m) (e.g 5, 10, …)		Soil Moisture		Tree cover (%)		Grassland Wetland Tree plantation
Aspect (e.g N, NE…)		Rainfall		Shrubs cover (%)		Natural forest Cropland
Elevation (e.g high, low…)		Drainage		Grass / Herbs cover (%)		Built-up area Grazing land Others
Slope curvature (e.g concave, covex…)		Temperature		Bare land cover		

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)

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