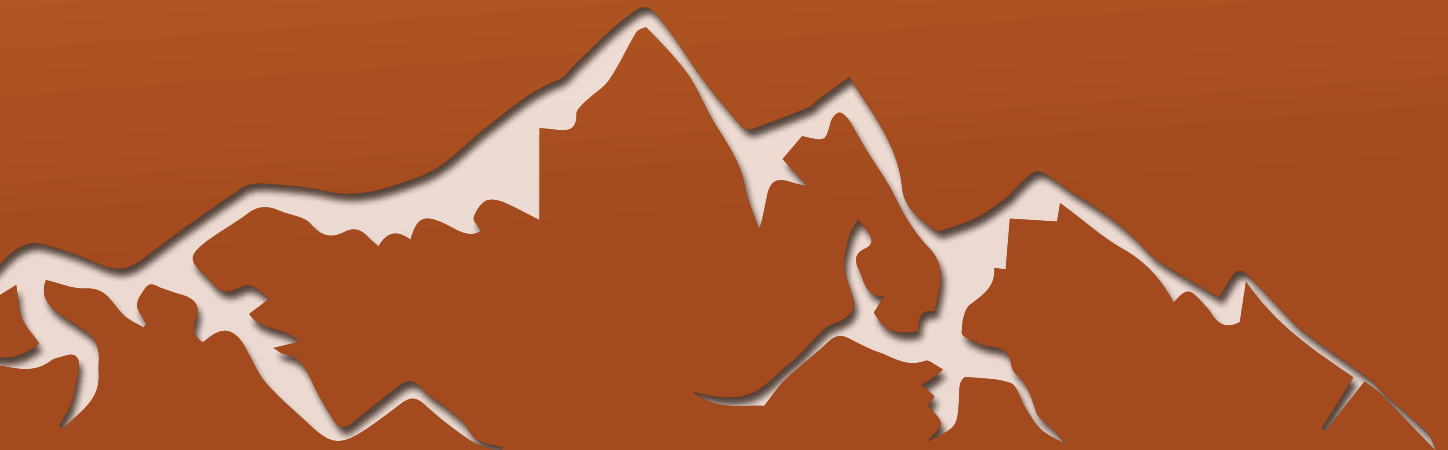




THE REPUBLIC OF UGANDA

# **District Multi-hazard, Risk and Vulnerability Profile for Sheema District**





## Acknowledgement

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3. Mbarara District: Mr. Tumwesigye Robert Ag. District Agriculture Officer, Mr. Katungye Francis – District Probation Officer, Mr. Lubega Kazooba – Senior Health Educator.
4. Rubirizi District: Mr. Murungi Ritah – Ag. District Natural Resources Officer, Yeyambe Steven – Forest Ranger, Mr. Tinkamanyire Jonan – Physical Planner, Mr. Tumushabe Nelson – Lands Officer, Mr. Kabandize Nicholas – Student on Intern (Natural Resources Department).
5. Sheema District: Mr. Tumushabe J. – Production Coordinator, Mr. Mugume Francis – District Health Inspector, Mr. Komujuni Barbarah – Ag. Senior Lands officer, Mr. Turyatunga Patrick – Environment officer.
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Hon. Hilary O. Onek

Minister for Relief, Disaster Preparedness and Management

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## List of Acronyms

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
MWE	Ministry of Water and Environment
NCCP	National Climate Change Policy
OPM	Office of the Prime Minister
PGIS	Participatory GIS
SMCA	Spatial Multi-criteria Analysis
STRM	Shuttle Radar Topography Mission
UBOS	Uganda Bureau of Statistics
UNDP	United Nations Development Program
UTM	Universal Transverse Mercator
WGS	World Geodetic System



## Definition of Key Concepts

**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 overlies 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).

## **EXECUTIVE SUMMARY**

The multi-hazard vulnerability profile outputs from this assessment for the five districts (Isingiro, Kamwenge, Mbarara, Rubirizi and Sheema) was a combination of spatial modeling using socio-ecological spatial layers, socio-economic, and meteorological data etc.) 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 GIS environment (ArcGIS 10.1).

### **Stakeholder engagements**

Stake holder 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. Hazard, risk and vulnerability assessment was done using a stack of methods including participatory approaches such as Participatory GIS (PGIS), Focus Group Discussions (FGDs), key informant interviews, transect drives as well as spatial and non-spatial modelling. Key informant interviews and Focus Group Discussions were guided by a checklist (Appendix 1 and 2). Key Informant Interviews for District officers included: Districts Natural Resources Officers, Environment Officers, Wetland Officers, Forest Officers, Production and Marketing Officers, Veterinary Officers, Health Inspectors. At sub-county level Key informants for this assessment included: Sub-county and parish chiefs, community Development mobilizers and health workers.

### **Participatory GIS**

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

### **Geo-referencing and ground-truthing**

Ground-truthing and geo-referencing was done 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 were classified using a participatory approach on a scale of "not reported/ not prone", "low", "medium" and "high", consistent with the methodology specified in Annex 3.

### **Data analysis and integration in GIS**

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

## **Data verification and validation**

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

## **Multi-hazards experienced in the districts 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 lightening
- 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 all the five district have over the past two decades increasingly experienced hazards including landslides, rock falls, soil erosion, floods, drought, hailstorms, strong winds, lightening, 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. Drought and flooding were identified as most serious problem in Isingiro, Kamwenge, Sheema and Mbarara districts with almost all sub-counties being vulnerable to the hazards. This could be due to the location of the districts in cattle corridor which as associated with prominent dry spells and droughts, but the area is also relatively flat with slope percentage rise (0-2) which is very prone to flooding in case of heavy rains. Landslides, rock falls and soil erosion were identified as most serious problem in Rubirizi districts with almost all sub-counties being vulnerable to the hazard except the rift valley flat plains.

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

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

## **The following recommended policy actions targeting vulnerability reduction include:**

- Improved enforcement of policies aimed at enhancing sustainable environmental health.
- Quickly review the animal diseases control act because of low penalties given to defaulters.

- Establishment of systems to motivate support of political leaders toward government initiatives and programmes aimed at disaster risk reduction.
- Increased awareness campaigns aimed at sensitizing farmers/communities on disaster risk reduction initiatives and practices.
- Revival of disaster committees at the district levels
- Periodic maintenance of feeder roads to reduce on traffic accidents
- Relocation of communities in the affected areas in the district by government
- Promotion of drought and disease resistant crop seeds
- Increase funding in the disaster and environmental departments
- Removal taxes on the importation of lightening conductors
- Support establishment of disaster early warning systems
- Increase funding and staff to monitor wetland degradation and non-genuine agro-inputs
- Improve the communication channel between the disaster department and local Communities
- Office of the prime minister should decentralize their activities at the district level
- Tree planting along road reserves
- Fund and equip recruited extension works
- Government should allocate funds aimed at disaster preparedness and management at district levels
- Removal of taxes on the importation of lightening conductors
- Support establishment of a disaster risk early warning systems

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background

Uganda has over the past years experienced frequent disasters that range from drought, to floods, landslides, human and animal disease, 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 proactive engagement of the whole spectrum of stakeholders in disaster risk reduction, are becoming critical.

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

From 2013 UNDP has been supporting the Office of the Prime Minister to develop district hazard risk and vulnerability profiles in the sub-regions of Rwenzori, Karamoja, Teso, Lango, Acholi and West Nile covering 42 districts. During the exercise above, local government officials and community members actively participated in the 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 inception report details methodological approach for HRV profiling and mapping for 5 districts in Western Uganda in response to a call by UNDP to engage an Individual Consultant to facilitate the process. The districts under consideration include Isingiro, Kamwenge, Mbarara, Rubirizi and Sheema.

### 1.2 Objectives of the study

The following main and specific objectives of the study are indicted:

#### 1.2.1 Main objective

The main objective of the study is to develop District Hazard, Risk and Vulnerability Profiles for Isingiro, Kamwenge, Mbarara, Rubirizi and Sheema Districts in Western Uganda (Figure 1).

### 1.2.3 Specific Objectives

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

- i. Collect and analyse field data generated using GIS in close collaboration and coordination with OPM in Isingiro, Kamwenge, Mbarara, Rubirizi and Sheema districts.
- ii. Develop district specific multi hazard risk and Vulnerability profiles 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 and Deliverables

The consultant understands that UNDP through the Project “Strengthening Capacities for DRM and Resilience Building” will contract the following work:

- i. Collection of field data using GIS in close collaboration and coordination with OPM Isingiro, Kamwenge, Mbarara, Rubirizi and Sheema districts and quantify them through a participatory approach on a scale of “not reported”, “low”, “medium” and “high”, consistent with the methodology specified in Annex 3.
- 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 multiple 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 for all the districts visited 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 semiarid 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.”



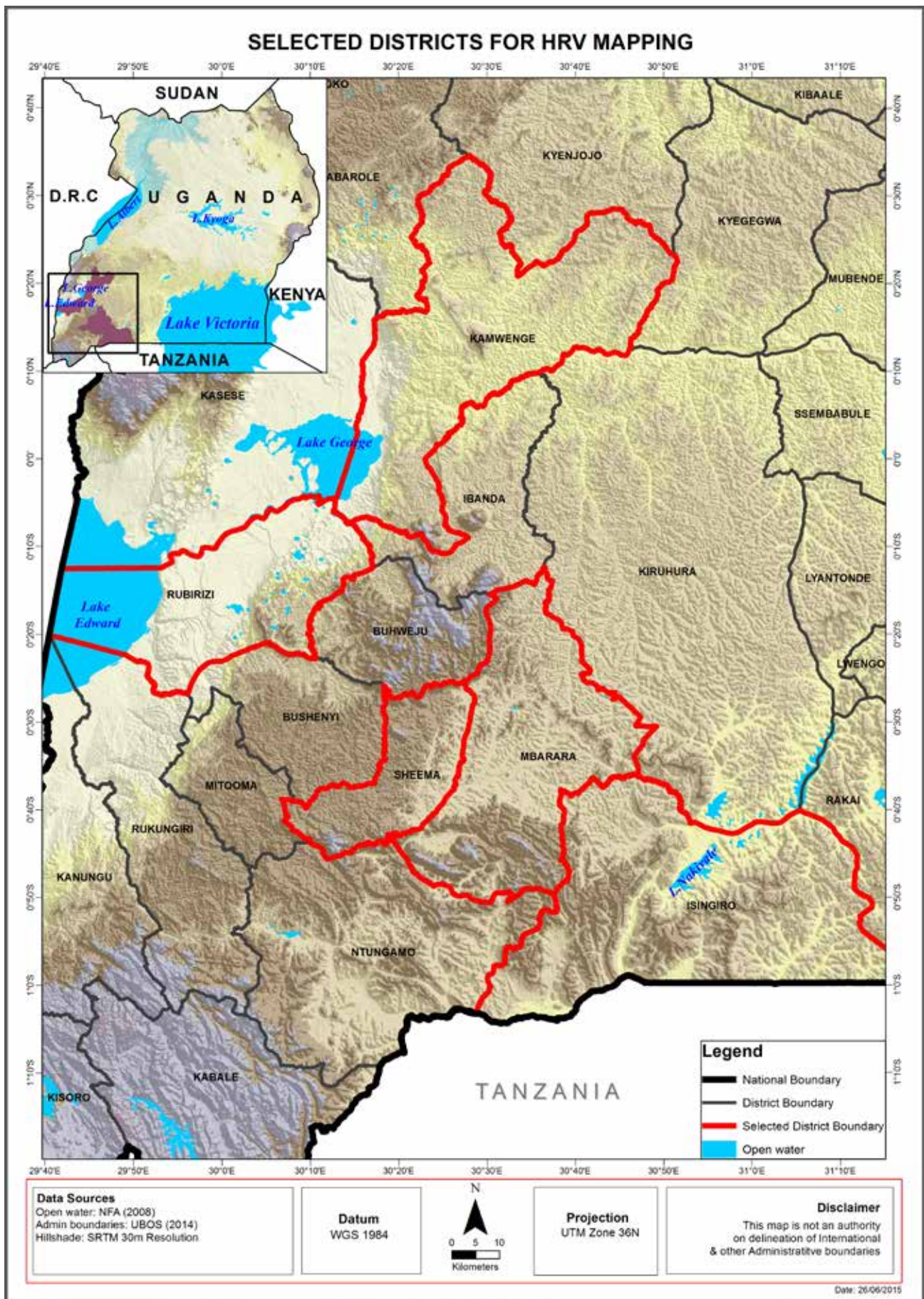


Figure 1: Location of Study Area

## **1.5 Structure of the Report**

This Report is organized into Two Chapters: Chapter 1 provides Introduction on the assignment. Chapter 2 discusses the overview and the Multi-hazard, Risks and Vulnerability profiles of Sheema district and discusses exposure to risk as well as potential hazard and risk outcomes on livelihoods, demography and institutions.



# CHAPTER TWO

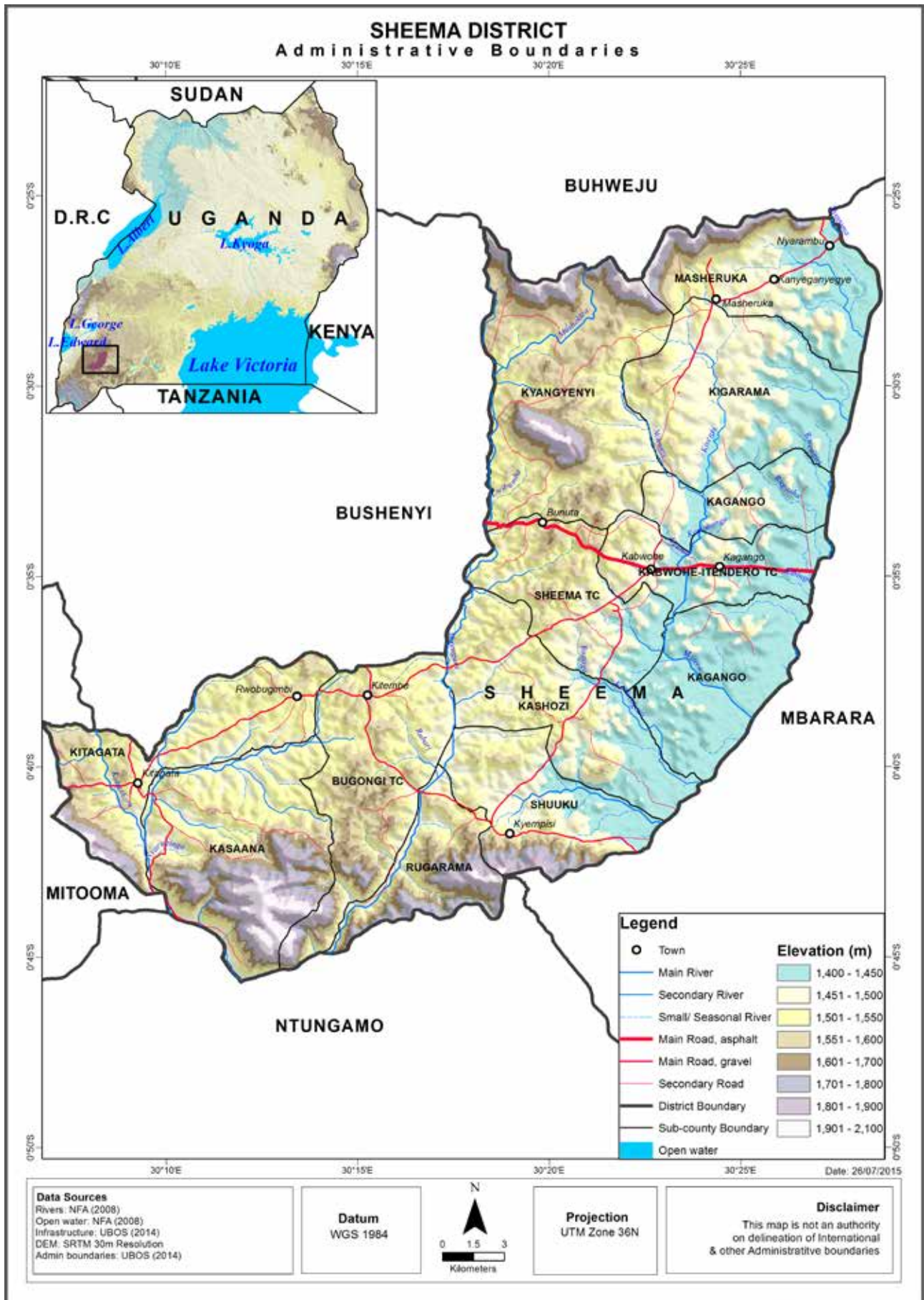
## **SHEEMA DISTRICT MULTI-HAZARD, RISKS AND VULNERABILITY PROFILE**

### **2.1 Overview of Sheema District**

Sheema District is located (UTM 210598; 9940989) in South Western Uganda. Sheema District is bordered by Buhweju District to the north, Mbarara District to the east, Ntungamo District to the south, Mitooma District to the southwest and Bushenyi District to the west. Sheema District which was formerly Sheema County was carved out of Bushenyi District in July 2010. The district has 9 sub-counties and 3 Town councils. These sub-counties include: Kasaana, Shuuku, Kitagata, Masheruka, Kyangyenyi, Kigarama, Kagango, Kashozi and Rugarama. The Town councils include: Kabwohe-Itendero, Sheema and Bugongi (Figure 73).

#### **2.1.1 Geomorphology**

Sheema District lies between altitude of 1410m - 2015 m.a.s.l. Areas south of the district around Kasana, Rugarama and Kitagata sub-counties have hilly areas with altitudes up to 2015m towards the district border with Ntungamo district. Also areas north of the district around Masheruka and Kyangyenyi sub-counties have high altitudes up to 2000m towards the district border with Buhweju district. Generally the middle parts of Sheema district have low altitudes between 1410m – 1550m. Low-lying sub-counties include Kagango, Kigarama and Kabwohe-Itendero Town council, the lowest being Kagango especially areas towards River Rwizi (Figure 2).

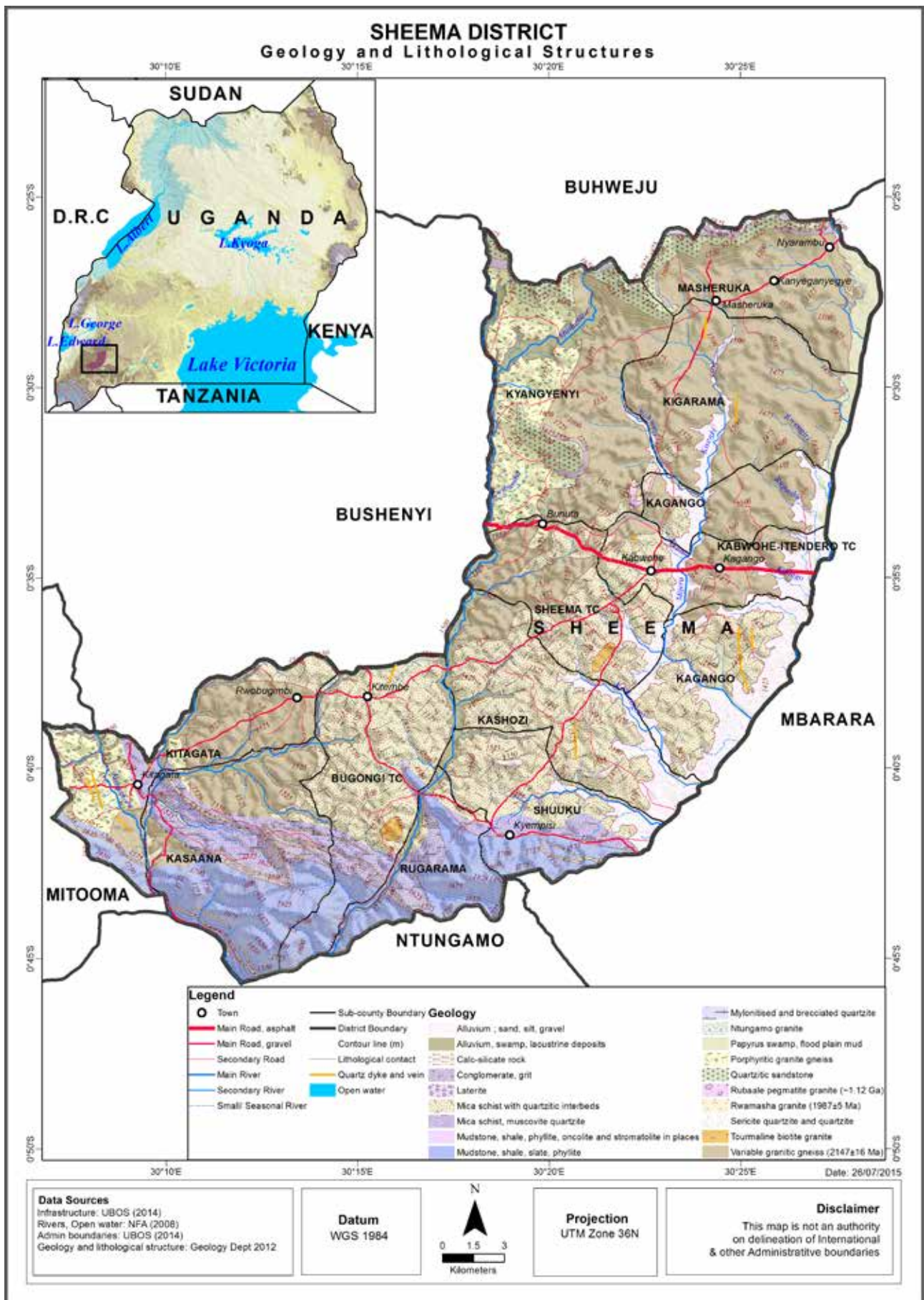


**Figure 2: Administrative Units and Geomorphology, Sheema District**

### **2.1.2 Geology**

Studies by the Geological Surveys and mines (2012) during geological mapping have indicated that areas south of the district (around Kasana, Rugarama and Kitagata sub-counties hilly areas) are dominated by mudstone, shale, slate and phyllites. Lower areas of Bugongi Town council, Shuuku, Kashozi and Kagango sub-counties are predominantly occupied by mica schist with quartzitic interbeds. Aluvium swamp lacustrine deposits dominate Kigarama, Masheruka, Kyangyenyi and Kabwohe-Itendero Town council low-lying areas. Hilly areas towards the Buhweju hills in Masheruka and Kyangyenyi sub-counties are dominated by quartzitic sandstones and Porphyritic granite gneiss (Figure 3).





**Figure 3: Geology and Lithological structures, Sheema District**

### **2.1.3 Vegetation and Land use Stratification**

Generally Sheema district is mainly covered by subsistence farmlands especially banana and coffee plantations. All sub-counties of the district have subsistence farmlands although the percentage covered by farmlands differs from sub-county to sub-county. Grasslands and bushlands occupy hills south of the district around Kasana, Rugarama and Kitagata hills as well as north of the district around Masheruka and Kyangyenyi hills towards the district border with Buhweju district. Wetlands exist along Rwizi river in Kagango, Shuuku, Kabwohe-Itendero Town council and Kashozi sub-counties forming the prominent River Rwizi wetland system. Some areas are built up especially in Kabwohe-Itendero Town council, Bugongi Town council, Sheema Town council, Shuuku Town Board and Kanyeganyegye (Figure 4).

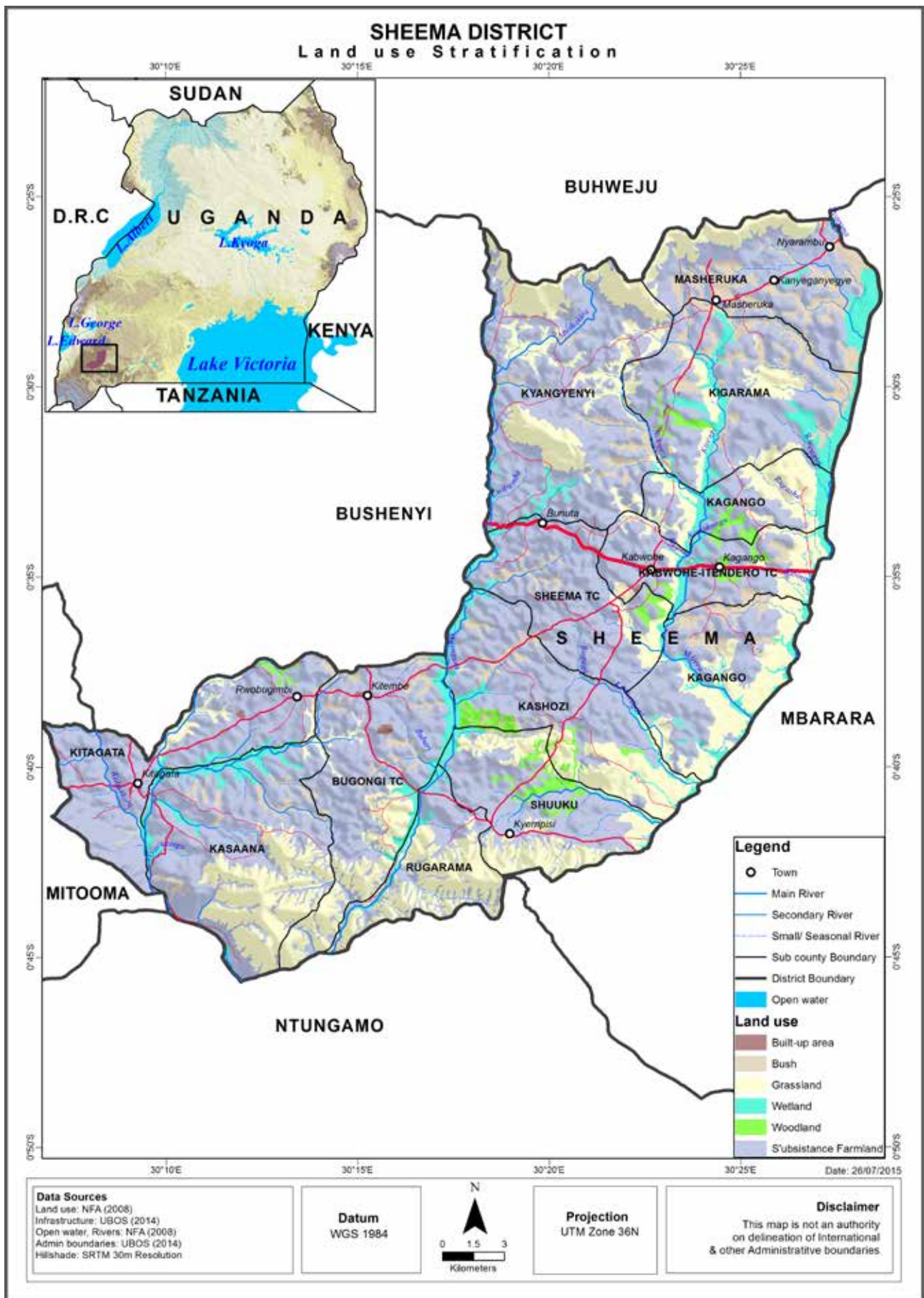


Figure 4: Land use Stratification, Sheema District



#### **2.1.4 Temperature and Humidity**

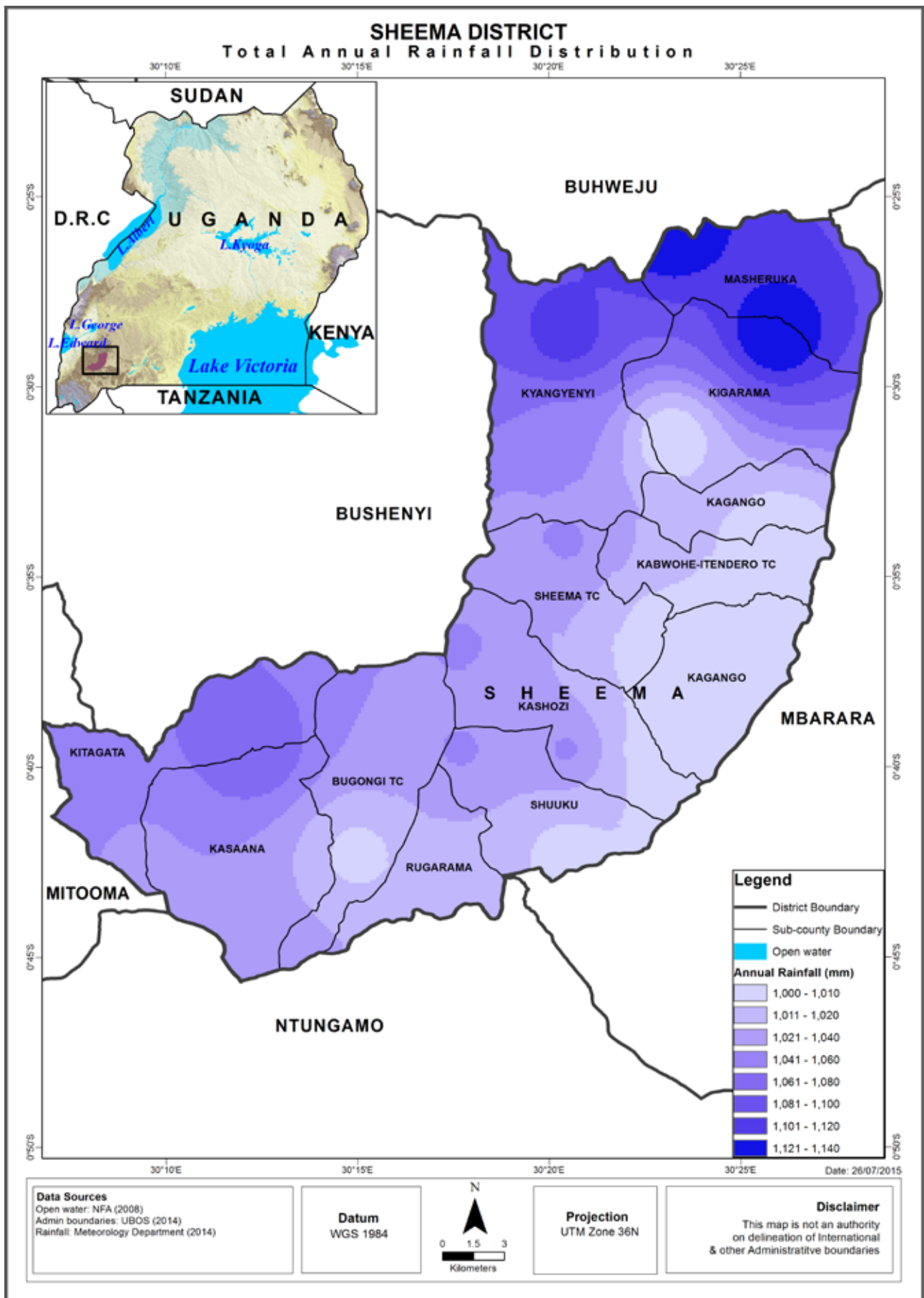
Sheema experiences small annual variation in air temperatures; and the climate may be described as generally hot and humid, with average monthly temperatures varying between 27°C and 31°C. The temperature maximum are consistently above 30°C and sometimes reach 38°C. Average minimum temperatures are relatively consistent and vary between 16°C and 18°C in the hilly areas of Kasana, Bugongi Town council and Rugarama sub-counties. The relative humidity is higher during rain seasons with maximum levels prevalent in May. The lowest humidity levels occur in dry seasons with minimum levels occurring in December and January. The average monthly humidity is between 60% and 80%.

#### **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 Mbarara. 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 Mbarara. The general conclusion from these climatic figures is that for most of the year, Sheema District experiences moderate to strong and gusty winds, increasing in the afternoon.

#### **2.1.6 Rainfall**

Total Annual Rainfall received by Sheema District ranges between 1020mm - 1130mm per annum. Lowest rainfall amounts are experienced near Mbarara district border in Kagango sub-county and Kabwohe-Itendero Town council with rainfall between about 1020mm -1040mm per annum. Highest annual rainfall between 1115mm -1130mm are experienced in Masheruka sub-county in the hills neighboring Buhweju district (Figure 5).



**Figure 5: Rainfall Distribution, Sheema District**



## 2.1.7 Hydrology

Sheema District lies in the Lake Victoria basin in the River Rwizi catchment. The main river system is the Rwizi River forming the boundary of Sheema and Mbarara districts. River Rwizi has a number of tributaries the major one being Mijera. Other main permanent rivers include Kishenyi, Mwingura and Mushakira. These rivers have wetlands along though most of the wetlands have been reclaimed for cattle grazing.

Generally the mid parts of the district around the low-lying sub-counties (Kagango, Kigarama and Kabwohe-Itendero Town council) are poorly drained and flood prone. The major wetland system in Sheema district is Rwizi wetland although the wetland is facing pronounced degradation from brick laying, siltation, sand mining and wetland conversion for cattle grazing and crop production.

## 2.1.8 Population

According to the National population and housing census 2014 provisional results, Sheema District had a total population of 211,720. Results also showed that most of the people in Sheema District reside in rural areas (153,529 (72.5%) compared to (58,191(27.5%) who reside in urban centers. The gender distribution was reported to be males: 100,651 (47.5%) and females: 111,069 (52.5%). About 97.9% (207,283) of the population form the household population and only 2.1% (4437) is Non-household. Kyangyenyi sub-county had the highest population of 31263 people while Rugarama sub-county had the least population of 10148 people (Figure 6).

Table 1 shows the population distribution per sub-county for the different gender.

**Table 1: Population Distribution in Sheema District**

Sub-County	HOUSEHOLDS		POPULATION		
	Number	Average Size	Males	Females	Total
Bugongi Town Council	2,732	4.2	5,688	6,137	11,825
Kabwohe-Itendero Town Council	5,271	3.7	9,763	10,537	20,300
Kagango	4,224	4.7	9,546	10,486	20,032
Kasaana	3,718	4.5	8,011	8,723	16,734
Kashozi	3,166	4.5	6,750	7,568	14,318
Kigarama	4,887	4.4	10,149	11,493	21,642
Kitagata	4,178	4.3	8,760	10,011	18,771
Kyangyenyi	6,708	4.6	14,930	16,333	31,263
Masheruka	3,962	4.4	8,542	9,303	17,845
Rugarama	2,013	5	4,819	5,329	10,148
Sheema Town Council	3,654	4.3	7,568	8,350	15,918
Shuuku	2,847	4.1	6,125	6,799	12,924

Source: UBOS Census 2014

## 2.1.9 Economic Activities

Most households in Sheema District are engaged in subsistence agriculture. The major crops grown in this district include: bananas, beans, coffee, sweet potatoes, millet, cassava, maize and sorghum. However, a considerable number of the population is involved in livestock production and the animals reared are cattle, goats, pigs and chicken.

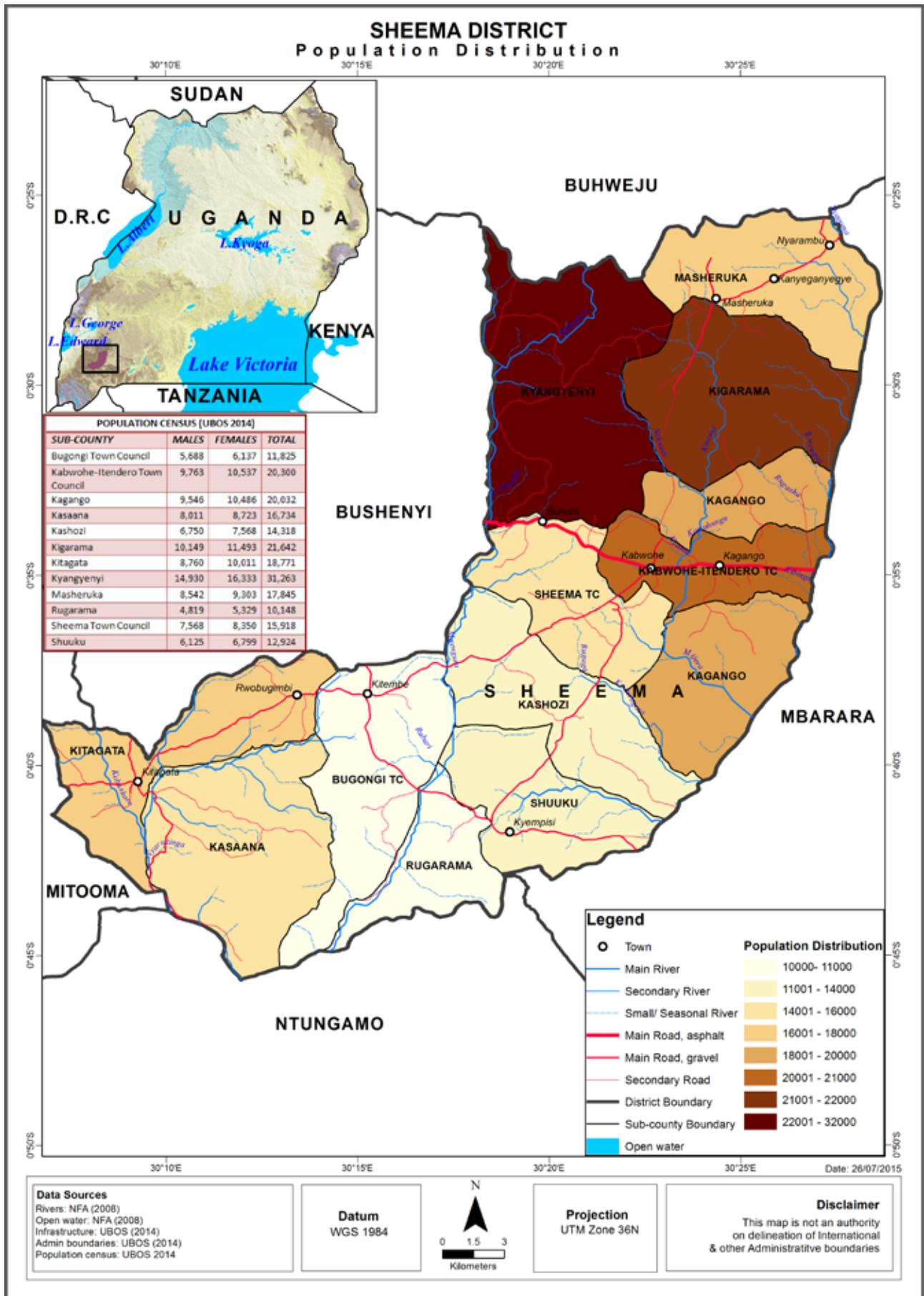


Figure 6: Population Distribution, Sheema District

## **2.2 METHODOLOGY**

### **2.2.1 Collection and analysis of field data using GIS**

#### **2.2.1.1 Preliminary spatial analysis**

Hazard prone areas' base maps were generated basing on several numerical models and guidelines using existing environmental and socio-ecological spatial layers, socio-economic data, and meteorological data, etc.) in a GIS environment (ArcGIS 10.1).

#### **2.2.1.2 Stakeholder engagements**

Stake holder 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. Hazard, risk and vulnerability assessment was done using a stack of methods including participatory approaches such as Participatory GIS (PGIS), Focus Group Discussions (FGDs), key informant interviews, transect drives as well as spatial and non-spatial modelling. Key informant interviews and Focus Group Discussions were guided by a checklist (Appendix 1 and 2). Key Informant Interviews for District officers included: Districts Natural Resources Officers, Environment Officers, Wetland Officers, Forest Officers, Production and Marketing Officers, Veterinary Officers, Health Inspectors. At sub-county level Key informants for this assessment included: Sub-county and parish chiefs, community Development mobilizers and health workers. One Key Informant Interview comprising of four respondents (District Environment officer, Production coordinator, Senior Lands officer and District Health Inspector) was held at Sheema District Headquarters (UTM, 206204; 9933854).

Focus Group Discussions were carried out in at least five purposively selected sub-counties that were ranked with highest vulnerability. 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. Three FGDs comprising of an average of 12 respondents (crop farmers, local leaders, nursing officers, police officers and cattle keepers) were conducted at Kasaana Sub-county (UTM, 189457; 9919393), Kyangenyi Sub-county (UTM, 203959; 9944588) and Masheruka Sub-county (UTM, 213752; 9949711). Each Parish of the selected Sub-counties was represented by at least one participant and the selection of participants was engendered. 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.

#### **2.2.1.3 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.

#### **2.2.1.4 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 III). Hazard hot spots, potential and susceptible areas will be classified using a participatory approach on a scale of “not occur”, “low”, “medium” and “high”, consistent with the methodology specified in Annex 3. 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.

### **2.2.2 Develop District specific multi-hazard risk and Vulnerability Profiles**

#### **2.2.2.1 Data analysis and integration**

From the verification of the Hazard prone areas base maps developed basing on several numerical models and guidelines for existing environmental and socio-ecological spatial layers .Final HRV maps will be generated in the GIS environment for each district up to sub-county level and parish level where possible. This is because at a small scale such as at sub-county level, the population could be facing as many hazards as can be listed and so it becomes inappropriate to do the profiling at that small scale. For each of the 5 target districts, specific hazard, risk and vulnerability profiles will be analyzed, discussed and presented in the report and maps.

#### **2.2.2.2 Data verification and validation**

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

### **2.2.3 Preserve the Spatial data to enable future use of the maps**

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

## 2.3 RESULTS FROM MULTI-HAZARD RISK, VULNERABILITY MAPPING

### 2.3.1 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 Sheema 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 lightening
- 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.

## **2.3.2 GEOMORPHOLOGICAL OR GEOLOGICAL HAZARDS**

### **2.3.2.1 Landslides, Rock falls and Soil erosion**

Multi-hazard, risk and vulnerability assessment was done through participatory approaches and Key Informant interviews were held with the Sheema District Environment Officer, Production coordinator, Senior Lands officer and District Health inspector. Focus Group Discussions were held in Kasaana Sub-county (UTM, 189457; 9919393), Kyangenyi Sub-county (UTM, 203959; 9944588) and Masheruka Sub-county (UTM, 213752; 9949711). Results from the participatory assessment revealed that soil erosion, landslides and rock falls are the most prominent hazards in order of severity during rainy seasons. It was reported that parts of Kamuhembe, Kyabuharambo and Nyabwine in Masheruka sub-county recently experienced massive soil erosion and rock falls which swept gardens and blocked roads. Parts of Kyeihara and Nyangorogoro in Kasaana sub-county usually experience soil erosion coupled with minimal landslides every rainy season of November. Participants of the focus group discussions also reported that in 2013, Kasaana Buraro experienced a strong landslide which swept away some homes and banana plantations in the high risk areas. This information was integrated with the spatial modelling using socio-ecological spatial data i.e. generated from 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)). Figure 7 shows areas vulnerable to landslides, rock falls and soil erosion. The map also shows hot spot areas where landslides, rock falls and soil erosion have occurred in the past 20 years.



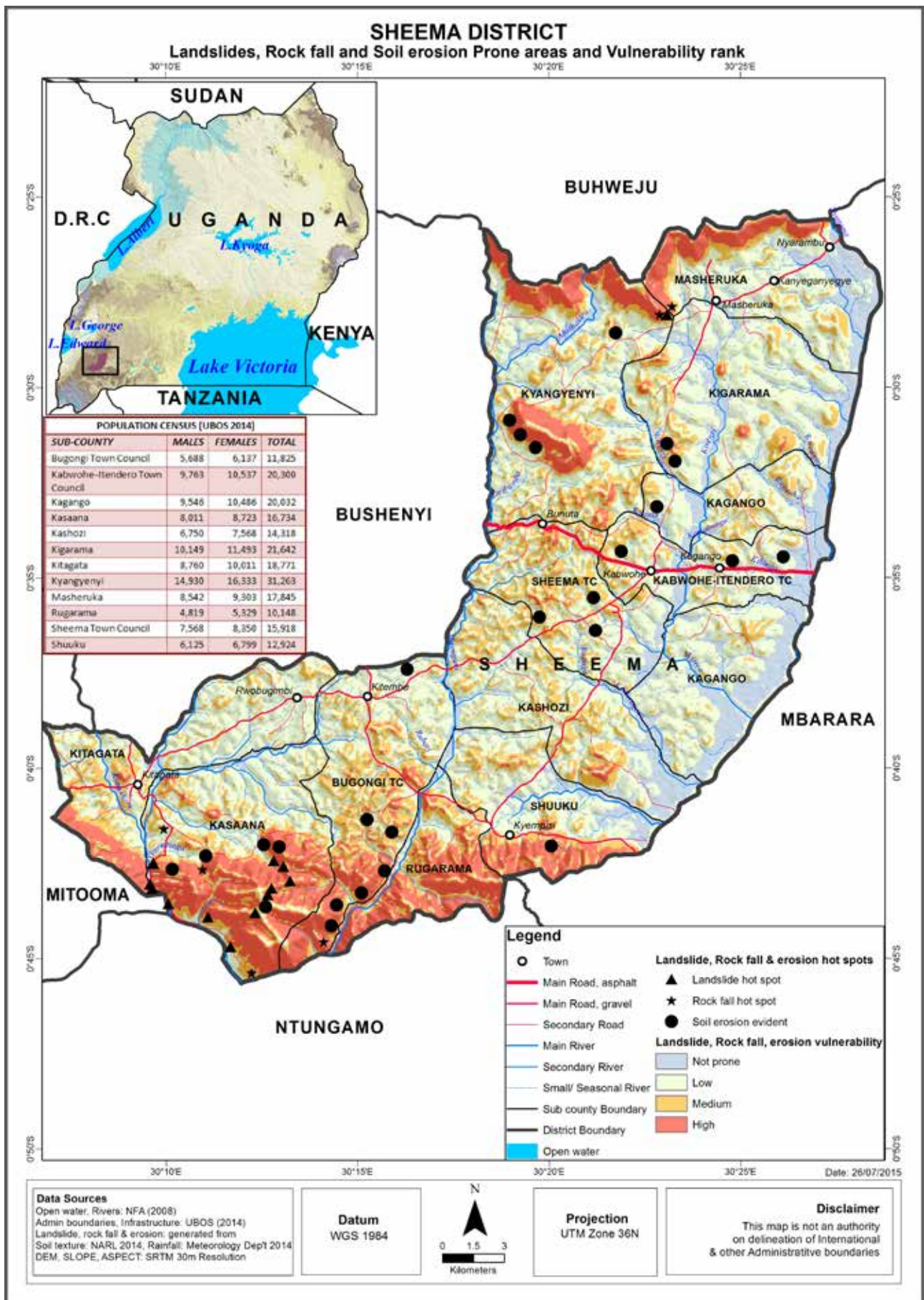


Figure 7: Landslides, Rock falls, soil erosion prone areas and Raking, Sheema District

### **2.3.2.2 Earthquakes and Faults**

Results from the participatory assessments indicated that earthquakes were not a problem in Sheema District. However, some participants of the focus group discussions reported that Sheema District as a whole experiences very minor tremors. Figure 8 indicates areas where faults exist as vulnerable areas where earthquakes have more impact and the ranking is dependent on the distance from the faults and lithological veins.



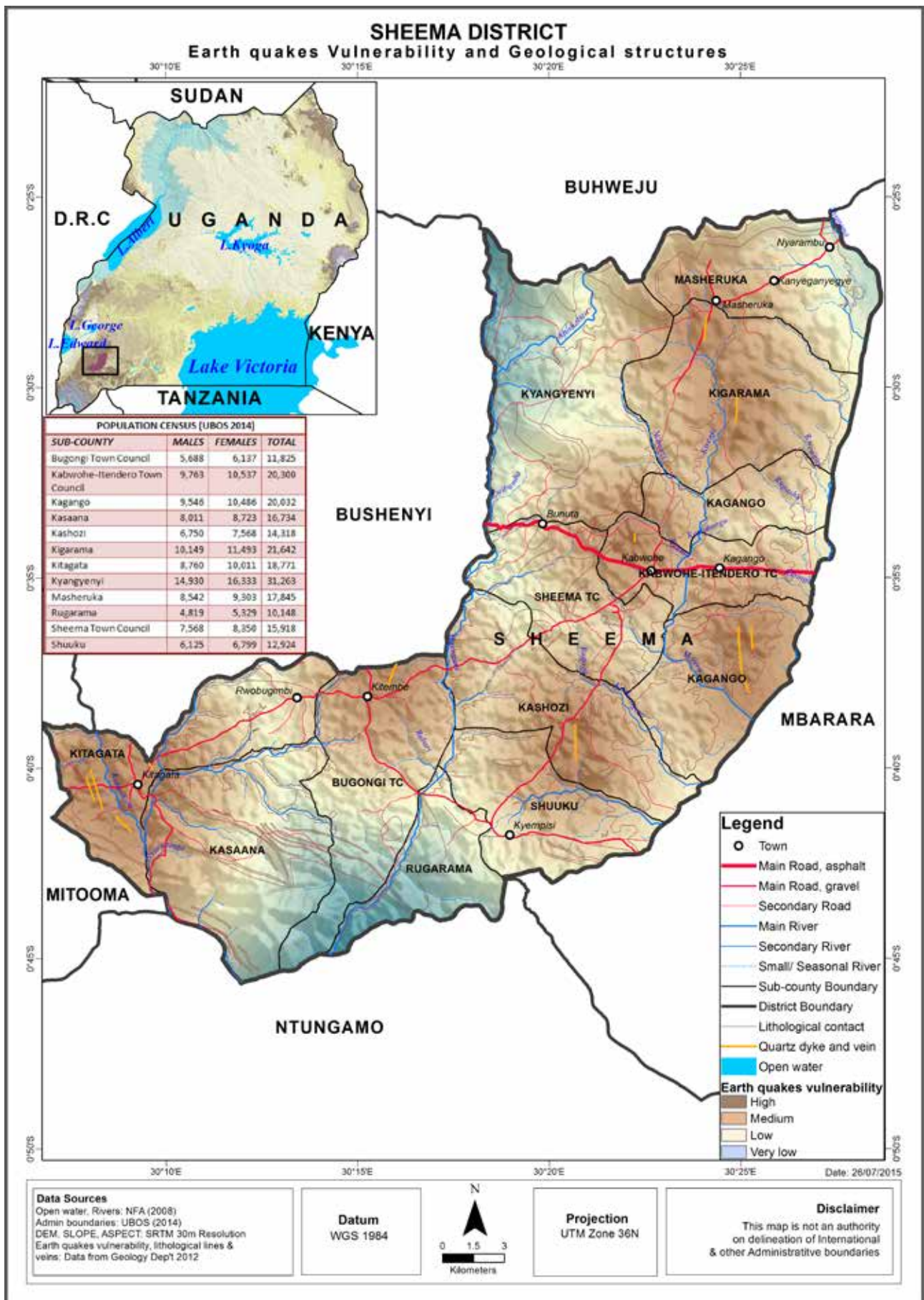


Figure 8: Earth quakes Vulnerability, Fault lines, Sheema District

## **2.3.3 CLIMATOLOGICAL OR METEOROLOGICAL HAZARDS**

### **2.3.3.1 Floods**

Results from the focus group discussions indicated that floods mostly occur in low lying areas, wetlands and along River Rwizi during the rainy season. Participants reported that wetlands were reclaimed for agricultural purposes and thus flood every rainy season. It was also reported that areas along River Rwizi in Masheruka, Kagango and Shuuku sub-counties are vulnerable to floods. Local communities adjacent to Orisindura wetland system of River Ndurumo in Kasaana and Kitagata sub-counties suffer serious crop loss due to floods in the rainy season. The other sub-counties affected by floods include: Masheruka, Kyangenyi (Muzira wetland system) and Kigarama. This information was integrated with the spatial modelling using socio-ecological spatial data i.e. generated from 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)). Figure 9 shows areas vulnerable to floods. The map also shows hot spot areas where floods have occurred in the past 20 years.



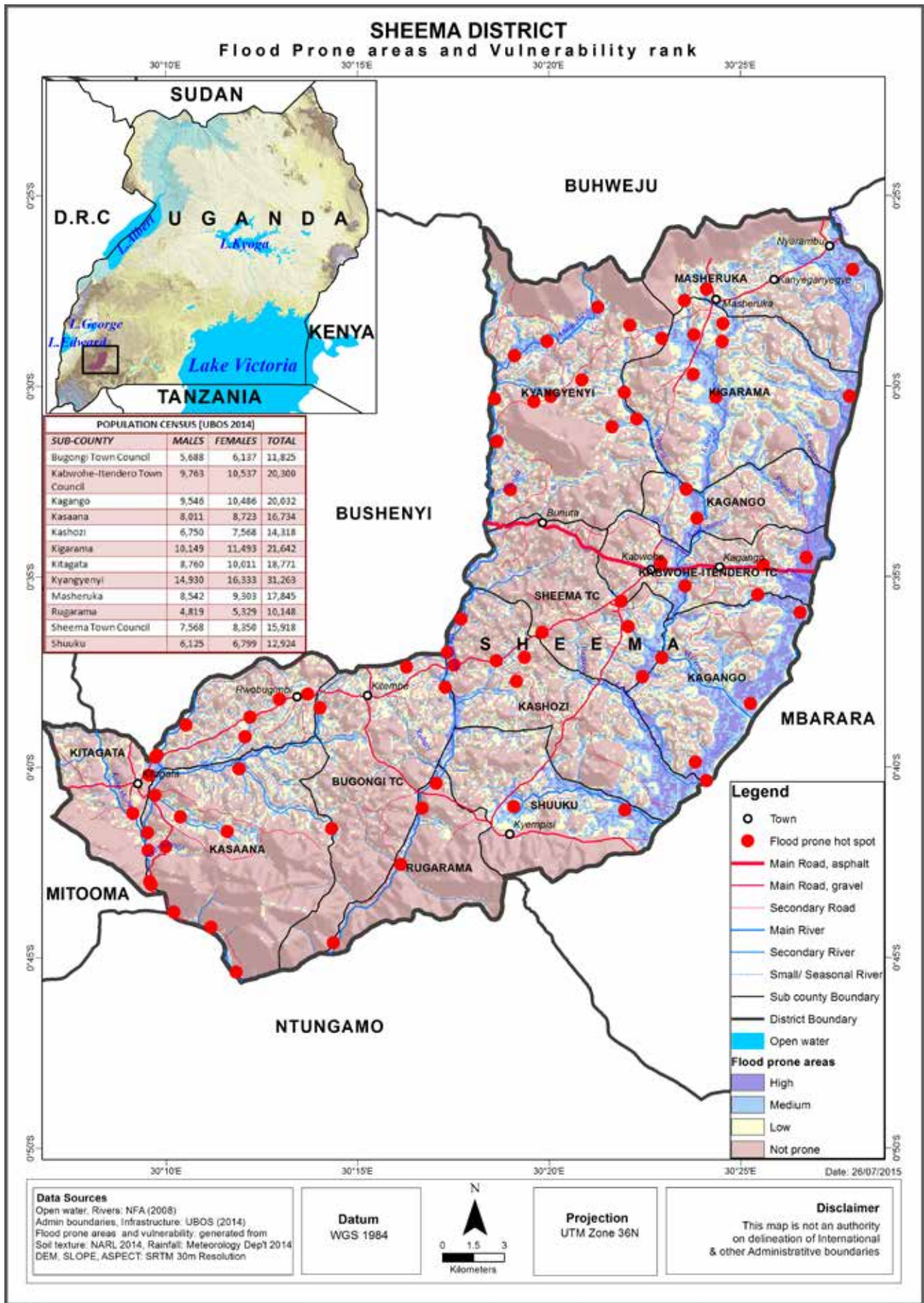


Figure 9: Floods prone areas and Ranking, Sheema District

### 2.3.3.2 Drought

Participatory assessments indicated that Sheema District had experienced drought and dry spells in the past 10 years. Results from the focus group discussions revealed that drought and dry spells are experienced most in Masheruka and Kagango sub-counties. It was further reported that the drought of 1999 that caused the drying of banana plantations, beans and maize crops in Masheruka, Shuuku and Kagango sub-counties was the worst. This information was integrated with the spatial modelling using socio-ecological spatial data i.e. generated from Rainfall and Temperature (Uganda National Meteorological Authority, 2014) using the WASP index. Figure 10 shows areas that are affected by drought.

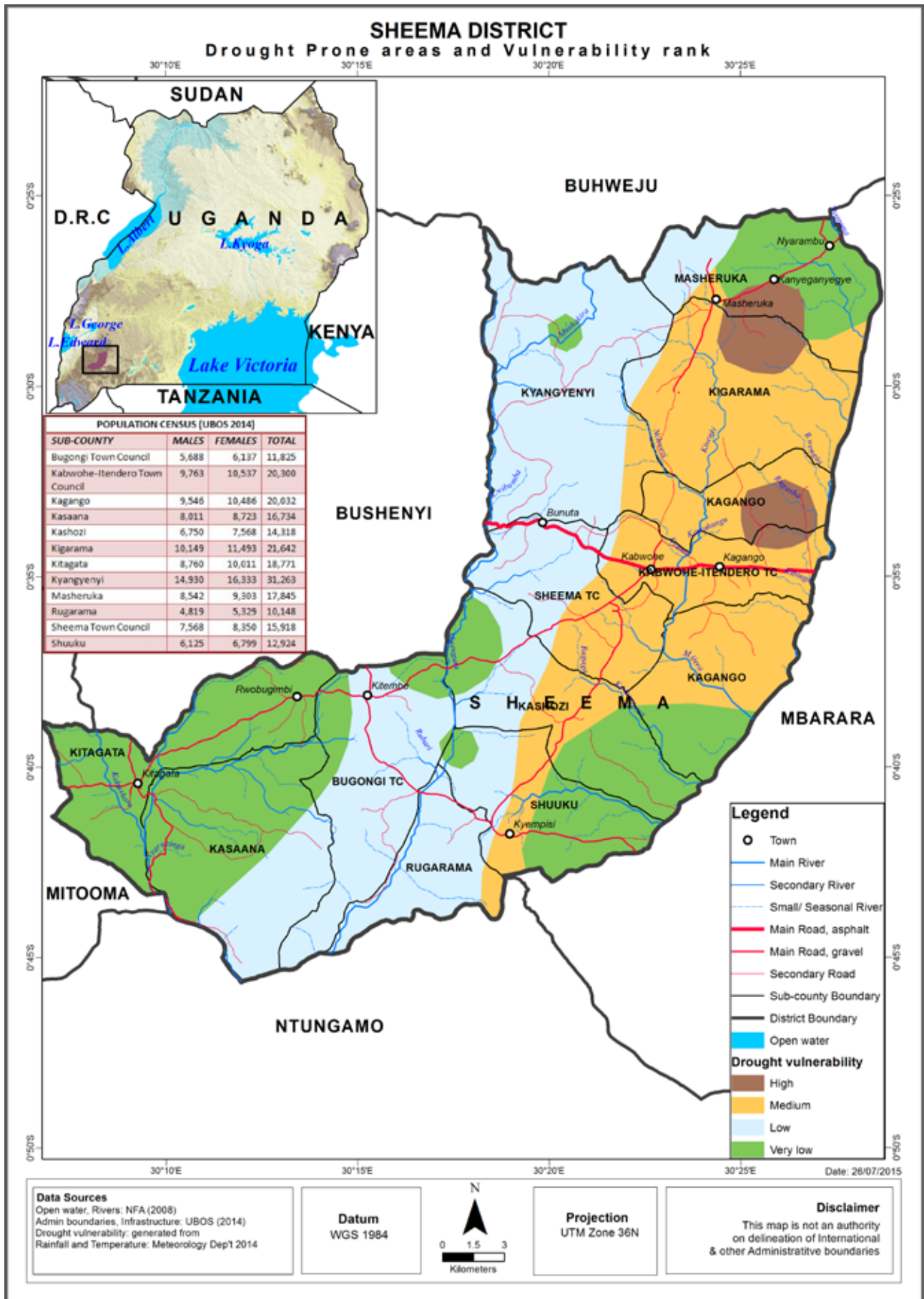


Figure 10: Drought prone areas and Ranking, Sheema District

### **2.3.3.3 Hailstorms**

Results from the discussions indicated that incidences of hailstorms were common in Sheema District during the rainy season. It was reported that hailstorms usually destroy banana plantations and other crops including cassava, beans, maize and sweet potatoes thereby resulting into food insecurity. The most affected sub-counties include: Masheruka, Kagango, Kitagata and Kigarama.

### **2.3.3.4 Strong winds**

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 Mbarara which is adjacent to Sheema district. The general conclusion from these climatic figures is that for most of the year, Sheema District experiences moderate to strong and gusty winds. Results from the Participatory assessment indicated that strong winds uproot and destroy banana plantations and other crops including maize, millet and cassava in hilly areas thereby causing food insecurity and malnutrition. Participants reported that in 2013 strong winds blew off the roof a market, petrol station and feeds factory in Kabwohe/Itendero town council. The other most affected sub-counties include: Masheruka, Kagango, Kitagata and Kigarama.

### **2.3.3.5 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. These conditions occur almost daily in many parts of the Earth and rarely in other areas. Globally, there are about 40 to 50 flashes of lightning every second or nearly 1.4 billion flashes per year. These electrical discharges are powerful and deadly. Each year, lightning strikes kill people, livestock, and wildlife. Results from the participatory assessments showed that there have been increased occurrences of lightening in the past 10 years. Participants reported that parts of Kyeihara and Nyangorogoro in Kasaana sub-county usually experience lightening in the rainy seasons. It was also reported that there were four incidences of lightening killing people in Kyabuharambo, Masheruka sub-county in 2012. Schools in this district are the most vulnerable as they don't have lightening conductors (Figure 11).



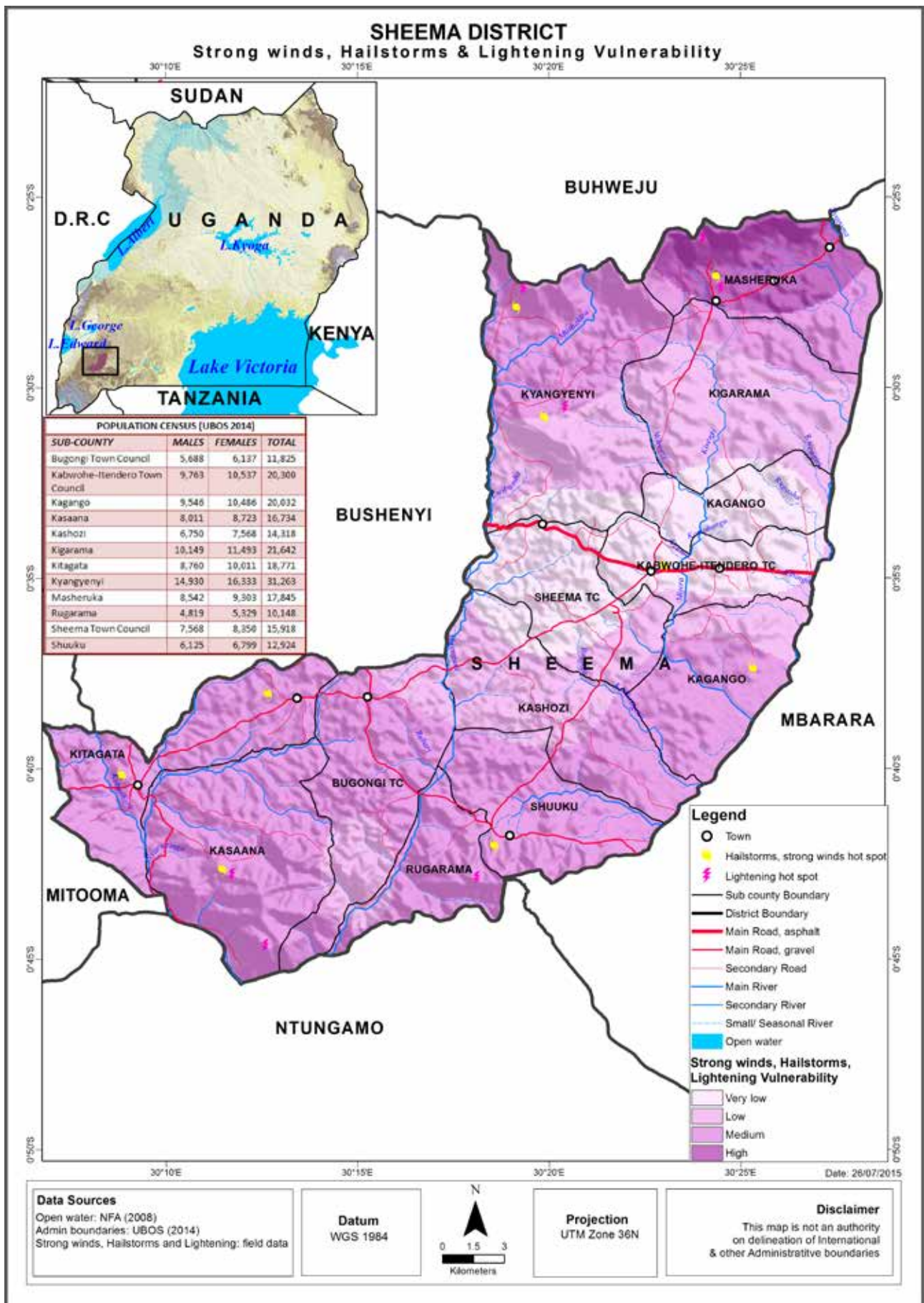


Figure 11: Hailstorms, strong winds, lightening prone areas, Ranking, Sheema District

## **2.3.4 ECOLOGICAL OR BIOLOGICAL HAZARDS**

### **2.3.4.1 Crop Pests and Diseases**

Results from participatory assessments indicated that crop pests and diseases were a serious problem because Sheema District lies in a banana – coffee agro-ecological zone. The most affected crops were bananas, coffee and cassava and eucalyptus trees which were affected by Sigatoka and banana bacterial wilt, coffee wilt disease, cassava mosaic and eucalyptus disease respectively. The most reported crop pests included: coffee twig borer, root mealy bug and caterpillar infestation. It was further reported that the most affected sub-counties included: Kigarama, Kasana and Bugongi and Kitagata (Figure 12).



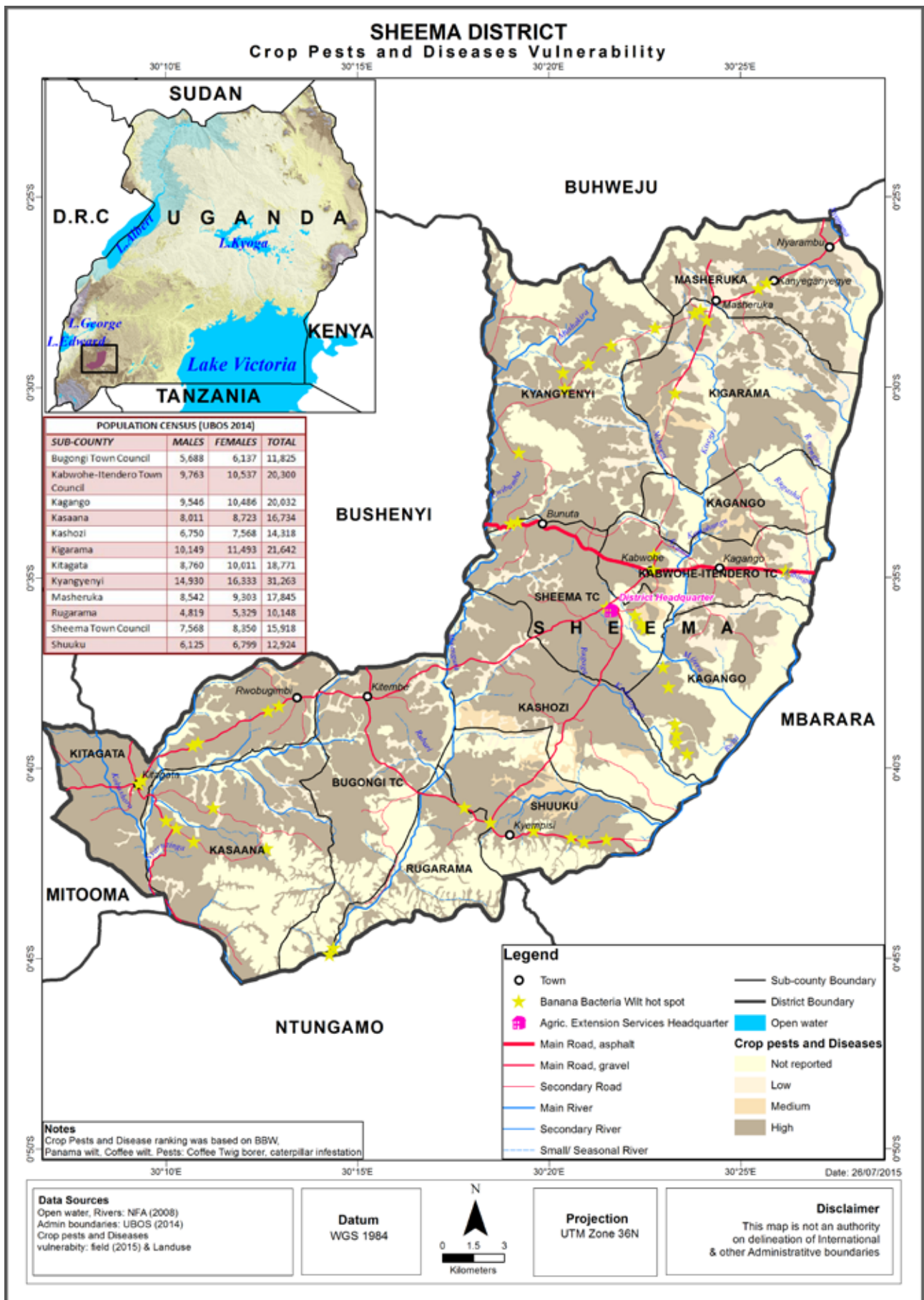


Figure 12: Crop Pest and Diseases Vulnerability, Sheema District

#### **2.3.4.2 Livestock Pests and Diseases**

Participatory assessments through focus group discussions indicated that livestock farmers in Sheema District were vulnerable to livestock pests and diseases. The most reported livestock diseases included: foot and mouth disease, lumpy disease, anthrax, rabies and east coast fever while ticks were the most mentioned livestock pests. It was reported that anthrax was more prominent in Kagango and Kigarama sub-counties and Sheema and Kabwohe-Itendero town councils. Participants also reported that in 2014 an epidemic killed very many chicken in parts of Kyabuharambo in Masheruka sub-county. However, several measure such as vaccination of animals and quarantine have been taken by district authorities to control the transmission of livestock diseases. All the sub-counties in Sheema District are affected by both livestock pests and diseases. Figure 13 shows areas vulnerable to Livestock pests and diseases.

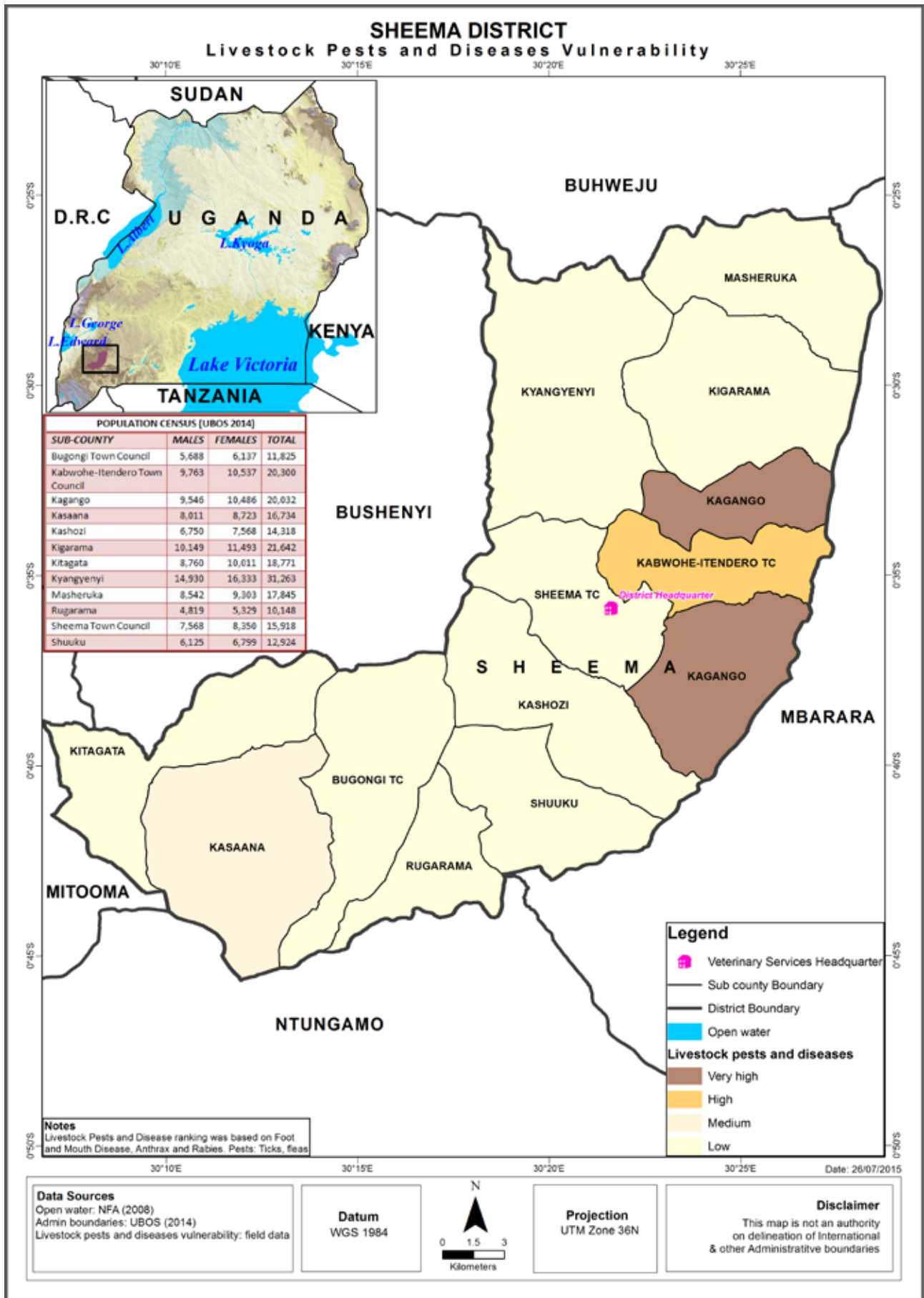


Figure 13: Livestock Pests and Diseases Vulnerability, Sheema District

### **2.3.4.3 Human Diseases outbreaks**

Results from the participatory assessments revealed that Sheema District as a whole was affected by human diseases in the past 10 years. The most reported human diseases included: Malaria, HIV and AIDS, measles, sexually transmitted infections, rabies, brucellosis, typhoid and tuberculosis. It was also reported that children in Kashozi sub-county were seriously affected by measles. Brucellosis was common among old people who consume considerable amounts of raw milk products such as cow ghee. Typhoid was common among residents of Kabwohe-Itendero town council due to contamination of water by latrines that pollute underground water sources of water. The prevalence of malaria has reduced in all the sub-counties because government provided treated mosquito nets in 2014. Figure 14 shows areas vulnerable to Human diseases outbreaks and also shows the location of health facilities in the district.



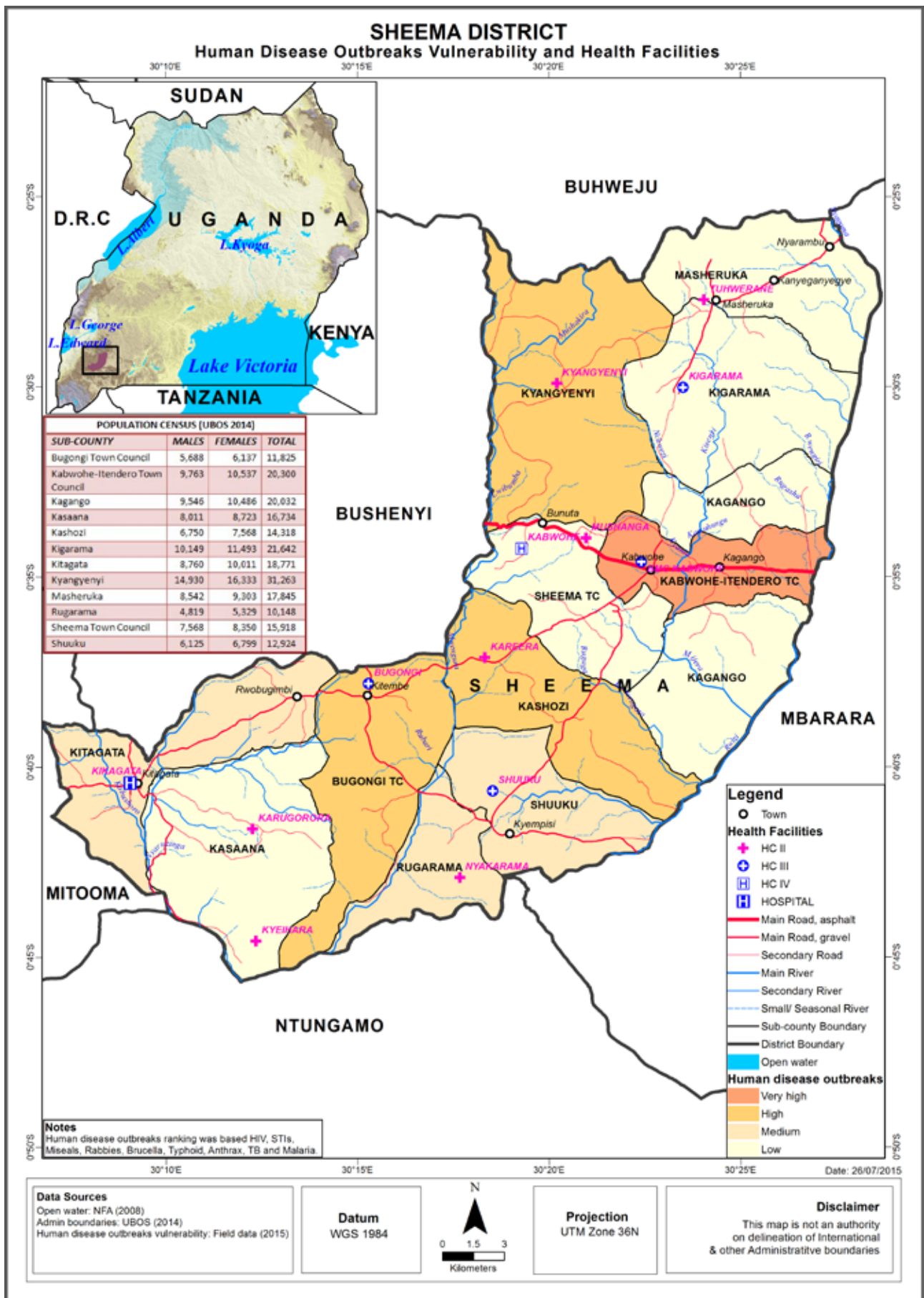


Figure 14: Human diseases outbreaks Vulnerability, Sheema District



#### **2.3.4.4 Vermin and Wild-life Animal Attacks**

Participants of the focus group discussions reported that vermin and wild life attacks were a not a serious problem in Sheema District. However, Sheema District lies in the National Park corridor and often elephants, buffaloes, baboons and monkeys cross through some sub-counties like Masheruka, Kagango and Kigarama thereby destroying people's gardens. It was also reported crop farmers in the areas of Nyaruhanga, Kyeihara, Nyamusebeya and Rwampungu in Kasaana sub-county are vulnerable to monkeys which destroy their crops.

#### **2.3.4.5 Invasive species**

Results from the discussions showed that *Lantana camara* and *Pasperum Spp* are the most common invasive species in Sheema District. Masheruka, Kigarama, Kagango, Kyangenyi and Kasaana sub-counties and Kabwohe-Itendero town council are the most affected by these invasive plants. It was reported that some of these species suppress the growth of crops and also dominate most grasslands in this district (Figure 15).

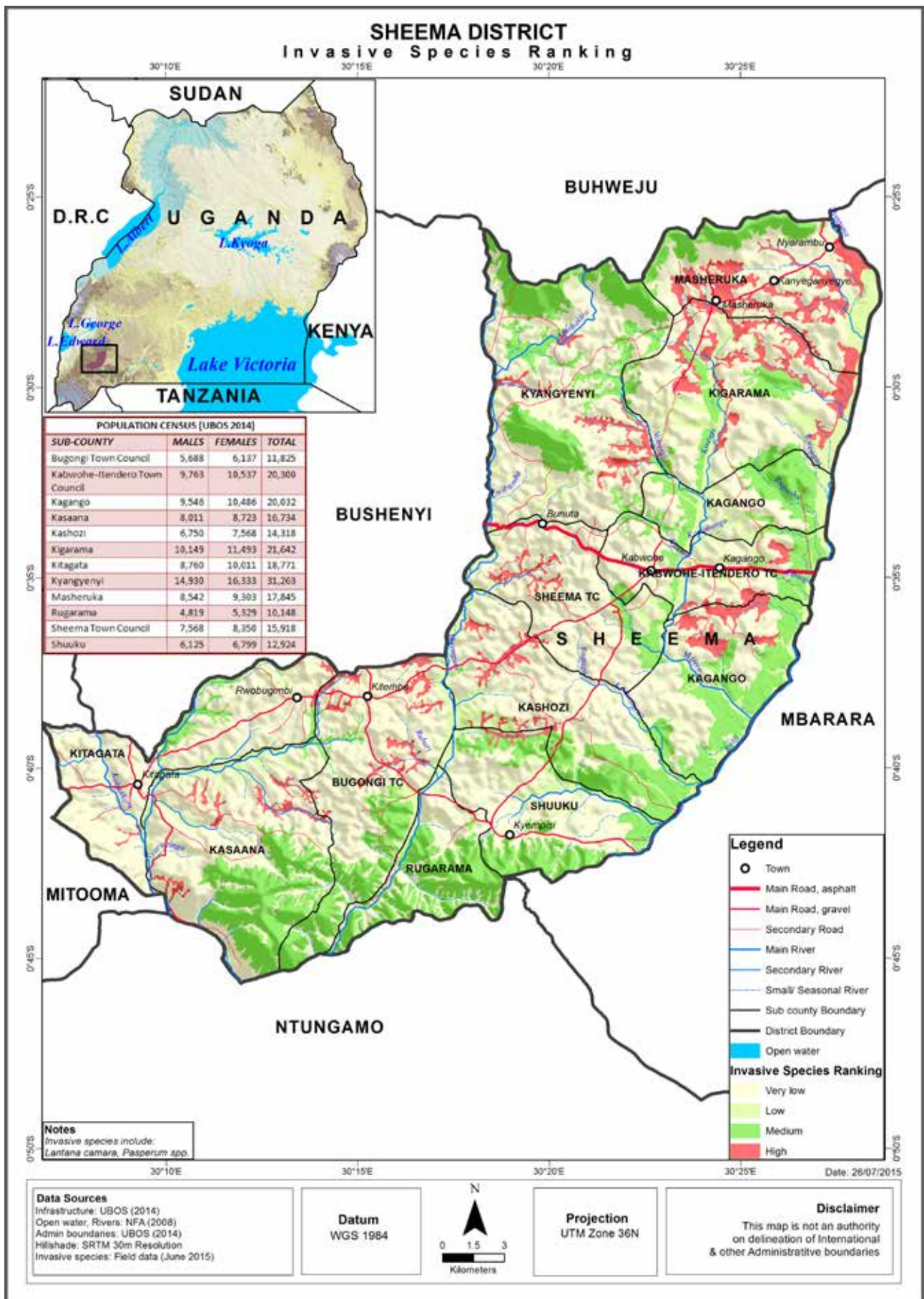


Figure 15: Invasive Species Ranking, Sheema District

## **2.3.5 HUMAN INDUCED AND TECHNOLOGICAL HAZARDS**

### **2.3.5.1 Bush and School fires**

Results from the participatory assessments indicated that bush fires weren't a serious issue in Sheema district. Participants reported that bush fires that rarely occur in this district are accidental, malicious and sometimes intentional especially during the dry season. The Bigona ranges in Shuuku sub-county are prone to bush fires. School fires have also been a serious problem in the past 10 years. Incidences of school fires were reported in Sacred heart Mushanga, Bugongi SS, Butsibo SS and Kibingo girls' secondary schools and Ryakasinga center for health education (Figure 16).





### **2.3.5.2 Land conflicts**

Results from the focus group discussions showed that land conflicts were a serious problem in Sheema District. Land tenure systems in this district are free hold and communal land ownership. However, very few people have land titles a situation that has increased conflicts among local communities. This has led to fights causing human deaths, destruction of livestock and crops especially in Kagango and Masheruka sub-counties (Figure 17).



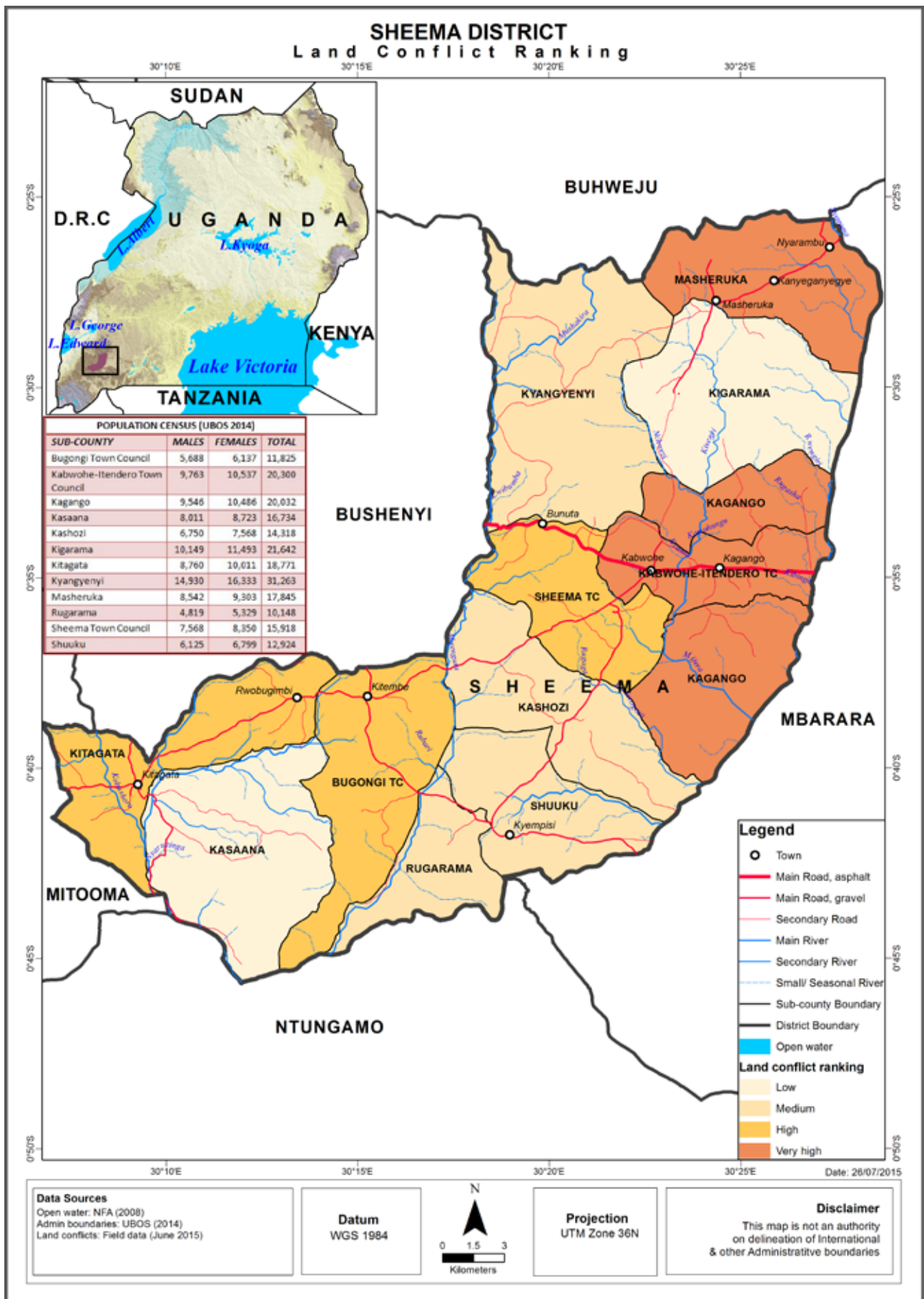


Figure 17: Land Conflict Ranking, Sheema District

### **2.3.5.3 Environmental degradation**

Wetland reclamation, stone quarrying, sand mining, brick laying and clay extraction are some of the most common forms of environmental degradation in Sheema District. Results from the participatory assessments showed that there was increased stone quarrying on the hill slopes of Kangore in Masheruka sub-county. Other hot spots of environmental degradation are evident in the sub-counties of Kagango, Kashozi and Shuuku where sand mining, brick making activities and clay extraction is done. Figure 18 shows environmental degradation risk areas and a few hot spots where environmental degradation has occurred in the past 10 years.

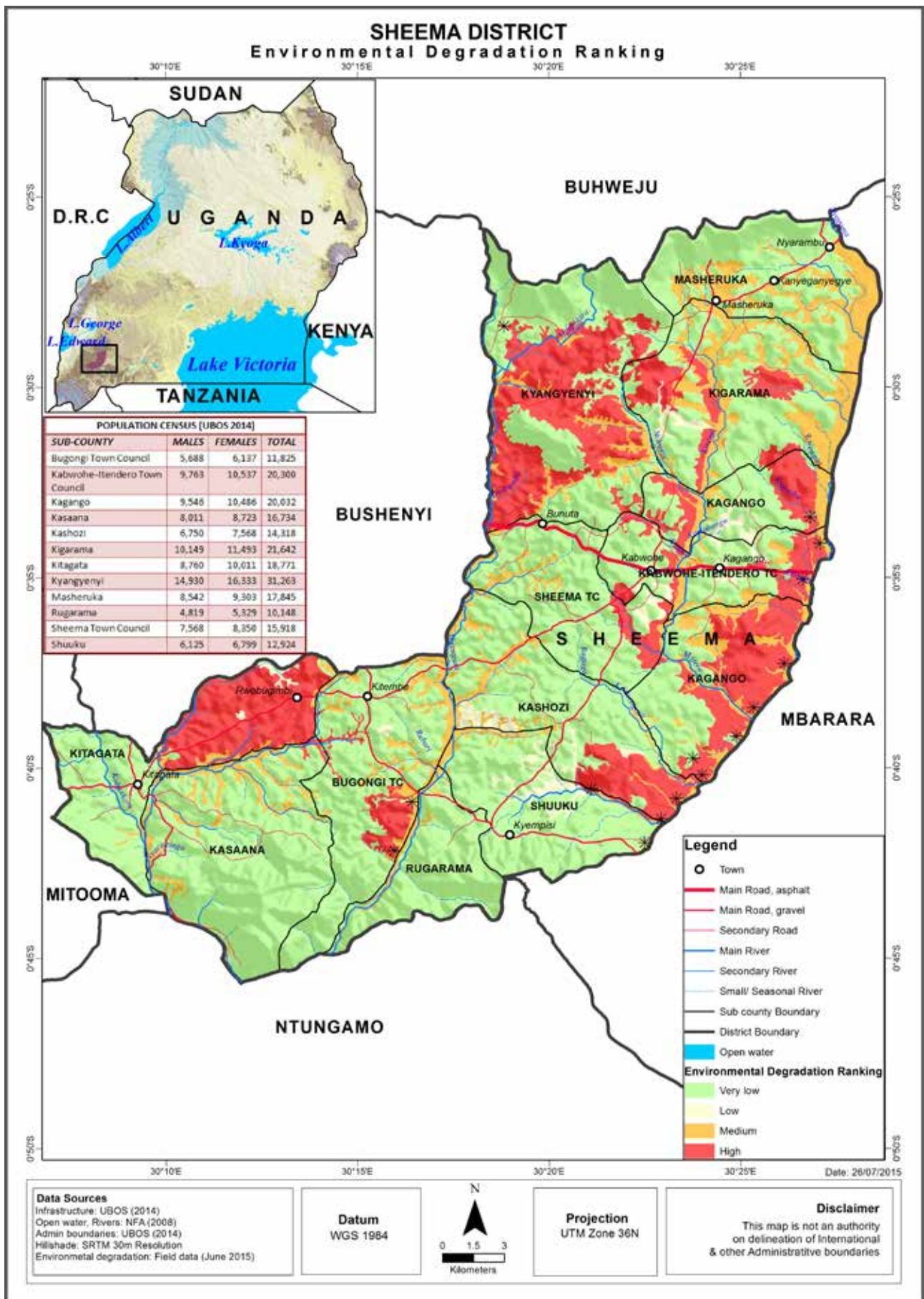


Figure 18: Environmental Degradation Ranking, Sheema District

#### **2.3.5.4 Road accidents**

Results from the discussions showed that the road accident black spots were Karera, Kyabandara-Kikorongo junction, Kyenkokora, Mushanga, Nyamufumura, Kitojo, Kemikyeera, Kagango market and along Kishabya-Nyaihanga road. Road accidents in the district range from head on collisions, overturning of heavy trucks loaded with food stuff and fuel. Sheema and Kabwohe-Itendero town councils were the most affected (Figure 19).



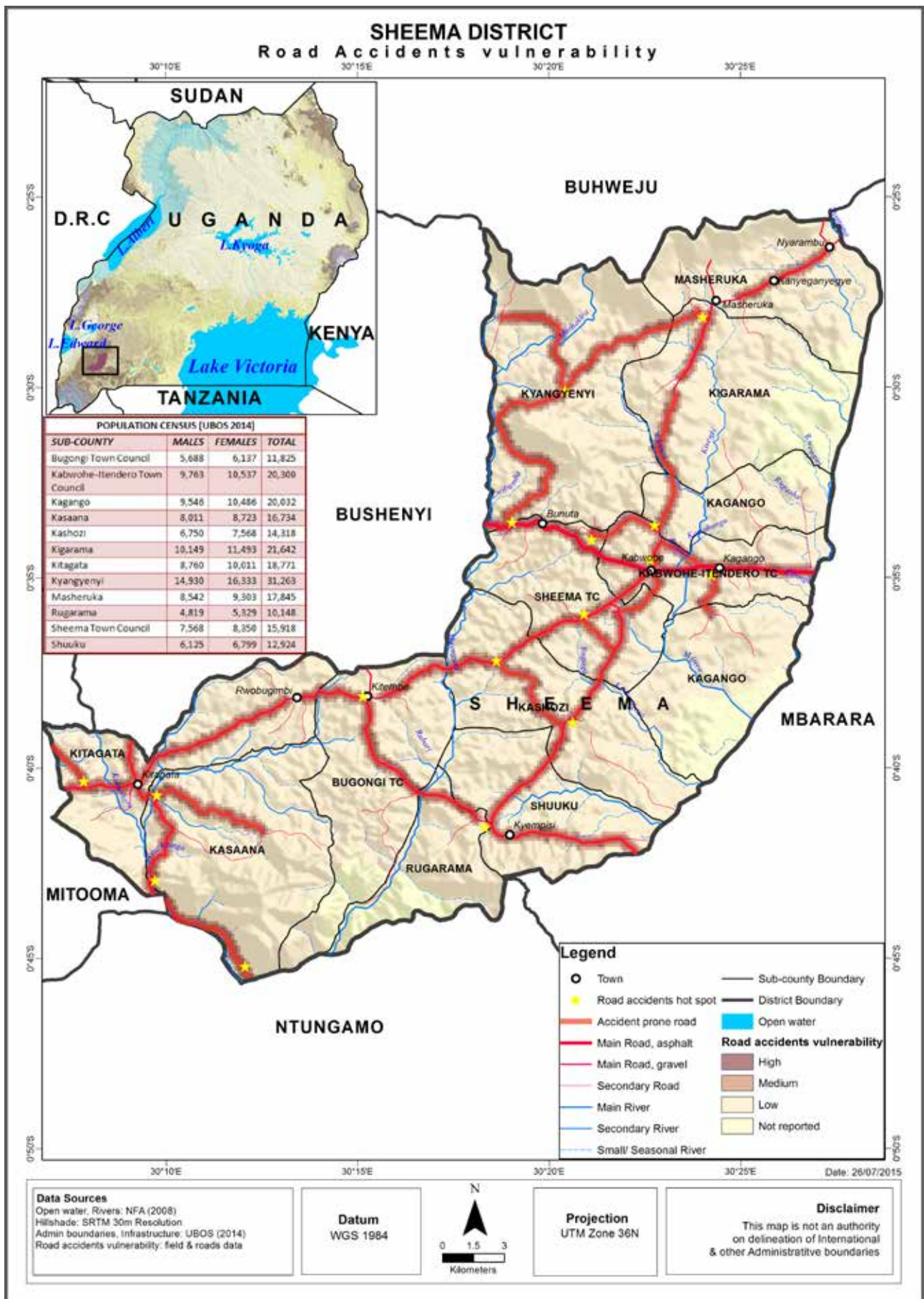


Figure 19: Road Accidents Vulnerability, Sheema District



## 2.4 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 2: Coping strategies to the Multi-hazards in Sheema District**

No	Multi-Hazards		Coping strategies
1	Geomorphological or Geological	Landslides, Rock falls and Erosion	<ul style="list-style-type: none"> <li>• Migration to safe areas</li> <li>• Terracing/ contour farming</li> <li>• Plant trees to control water movement on hill slopes</li> <li>• Mulching in banana plantations</li> <li>• Plant grass in banana plantations on hill slopes</li> <li>• Removal of stones from banana farmlands</li> </ul>
2		Earthquakes and faults	<ul style="list-style-type: none"> <li>• No action, communities think the tremors are minor</li> </ul>
3	Climatological or Meteorological	Floods	<ul style="list-style-type: none"> <li>• Digging up of trenches in the flood plains</li> <li>• Planting trees to control water movement to flood plains</li> <li>• Migration to other areas</li> <li>• Seek for government food aid</li> </ul>
4		Drought	<ul style="list-style-type: none"> <li>• Leave wetlands as water catchments</li> <li>• Plant trees as climate modifiers</li> <li>• Buy food elsewhere in case of shortage</li> <li>• Buy water from the nearby areas</li> <li>• Food Storage especially dry grains</li> </ul>
5		Strong winds, Hailstorms and Lightening	<ul style="list-style-type: none"> <li>• Plant trees as wind breakers</li> <li>• Use of stakes against wind in banana plantations</li> <li>• Use of ropes to tire banana against wind</li> <li>• Installation of lightening conductors</li> <li>• Stay indoors during rains</li> <li>• Changing building designs and roof types</li> <li>• Removal of destroyed crops</li> <li>• Request for aid from the Office of the Prime Minister</li> <li>• Installation of lightening conductors on newly constructed schools</li> </ul>

6	Ecological or Biological	Crop pests and Diseases	<ul style="list-style-type: none"> <li>• Spraying pests</li> <li>• Cutting and burying BBW affected crops</li> <li>• Burning of affected crops</li> <li>• Vigilance</li> </ul>
7		Livestock pests and Diseases	<ul style="list-style-type: none"> <li>• Spraying pests</li> <li>• Vaccinations</li> <li>• Burying animals that have died from infection</li> <li>• Quarantine</li> </ul>
8		Human epidemic Diseases	<ul style="list-style-type: none"> <li>• Mass immunisation</li> <li>• Visiting health centres</li> <li>• Use of mosquito nets</li> </ul>
9		Vermin and Wild-life animal attacks	<ul style="list-style-type: none"> <li>• Guarding the gardens</li> <li>• Poisoning</li> <li>• Hunt and kill</li> <li>• Report to UWA</li> </ul>
10		Invasive species	<ul style="list-style-type: none"> <li>• Uproot</li> <li>• Cut and burn</li> <li>• Sensitization on Invasive species management</li> </ul>
11	Human induced or technological	Land conflicts	<ul style="list-style-type: none"> <li>• Community dialogues</li> <li>• Report to court</li> <li>• Migration</li> </ul>
12		Bush fires	<ul style="list-style-type: none"> <li>• Stop the fires in case of fire outbreak</li> <li>• Fire lines (may be constructed, cleared grass)</li> <li>• Fire breaks planted along gardens e.g. euphorbia spp.</li> <li>• Vigilance especially in dry seasons where most burning is done</li> </ul>
13		Road accidents	<ul style="list-style-type: none"> <li>• Construction of humps</li> <li>• New road has Signage including speed limits</li> <li>• Sensitisation</li> </ul>
14		Environmental degradation	<ul style="list-style-type: none"> <li>• Leave wetlands as water catchments</li> <li>• Plant trees as climate modifiers</li> <li>• Sensitization</li> </ul>

## 2.5 VULNERABILITY PROFILES

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

Vulnerability was assessed basing on two broad criteria i.e. socio-economic and environmental components of vulnerability. Participatory approach was employed to assess these vulnerability components by characterizing the exposure agents, including hazards, elements at risk and their spatial dimension. Participants also characterized the susceptibility of the district including identification of the potential impacts, the spatial disposition and the coping mechanisms. Participants also identified the resilience dimension at different spatial scales (Table 3).

Table 4 (vulnerability profile) shows the relation between hazard intensity (probability) and degree of damage (magnitude of impacts) depicted in the form of hazard intensity classes, and for each class the corresponding degree of damage (severity of impact) is given. It reveals that climatological and meteorological hazards in form of drought and hailstorms predispose the community to high vulnerability state. The occurrence of pests and diseases and lightening, also create a moderate vulnerability profile in the community (Table 4). Table 5 shows Hazard assessment for Sheema District.

**Table 3: Components of vulnerability in Sheema District**

Vulnerability	Exposure		Susceptibility			Resilience	
	Hazards	Elements at Risk	Geographical Scale	Susceptibility	Geographical Scale	Coping strategies	Geographical Scale
Socio-economic component	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 Lightening	- 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 bury affected crops -Sensitization on crop disease management	District
	Livestock Pests and Diseases	-Livestock (cattle, goats etc.)	District	- Loss of livestock - Reduced livestock productivity	District	- Vaccination - Bury 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

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



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

	PROBABILITY	SEVERITY OF IMPACTS	RELATIVE RISK	VULNERABLE SUB-COUNTIES
	<i>Relative likelihood this will occur</i>	<i>Overall Impact (Average)</i>	<i>Probability x Impact Severity</i>	
Hazards	1 = Not occur 2 = Doubtful 3 = Possible 4 = Probable 5 = Inevitable	1 = No impact 2 = Low 3 = medium 4 = High	0-1 = Not Occur 2-10 = Low 11-15 = Medium 16-20 = High	
Floods	5	4	20	The most vulnerable sub-counties are Masheruka, Kasaana, Kagango, Shuuku, Kyangenyi, Kigarama, Kitagata and Kabwohe/Itendero town council.
Droughts	5	3	15	Kagango, Masheruka and Shuuku are the most affected sub-counties.
Soil erosion, rock falls and landslides	5	3	15	Kyangenyi, Kasaana, Masheruka and Shuuku are the most affected.
Hail storms, lightening and strong winds	5	3	15	Masheruka, Kyangenyi, Kagango, Kitagata, Kasaana, Shuuku and Kigarama are the most affected sub-counties.
Bush fires	3	2	6	Most affected sub-counties are Shuuku, Kasaana, Kitagata, Masheruka and Kyangenyi.
Crop pests and diseases	4	3	12	Kasaana, Kigarama, Kitagata, Kyangenyi, Masheruka, Shuuku sub-counties and Bugongi and Sheema town councils were the most affected.
Livestock pests and diseases	4	3	12	Kagango, Kigarama, Masheruka sub-counties and Kabwohe-Itendero and Sheema town councils are the most affected.
Human Diseases outbreaks	5	2	10	Almost all sub-counties in the district are affected by Human diseases. HIV rates were reported highest in Kabwohe-Itendero and Bugongi town councils and Kyangenyi, Shuuku and Kitagata sub-counties.

Land conflicts	5	3	15	Almost all sub-counties in the district are affected by land conflicts. However, Kagango, Kyangenyi and Masheruka sub-counties are the most affected.
Vermin and Wild-life animal attacks	5	2	10	Masheruka, Kagango and Kigarama are the most affected sub-counties.
Earthquakes and faults	3	2	6	Minor tremors occur in all sub-counties of the district.
Road accidents	3	3	9	Kabwohe-Itendero and Sheema town councils are the most affected.
Environmental degradation	5	2	10	Kagango, Kashozi, Masheruka and Shuuku sub-counties are the most affected.

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

#### Key for Relative Risk

H	High
M	Medium
L	Low
N	Not occur

**Table 5: Hazard Risk Assessment**

Hazard	Bugongi T.C	Kabwohe/Itendero T.C	Kagango	Kasaana	Kashozi	Kigarama	Kitagata	Kyangenyi	Masheruka	Rugarama	Sheema T.C	Shuuku
Floods	M	H	H	H	M	H	H	H	H	M	M	H
Drought	L	M	H	L	L	M	L	L	H	L	L	H
Landslides, Rock falls and Erosion	M	L	L	H	M	L	M	H	H	M	L	H
Strong winds, Hailstorms and Lightening	M	L	M	M	M	M	M	M	H	M	L	M
Crop pests and Diseases	H	M	M	H	M	H	H	H	H	M	H	H
Livestock pests and Diseases	M	H	H	M	M	H	M	M	H	M	H	M
Human disease outbreaks	H	H	L	L	L	L	M	H	L	L	H	H
Vermin and Wildlife animal attacks	L	L	M	M	L	M	L	L	M	L	L	L
Land conflicts	M	M	H	M	M	M	M	H	H	M	M	M
Bush fires	L	L	L	M	L	L	M	M	M	L	L	H
Environmental degradation	M	M	H	M	H	M	M	M	H	M	M	H
Earthquakes and faults	L	L	L	L	L	L	L	L	L	L	L	L
Road accidents	M	H	L	L	L	L	L	L	L	L	H	L

**Key**

H	High
M	Medium
L	Low
N	Not occur

## **2.6 GENERAL CONCLUSIONS AND RECOMMENDATIONS**

### **2.6.1 Conclusions**

The multi-hazard vulnerability profile output from this assessment was a combination of spatial modeling using socio-ecological spatial layers (i.e. DEM, Slope, Aspect, Flow Accumulation, Land use, vegetation cover, hydrology, soil types and soil moisture content, population, socio-economic, health facilities, accessibility, and meteorological data etc.) 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 Isingiro district has over the past two decades increasingly experienced hazards including landslides, rock falls, soil erosion, floods, drought, hailstorms, strong winds, lightening, 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. Generally drought and flooding were identified as most serious problem in Isingiro 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 Isingiro district increase their vulnerability to hazard exposure necessitating urgent external support.

Hazards experienced in Isingiro 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 lightening.
- 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, counteracting 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, 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.

### **2.6.2 Recommendations**

The following recommended policy actions targeting vulnerability reduction include:

- i. Office of the prime minister should decentralize their activities at the district level
- ii. Improve the communication channel between the disaster department and local Communities

- iii. Revival of disaster committees at the district level
- iv. Support establishment of a disaster risk early warning systems
- v. Tree planting along road reserves
- vi. Promotion of drought and disease resistant crop seeds
- vii. Funding and recruitment of extension workers at Sub-county level
- viii. Improved enforcement of policies aimed at enhancing sustainable environmental health.
- ix. Quickly review the animal diseases control act because of low penalties given to defaulters.
- x. Establishment of systems to motivate support of political leaders toward government initiatives and programmes aimed at disaster risk reduction.
- xi. Increased awareness campaigns aimed at sensitizing farmers/communities on disaster risk reduction initiatives and practices.
- xii. Periodic maintenance of feeder roads to reduce on traffic accidents
- xiii. Relocation of communities in the affected areas in the district by government
- xiv. Increase funding and staff to monitor wetland degradation and non-genuine agro-inputs
- xv. Increased importation of lightening arrestors for at least government institutions and facilities



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**APPENDIX I: DATA COLLECTION TOOLS**



**Plate 1: Key Informant Interview with District Environment Officer in Sheema District**



**Plate 2: Key Informant Interview with Senior Land Officers in Sheema District**



**Plate 3: Key Informant Interview with Operations Manager Stone quarry Kasaana Sub-county**



**Plate 4: Key Informant Interview with Manager Kitagata hot spring, Kitagata Sub-county**





**Plate 5: Focus Group Discussion in Kasaana Sub-county**



**Plate 6: Focus Group Discussion in Masheruka Sub-county**

## FOCUS GROUP DISCUSSION GUIDE FOR DISTRICT DISASTER RISK MANAGEMENT FOCAL PERSONS

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

No.	Name of Participants	Designation	Contact	Signature

### Introduction

- i. You have all been requested to this session because we are interested in learning from you. We appreciate your rich experiences and hope to use them to strengthen service delivery across the district and the country as whole in a bid to improve access to information on Hazards and early warning.
- ii. There is no “right” or “wrong” answers to any of the questions. As a Focus Group Discussion leader, I will try to ask all people here today to take turns speaking. If you have already spoken several times, I may call upon someone who has not said as much. I will also ask people to share their remarks with the group and not just with the person beside them, as we anxious to hear what you have to say.
- iii. This session will be tape recorded so we can keep track of what is said, write it up later for our report. We are not attaching names to what you have to what is said, so whatever you say here will be anonymous and we will not quote you by name.
- iv. I would not like to keep you here long; at most we should be here for 30 minutes- 1 hour.



## **Section A: Floods, Droughts, Landslides, Crop and Animal Production**

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 floods in the past 10 years in your area of jurisdiction?
5. Which villages, parishes or sub-counties have been most affected by floods?
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 floods in your area of jurisdiction?
8. In which way are the crops affected by floods?
9. Which domestic animals are majorly affected by floods in your area of jurisdiction?
10. In which way are the domestic animals affected by floods?
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. Have you experienced drought in the past 10 years in your area of jurisdiction?
14. Which villages, parishes or sub-counties have been most affected by drought?
15. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
16. Which crops are majorly affected by drought in your area of jurisdiction?
17. In which way are crops affected by drought?
18. Which domestic animals are majorly affected by drought in your area of jurisdiction?
19. In which way are the domestic animals affected by drought?
20. Which agricultural practices are being adopted by farmers in a bid to mitigate the above challenges?
21. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?
22. Have you experienced landslides in the past 10 years in your area of jurisdiction?

23. Which villages, parishes or sub-counties have been most affected by landslide?
24. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
25. Which crops are majorly affected by landslides in your area of jurisdiction?
26. In which way are the crops affected by landslides?
27. Which domestic animals are majorly affected by landslides in your area of jurisdiction?
28. In which way are the domestic animals affected by landslides?
29. Which agricultural practices are being adopted by farmers in a bid to mitigate the above challenges?
30. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?

### **Section B: Animal, crop and human disease outbreaks**

31. Have you experienced any epidemic animal disease outbreaks in the past 10 years in your area of jurisdiction?
32. Which villages, parishes or sub-counties have been most affected by epidemic animal disease outbreaks?
33. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
34. Specify the epidemic animal disease outbreaks that have majorly affected animals in your area of jurisdiction?
35. Which domestic animals are majorly affected by epidemic animal disease outbreaks in your area of jurisdiction?
36. In which way are the domestic animals affected by epidemic animal disease outbreaks?
37. Which mitigation practices are being adopted by farmers in a bid to mitigate the above epidemic animal disease outbreaks?
38. What are the relevant government's interventions focusing at helping farmers mitigate the epidemic animal disease outbreaks mentioned?
39. Have you experienced any crop pests and disease outbreaks in the past 10 years in your area of jurisdiction?
40. Which villages, parishes or sub-counties have been most affected by epidemic animal disease outbreaks?
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. Specify the crop pests and disease outbreaks that have majorly affected animals in your area of jurisdiction?
43. Which crops are majorly affected by crop pests and disease outbreaks in your area of jurisdiction?
44. In which way are the crops affected by crop pests and disease outbreaks?
45. Which mitigation practices are being adopted by farmers in a bid to mitigate the above crop pests and disease outbreaks?
46. What are the relevant government's interventions focusing at helping farmers mitigate the crop pests and disease outbreaks mentioned?
47. Have you experienced any epidemic human disease outbreaks in the past 10 years in your area of jurisdiction?
48. Specify the epidemic human disease outbreaks that have majorly affected animals in your area of jurisdiction?
49. In which way are the humans affected by epidemic human disease outbreaks?
50. Which mitigation measures have been adopted by local communities in a bid to mitigate the above epidemic human disease outbreaks?
51. What are the relevant government's interventions focusing at helping local communities mitigate the epidemic human disease outbreaks mentioned?

### **Section C: Land, wild-life conflicts and Road accidents**

52. Have you experienced land conflicts in the past 10 years in your area of jurisdiction?
53. Which villages, parishes or sub-counties have been most affected by land conflicts?
54. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
55. Which particular villages, parishes or sub-counties have been majorly affected by land conflicts in your area of jurisdiction?
56. What impacts have been caused by land conflicts?
57. To what extent have the land conflicts affected livelihoods of the local communities in your area of jurisdiction?
58. Which conflict resolution measures have been adopted local communities in a bid to mitigate the above challenges?
59. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

60. Do you have any national park or wildlife reserve in your area of jurisdiction?
61. Have you experienced wildlife attacks in the past 10 years in your area of jurisdiction?
62. Which particular villages, parishes or sub-counties have been majorly affected by wildlife attacks in your area of jurisdiction?
63. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
64. What impacts have been caused by wildlife attacks?
65. To what extent have the wildlife attacks affected livelihoods of the local communities in your area of jurisdiction?
66. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?
67. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
68. Have you experienced Road accidents in the past 20 years in your area of jurisdiction?
69. Which roads have experienced Road accidents?
70. What impacts have been caused by Road accidents?
71. To what extent have the Road accidents affected livelihoods of the local communities in your area of jurisdiction?
72. Which conflict resolution measures have been adopted local communities in a bid to mitigate the above challenges?
73. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

#### **Section D: Hailstorms, lightening, bush fires, earthquakes, faults/ cracks**

74. Have you experienced hailstorms or lightening in the past 10 years in your area of jurisdiction?
75. Which villages, parishes or sub-counties have been most affected by hailstorms or lightening?
76. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
77. What impacts have been caused by hailstorms or lightening?
78. To what extent have the hailstorms or lightening affected livelihoods of the local communities in your area of jurisdiction?

79. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?
80. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
81. Have you experienced any serious bush fires in the past 10 years in your area of jurisdiction?
82. Which particular villages, parishes or sub-counties have been majorly affected by or lightening in your area of jurisdiction?
83. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
84. What impacts have been caused by serious bush fires?
85. To what extent have the serious bush fires affected livelihoods of the local communities in your area of jurisdiction?
86. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?
87. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
88. Do you have any earth faults or earth cracks as lines of weakness in your area of jurisdiction?
89. Have you experienced any earth quakes in the past 10 years in your area of jurisdiction?
90. Which particular villages, parishes or sub-counties have been majorly affected by earth quakes in your area of jurisdiction?
91. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
92. What impacts have been caused by earth quakes?
93. To what extent have the earth quakes affected livelihoods of the local communities in your area of jurisdiction?
94. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?
95. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?



## FOCUS GROUP DISCUSSION GUIDE FOR LOCAL COMMUNITIES

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

No.	Name of Participants	Village/ Parish	Contact	Signature

### Introduction

- v. You have all been requested to this session because we are interested in learning from you. We appreciate your rich experiences and hope to use them to strengthen service delivery across the district and the country as whole in a bid to improve access information on Hazards and early warning.
- vi. There is no “right” or “wrong” answers to any of the questions. As a Focus Group Discussion leader, I will try to ask all people here today to take turns speaking. If you have already spoken several times, I may call upon someone who has not said as much. I will also ask people to share their remarks with the group and not just with the person beside them, as we anxious to hear what you have to say.
- vii. This session will be tape recorded so we can keep track of what is said, write it up later for our report. We are not attaching names to what you have to what is said, so whatever you say here will be anonymous and we will not quote you by name.
- viii. I would not like to keep you here long; at most we should be here for 30 minutes- 1 hour.

### Section A: Floods, Droughts, Landslides, Crop and Animal Production

1. Which crops are majorly grown in this community?
2. Which domestic animals are dominant in your community?
3. Have you experienced floods in the past 10 years?

4. Since when did you last experience floods?
5. In a period of 10 years, how often do you experienced floods?
  - i. Monthly...
  - ii. 2 months...
  - iii. 3 months...
  - iv. Quarterly ...
  - v. 6 months...
  - vi. Annually...
  - vii. Others specify...
6. Which crops are majorly affected by floods in your community?
7. In which way are the crops affected by floods in your community?
8. Which domestic animals are majorly affected by floods in your community?
9. In which way are the domestic animals affected by floods in your community?
10. What measures have been taken by the Government to mitigate the effects of floods?
11. Have you experienced drought in the past 10 years?
12. Since when did you last experience drought?
13. In a period of 10 years, how often do you experience drought?
  - i. Monthly...
  - ii. 2 months...
  - iii. 3 months...
  - iv. Quarterly ...
  - v. 6 months...
  - viii. Annually...
  - ix. Others specify...
14. Which crops are majorly affected by drought in your community?
15. In which way are crops affected by drought in your community?
16. Which domestic animals are majorly affected by drought in your community?
17. In which way are the domestic animals affected by drought in your community?
18. What measures have been taken by the Government to mitigate the effects of drought?
19. Have you experienced landslide in the past 10 years?

**20.** Since when did you last experience landslide?

**21.** In a period of 10 years, how often do you experience landslide?

vi. Monthly...

vii. 2 months...

viii. 3 months...

ix. Quarterly ...

x. 6 months...

x. Annually...

xi. Others specify...

**22.** Which crops are majorly affected by landslide in your community?

**23.** In which way are crops affected by landslide in your community?

**24.** Which domestic animals are majorly affected by landslide in your community?

**25.** In which way are the domestic animals affected by landslide in your community?

**26.** What measures have been taken by the Government to mitigate the effects of landslide?

## **Section B: Animal, crop and human disease outbreaks**

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

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

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

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

**31.** Which measures have you adopted to mitigate the above epidemic animal disease outbreaks in your community?

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

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

**34.** Specify the crop pests and disease outbreaks that have majorly affected animals in your

community?

35. Which crops are majorly affected by crop pests and disease outbreaks in your community?
36. In which way are the crops affected by crop pests and disease outbreaks?
37. Which measures have you adopted to mitigate the above crop pests and disease outbreaks in your community?
38. What are the relevant government's interventions focusing at helping farmers mitigate the crop pests and disease outbreaks mentioned?
39. Have you experienced any epidemic human disease outbreaks in the past 10 years in your community?
40. Specify the epidemic human disease outbreaks that have majorly affected animals in your community?
41. In which way are the humans affected by epidemic human disease outbreaks?
42. Which measures have you adopted to mitigate the above epidemic human disease outbreaks?
43. What are the relevant government's interventions focusing at helping local communities mitigate the epidemic human disease outbreaks mentioned?

### **Section C: Land, wild-life conflicts and Road accidents**

44. Have you experienced land conflicts in the past 10 years in your community?
45. Which particular villages, parishes or sub-counties have been majorly affected by land conflicts in your community?
46. What impacts have been caused as result of land conflicts?
47. To what extent have the land conflicts affected livelihoods in your community?
48. Which conflict resolution measures have you adopted to mitigate the above challenges?
49. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
50. Do you have any national park or wildlife reserve in your community?

51. What is the distance of your community from the national park or wildlife reserve?
52. Have you experienced wildlife attacks in the past 10 years in your community?
53. Which particular villages, parishes or sub-counties have been majorly affected by wildlife attacks in your community?
54. What impacts have been caused by wildlife attacks?
55. To what extent have the wildlife attacks affected livelihoods in your community?
56. Which measures have you adopted to mitigate the above challenges?
57. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
58. Have you experienced Road accidents in the past 20 years in your community?
59. Which roads have experienced Road accidents?
60. What impacts have been caused by Road accidents?
61. To what extent have the Road accidents affected livelihoods in your community?
62. Which conflict resolution measures have been adopted local communities in a bid to mitigate the above challenges?
63. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

#### **Section D: Hailstorms, lightening, bush fires, earthquakes, faults**

64. Have you experienced hailstorms or lightening in the past 10 years in your community?
65. Which particular villages, parishes or sub-counties have been majorly affected by hailstorms or lightening in your community?
66. What impacts have been caused by hailstorms or lightening?
67. To what extent have the hailstorms or lightening affected livelihoods in your community?
68. Which measures have you adopted to mitigate the above challenges?
69. What are the relevant government's interventions focusing at helping local communities



mitigate the challenges mentioned?

**70.** Have you experienced serious bush fires in the past 10 years in your community?

**71.** Which particular villages, parishes or sub-counties have been majorly affected by or lightening in your community?

**72.** What impacts have been caused by serious bush fires?

**73.** To what extent have the serious bush fires affected livelihoods in your community?

**74.** Which measures have you adopted to mitigate the above challenges?

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

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

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

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

**79.** What impacts have been caused by earth quakes?

**80.** To what extent have the earth quakes affected livelihoods in your community?

**81.** Which measures have you adopted to mitigate the above challenges?

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

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

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



**With support from:**

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P.O. Box 7184  
Kampala, Uganda  
Site: [www.undp.org](http://www.undp.org)



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