THE REPUBLIC OF UGANDA

Butaleja District

Hazard, Risk and Vulnerability Profile

2016

Acknowledgement

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

I extend my sincere thanks to the Department of Relief, Disaster Preparedness and Management, under the leadership of the Commissioner, Mr. Martin Owor, for the oversight and management of the entire exercise.
The HRV assessment team was led by Ms. Ahimbisibwe Catherine, Senior Disaster Preparedness Officer supported by Ogwang Jimmy, Disaster Preparedness Officer and the team of consultants (GIS/DRR specialists); Dr. Bernard Barasa, and Mr. Nsiimire Peter, who provided technical support.

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My appreciation also goes to Butaleja District Team.
The entire body of stakeholders who in one way or another yielded valuable ideas and time to support the completion of this exercise.

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

EXECUTIVE SUMMARY

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

Preliminary spatial analysis

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

Stakeholder engagements

Stakeholder engagements were carried out in close collaboration with OPM's DRM team and the District Disaster Management focal persons with the aim of identifying the various hazards ranging from; drought, floods, landslides, human and animal disease, pests, animal attacks, earthquakes, fires, conflicts etc. Stakeholder engagements were done through Focus Group Discussions (FGDs) and key informant interviews guided by checklist tools (Appendix I). At district level Key Informants included: District Agricultural Officer, District Natural Resources Officer, District Health Inspector and District Planner while at sub-county level Key informants included: Sub-county and parish chiefs, community Development mobilisers 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 Busabi, Nawanjofu, Himutu and Mazimasa 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 Mbale 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 Butaleja 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 Butaleja 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, road accidents and land conflicts putting livelihoods at increased risk. Drought and floods were identified as most serious problems in Butaleja District with almost all sub-counties being vulnerable to the hazards. This is because the area is generally flat hence 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 OPM and Meteorology Authority 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 facilitate them.

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BBW	Banana Bacterial Wilt
ARI	Acute Respiratory Infections
CBOs	Community Based Organisations
CSOs	Civil Society Organisations
DEAP	District Environment Action Plan
DPTC	District Technical Planning Committee
DTT	District Technical Team
ENR	Environment and Natural Resources
LEC	Local Environment Committee
NBSAP	National Biodiversity Strategy and Action Plan
NEMA	National Environment Management Authority
NGOs	Non-Governmental Organisations
STIs	Sexually Transmitted Infections
UBOS	Uganda Bureau of Statistics
UNCCD	United Nations Convention on Climate Change and Desertification
UNCCD	United Nations Convention on Combating Desertification
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
DDMC	District Disaster Management Committee
DEM	Digital Elevation Model
DLG	District Local Government
DRM	Disaster Risk Management
DWD	Directorate of Water Development
DWRM	Directorate of Water Resources Management
ENSO	El Niño Southern Oscillation
FGD	Focus Group Discussion
GIS	Geographical Information Systems
HRV	Hazard Risk Vulnerability
KII	Key Interview Informant
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
MWE	Ministry of Water and Environment
NCCP	National Climate Change Policy
OPM	Office of the Prime Minister
PGIS	Participatory GIS
SMCA	Spatial Multi-criteria Analysis
STRM	Shuttle Radar Topography Mission
UBOS	Uganda Bureau of Statistics
UNDP	United Nations Development Program
UNRA	Uganda National Roads Authority
UTM	Universal Transverse Mercator
WGS	World Geodetic System

DEFINITION OF KEY TERMS

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

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

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

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

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

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

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

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

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

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

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

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

INTRODUCTION

1.1 Background

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

The Government of Uganda is shifting the disaster management paradigm from the traditional emergency response focus towards one of prevention and preparedness. Contributing to the evidence base for Disaster and Climate Risk Reduction action, the Government of Uganda is compiling a National Risk Atlas of hazard, risk and vulnerability conditions in the Country to encourage 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 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 Butaleja District in Eastern 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 Butaleja District, in Eastern Uganda.

1.2.3 Specific Objectives

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

i. Collect and analyze field data generated using GIS in close collaboration and coordination with OPM.
ii. Develop District specific multi-hazard risk and Vulnerability profile using a standard methodology.
iii. Preserve the spatial data to enable use of the maps for future information.
iv. Produce age and sex disaggregated data in the HRV maps.

1.3 Scope of Work

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

i. Collection of field data using GIS in close collaboration and coordination with OPM in Butaleja 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 five sections: Section 1 provides Introduction on the assignment. Section 2 elaborates on the overview of Butaleja district. Section 3 focuses on the methodology employed. Section 4 elaborates the Multi-hazard, Risks and Vulnerability profile and Coping strategies for Butaleja district. Section 5 describes Conclusions and policy related recommendations.

OVERVIEW OF BUTALEJA DISTRICT

2.1 Location

Butaleja District is bordered by Budaka District to the North, Mbale District to the East, Tororo District to the southeast, Bugiri District to the south and Namutumba District to the west in Eastern Uganda. The district headquarters are located approximately 38km by road South West of Mbale. The coordinates of the district are 0^{o} 56N, 33^{o} 57E. Butaleja district was established in July 2005 out of Tororo district when Bunyole County was cut away to create the new district. The District is a low-lying and flat area, located at the far bottom of Mount Elgon, A large part of the district is predominantly covered by wetlands, it is surrounded by two wetland systems namely Doho Namatala, and Mpologoma wetland systems. The location of the district makes it a drainage area for the Elgon region rendering it susceptible to floods.

Administratively Butaleja is composed of Ten sub-counties and two Town Councils. The Ten sub-counties are: Budumba, Busaba, Busabi, Naweyo, Himutu, Busolwe, Butaleja, Kachonga, Mazimasa and Nawanjofu; while the two Town Councils are Busolwe and Butaleja. Butaleja district covers a total land area of 644 sq km Out of which 257sq kms (40%) is wetlands. (Figure 1).

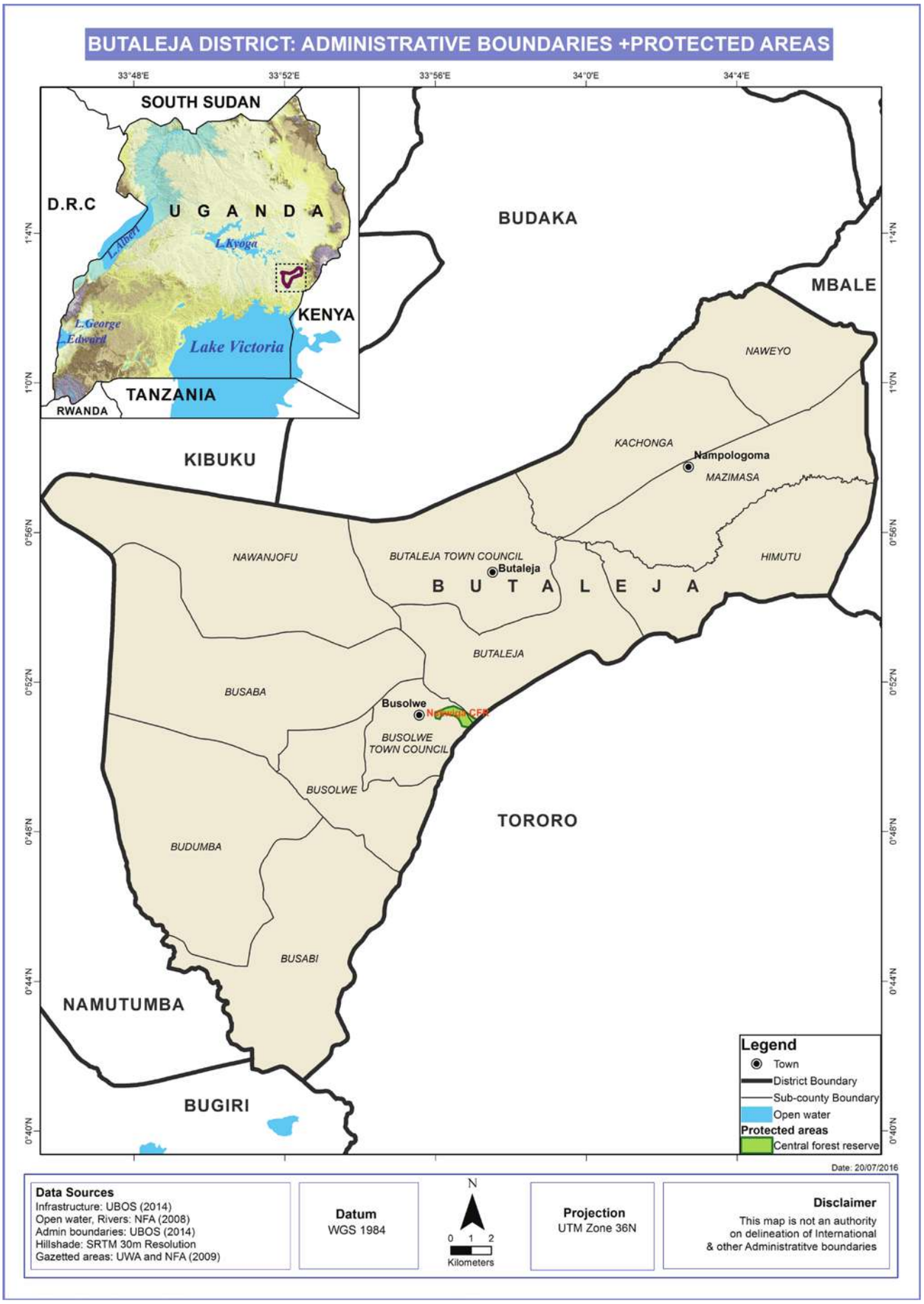


Figure 1: Administrative Boundaries and Gazetted areas, Butaleja District

2.1.1 Geomorphology

The topography of Butaleja district is generally gently sloping and nearly flat for most of the parts of the district which is suitable for agriculture with minimum risk of severe run-off of top soils. The altitude of Butaleja district ranges between 800 – 1000 m.a.s.l with the lowest areas along the Namatala wetland system in Nawanjofu sub-county. The gently sloping landscape makes Butaleja soils good for moderate and appropriate mechanized farming. The roads can be relatively easily constructed and the bandy surfaces that are common in the District provide opportunities for high grade feeder road surfacing. Butaleja District still has vast land which if well harnessed can form a strong economic base (Figure 2).

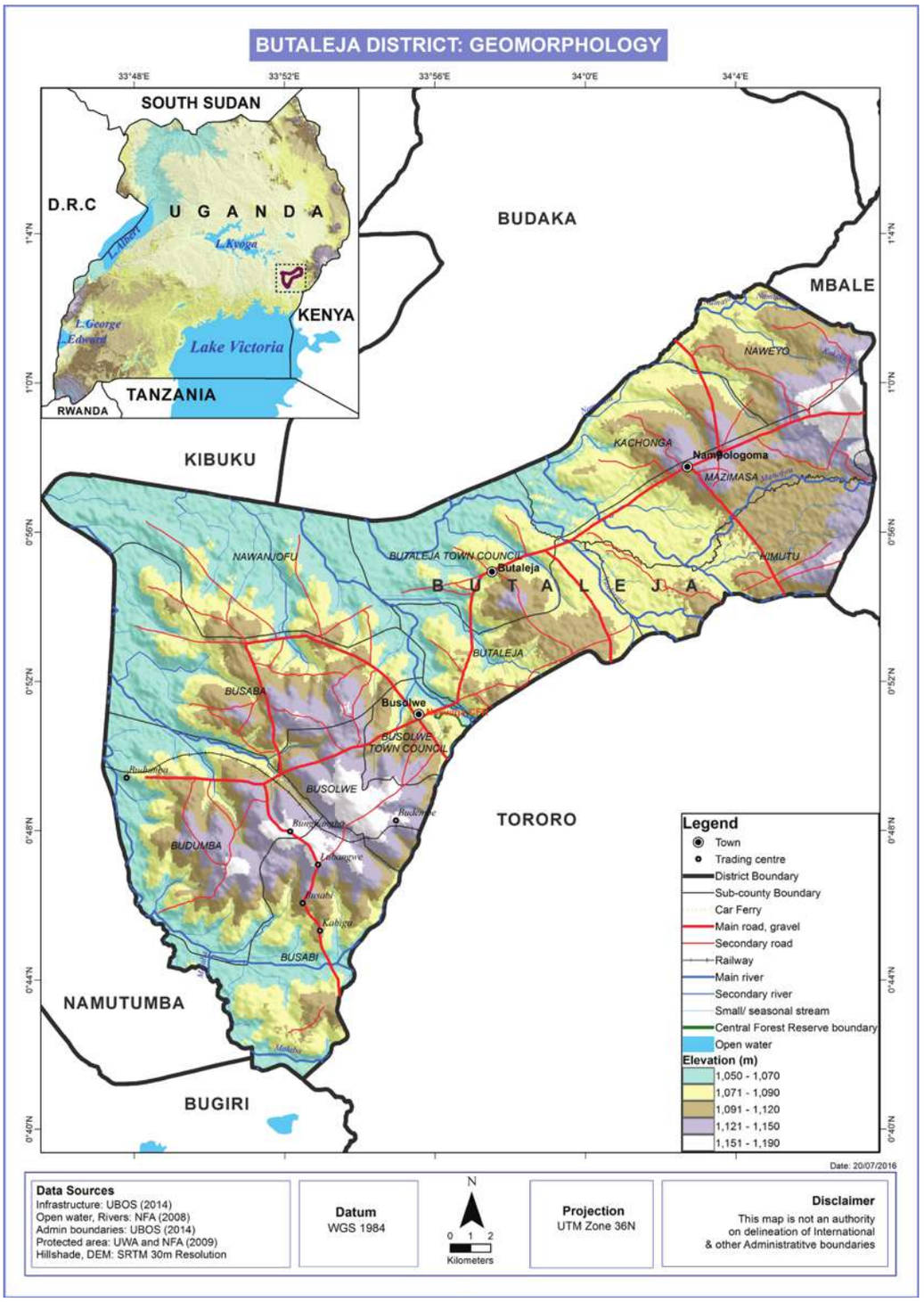


Figure 2: Geomorphology, Butaleja District

2.1.2 Soils and Geology

Butaleja District has plinthosols (Ferruginous tropical soils). These soils have mottled clay materials have a high content of aluminium and iron with over 80% iron oxides, when exposed to air they tend to become as hard as a rock. Low nutrient status renders them unsuitable for arable farming (Figure 3).

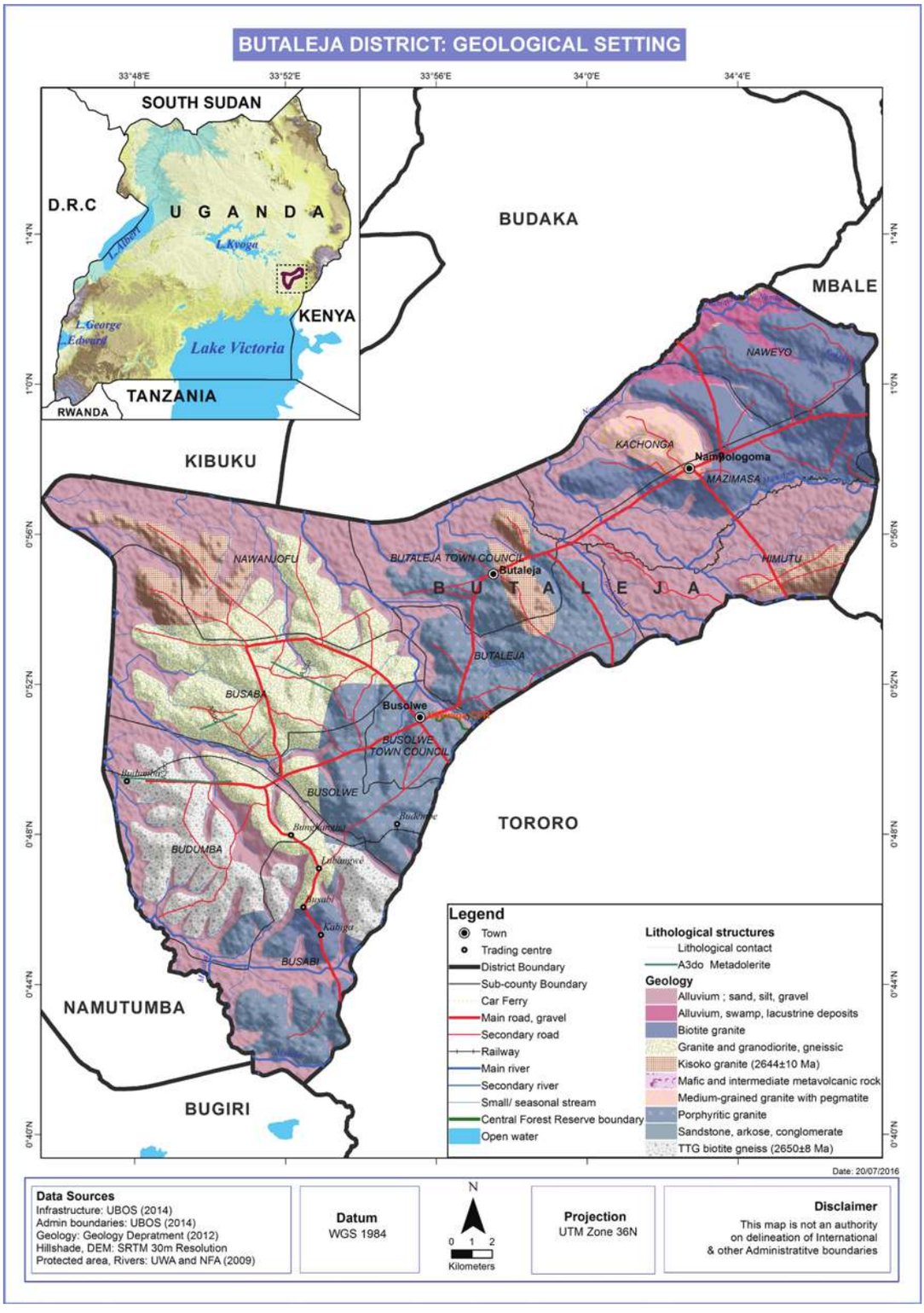


Figure 3: Geology and Lithological Structures, Butaleja District

2.1.3 Vegetation and Land use Stratification

Wooded Savannah

The wooded savannah is mainly composed of combretum categorized as moist combretum, dry combretum and palm savannah and other tree species that include Terminalia, Albizia zygia. The savannah grasslands have trees like Acacia sp, maesopsis, Albizia coriara etc

Forests

In the forest category there is the medium altitude /mosaic savannah. However forested areas are no longer evident since the tree cover has highly reduced due to rampant cutting down of trees and conversion of formerly forested areas into Agricultural fields and major tree species have been harvested for fuel wood and timber. Shifting cultivation that used to encourage re-vegetation has lost pace due to population increase. Woodlands form the largest proportion of the forest covering about 161km^2 of the total district area. Gazetted central forest reserve at Nakwiga in Busolwe town council covers 111ha while Private Woodlots of eucalyptus cover about 150ha.

Vegetation Diversity

A few indigenous tree species exist and are scattered, however, they are threatened by the high demand of fuel wood (fire wood, charcoal) and timber for construction. Most of the woodlots are dominated by eucalyptus species.

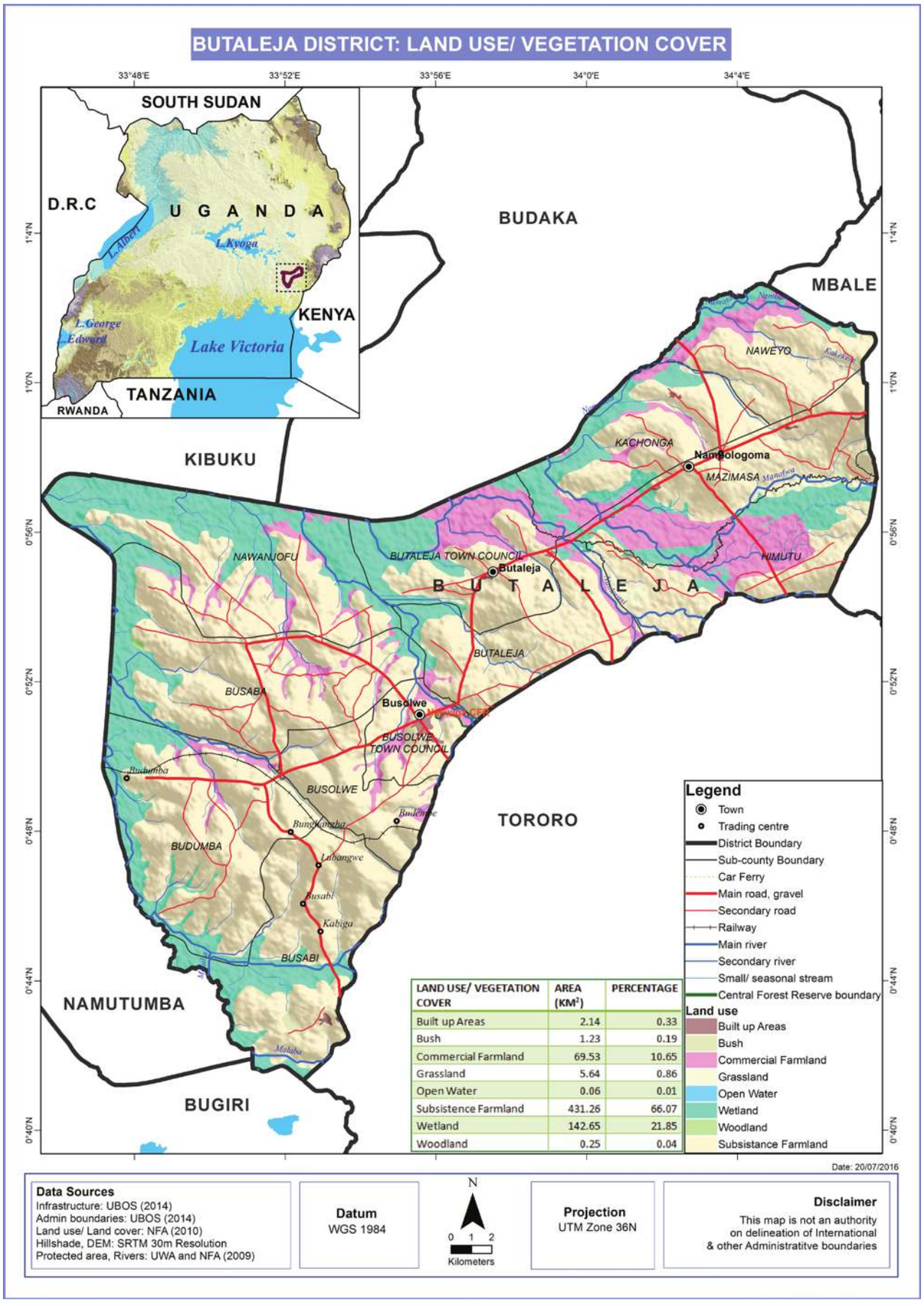


Figure 4: Land use Stratification, Butaleja District

2.1.4 Temperature and Humidity

The District generally records temperature ranges between 16.2°C and 28.7°C and the relative humidity ranges between 52% and 89% (Butaleja Local Government, 2007).

2.1.5 Wind

The long-term wind speed records from the Global Weather Data Website (1979 - 2014) indicate average annual wind speeds of 2 knots and 3 knots at 0600 hours and 1200 hours, for Mbale. 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 Mbale. The general conclusion from these climatic figures is that for most of the year, Mbale experiences moderate to strong and gusty winds, increasing in the afternoon.

2.1.6 Rainfall

Butaleja district has a sub-humid climate with a bimodal rainfall which peaks during the months of May to October. The total rainfall ranges between 1,130 mm and 1,720 mm. Wetter months are April-May and September-October, with two dry spells in June-July and December-January Butaleja district has in the past suffered irregular and unpredictable rainfall patterns that disorganize farmers' cropping seasons (Figure 5).

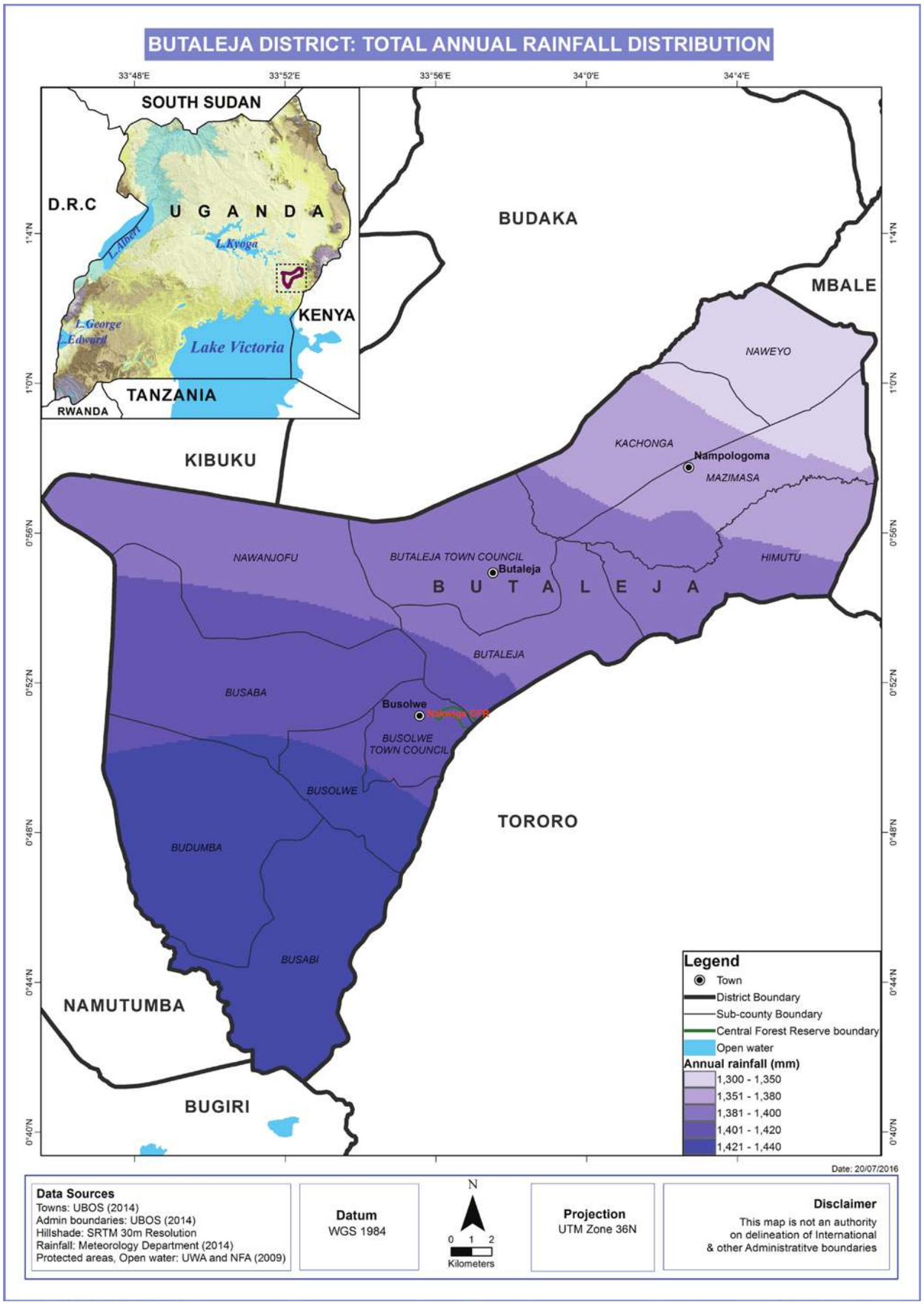


Figure 5: Total Annual Rainfall Distribution, Butaleja District

2.1.7 Hydrology

Water is strategic resource for sustenance of life, social economic development and maintenance of the Environment. Water is one of the critical resources in the District. The state of water is looked at as per its quality as well as water sources such as rainfall bore holes wetlands and springs and piped water. Access to clean, safe water is nationally recognized as a fundamental human right. The rivers and streams such as Manafwa, Namatala, Mpologoma, Nakwasi and Dumbu flowing through the District provide water for production to the general population. Some of these streams are seasonal in nature; water dries up during the dry season due to channeling during the cultivation of rice, while others are pamanent for instance the Mpologoma. Figure 3 indicates drainage system in Butaleja district.

Generally water from the wetlands is used for domestic purposes, livestock watering, flood irrigation on rice fields and also watering of vegetables. This can clearly be seen from the drainage channels dug into the wetlands and the catchment's gardens. There is a lot of water wastage and no storage made. The technology of water reservoirs is still rudimentary. It is important to note that the quality of water is poor in most of the rivers/streams or wetlands. This leaves the option of springs and bore holes although the later are few. The quality of water is deteriorating due to poor farming methods in the watersheds which have been caused by silting of streams and river valleys

2.1.8 Population

According to the National Population and Housing Census (2014) results, Butaleja District had a total population 245,873 people with a population growth rate of 3.3 percent per annum. Results also showed that most of the people in Butaleja District reside in rural areas (209,624 (85%) compared to (36,249 (15%) who reside in urban centers. The gender distribution was reported to be males: 119,068 (48%) and females: 126,805 (52%). About 99.7% (245,223) of the population form the household population and only 0.3% (650) is Non-household. Mazimasa sub-county had the highest population of 32,758 people while Himutu sub-county had the least population of 14,802 people (Figure 6). Table 1 shows the population distribution per sub-county for the different gender.

Studies in the past indicated 57.4% of the district population as children below 18 years, 6% of the population as aged 65 and above and 36.7% of the population as the active working group, 18-65 years.

Table 1: Population Distribution in Butaleja District

SUB-COUNTY	HOUSEHOLD		POPULATION				
	Number	*Average*	*Males*	*Females*	*Total*	*Area*	*Population Density*
Budumba	3918	5.7	10644	11668	22312	83.3	268.0
Busaba	4288	5.8	12041	12772	24813	80.5	308.1
Busabi	3236	5.5	8644	9347	17991	65.0	277.0
Busolwe	2701	5.5	7094	7711	14805	33.3	444.9
Busolwe Town Council	2780	6.0	7962	8768	16730	17.0	983.5
Butaleja	2825	5.6	7776	8025	15801	43.8	361.2
Butaleja Town Council	3448	5.7	9544	9975	19519	51.9	376.5
Himutu	2678	5.5	7236	7566	14802	55.2	268.1
Kachonga	4401	5.6	12026	12647	24673	50.4	489.4
Mazimasa	6200	5.3	15823	16935	32758	53.4	613.3
Nawanjofu	3759	5.2	9477	10003	19480	80.5	242.0
Naweyo	4077	5.4	10801	11388	22189	40.9	542.4

Source: UBOS Census 2014

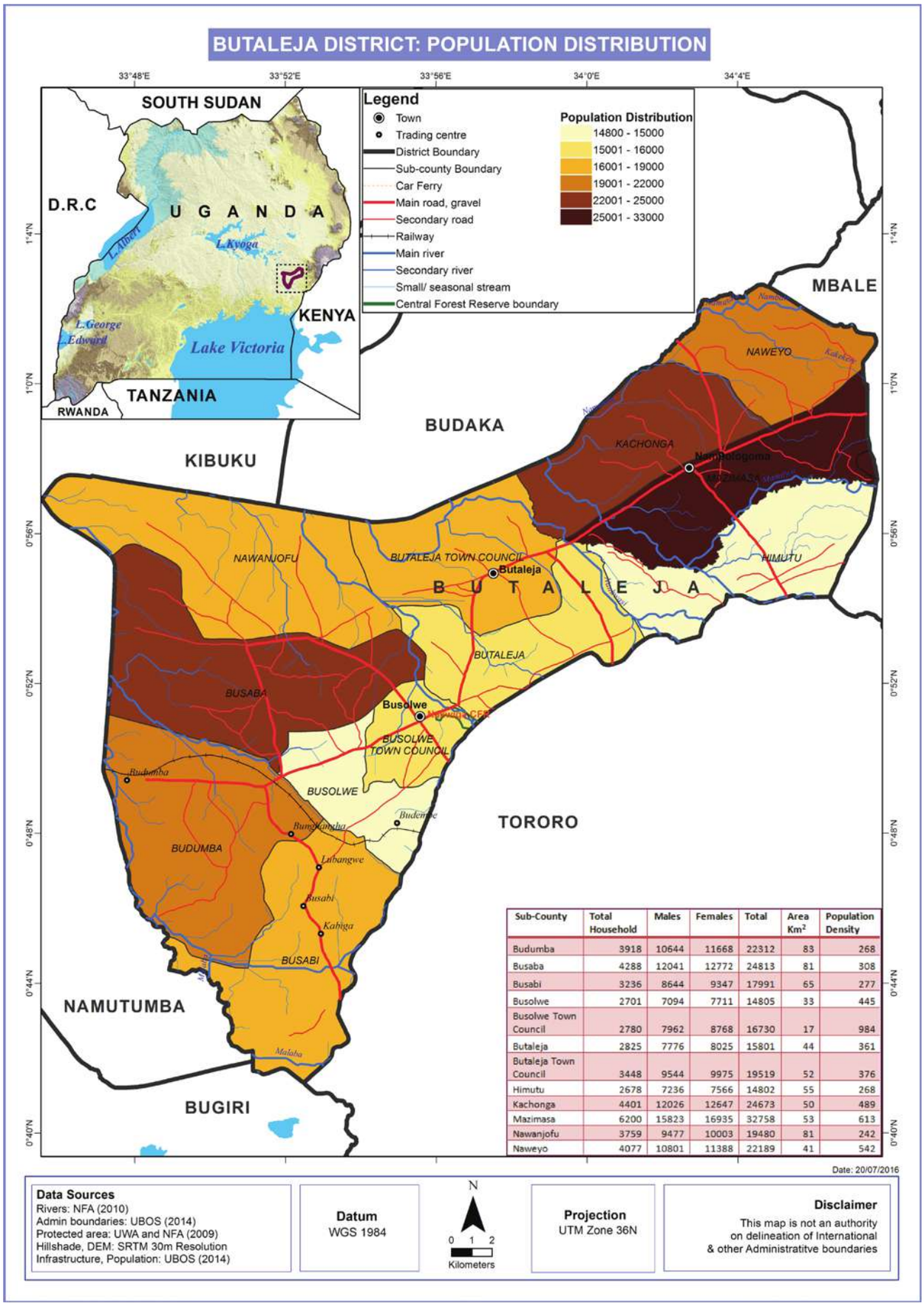


Figure 6: Population Distribution, Butaleja District

2.1.9 Economic activities

The major source of livelihood is subsistence farming taking a percentage of 94%. Rice growing is the main economic activity mainly in Mazimasa, Himutu, Naweyo, Kachonga and Butaleja sub-counties (UBOS, 2002). There is great dependency on wetlands for sustenance of livelihoods due to their high level of rice productivity. The population is engaged in rice cultivation as a cash crop in Doho and Lwoba Schemes. Generally majority of the population depend on Agriculture for food, income and employment. The other crops grown include millet, vegetables, sweet potatoes maize, sugar cane, and sorghum. Communities also make and mats baskets out of local materials harvested from the wetlands.

Grazing is common in the wetlands throughout the year though mostly in the dry season; subsistence fishing is also carried out in the permanent wetlands and seasonally in the seasonal wetlands and floodplains. Some wetlands are used as hunting ground for wild game. This is evidenced by hunting of small animals like squirrels and a few antelopes in some wetlands in Butaleja District. They are also sources of tree products for construction local medicines, charcoal burning and making of floats for instance on the Hisiro island.

2.1.10 Population distribution by ethnicity

The Banyole form the largest percentage of the population with the biggest representation of the population, The Bagwere, Bagisu, Basoga, Japadolah, Itesot, Baganda, Samia are the other ethenic groups in the District. Most of these people might have migrated because of trade. Banyole are the biggest ethnic group (66%), followed by Bagwere (5%), Japadhola (3%), Basoga (1%) and Iteso, Baganda, Basamia, Banyankole and the Acholi have less than 1%

2.1.11 Fertility and Mortality Levels

The fertility levels have remained high over the past 3 decades with the total fertility (TFR) of 7.1 children per woman. Butaleja being most dominated by the rural setting, the TFR has not reduced much (7.1 children) compared to 6.3 at the national and 4.4 for urban areas (Source: 2006 UDHS).

The infant mortality rate declined from 96 to 17 deaths per 1000 live births between 1991 and 2006 while the under-five mortality declined from 201 to 152 deaths per 1000 live births over the same period. The all life expectancy at birth from census 2002 indicated a level of 50.4 for both sexes (52 years for females and 48 years for males). For Butaleja it is believed that the life expectancy is 47 years as in 2008

2.1.12 Literacy rate

The 2005/06 Uganda National Household Survey revealed that the average literacy rate among persons above 10 years was 63%. Males were found to be more literate (71.6%) than females (54%). The literacy rates in 2002/03 and 2005/06 have remained more or less the same regardless of the sex. It is believed that the literacy level has not changed much despite the introduction of the functional adult literacy classes as it stands at 64%.

Major Crops

Butaleja district grows a variety of crops and among them millet leads with a percentage of 24.25% followed by maize 17.78%, and cassava is the least with 11.6%. The major crops grown in the District are; rice, finger millet, groundnuts, sorghum, maize, cassava and sweet potatoes. Others are cotton, onions, sunflower, Soya, beans and simsim as presented in the table 9.1 below.

Table 2: Crops grown in Butaleja District

Crop	Average Yields @ Ha. in Tons	Estimated Planted Has. (Has.) FY 2008/2009	Estimated Production (Total in Tons
Maize	1.7	6,500	11,050
Sorghum	1.2	2,500	3,000
Finger Millet	0.8	5,000	4,000
Rice	2.5	25,000	62,500
Soya Beans	1.2	3,500	4,200
Beans	0.5	4,100	2,050
Groundnuts	0.6	7,200	4,320
Sim sim	0.3	10.5	3.2
Cassava	10	1,550	15,500
Sweet Potatoes	8	3,450	27,600
Tomatoes	25	135	3,375
Cabbages	20	175	3,500
Onions	12	55	660
Cow Peas	0.5	850	425
Sunflower	1.2	125	150
Cotton	0.6	6,000	3,600
Coffee	1.0	110	Still growing @ 2 tons
Pineapple	25	28	Still growing (5 tons and over)

Source: Butaleja District production Department

Number of livestock by type

There was a tremendous fall (28.34%) of the local cattle reared in 2008 which could have been caused by disease that claimed lives of very many cattle. It may also be noticed that the culture of looking after exotic cattle is still low (0.05%) in 2008.

Generally there was a decrease in the animals kept in 2008 save for the local poultry which increased by 20.9% as indicated in table 8.

Table 3: Livestock in Butaleja District

Animals/ Birds	2007	Percent	2008	Percent
Cattle Exotic	253	0.07	142	0.05
Cattle Local	136,800	38.50	28,500	10.16
Goats Local	46,506	13.09	52,700	18.79
Goats Exotic(improved)	2,350	0.66	2,632	0.94
Sheep Local	4,315	1.21	4,950	1.76
Pigs Local	2,020	0.57	2,880	1.03
Cats	1,002	0.28	1,200	0.43
Dogs	2,045	0.58	2,450	0.87
Poultry Local	160,000	45.03	185,000	65.96
Total	**355291**	**100.00**	**280454**	**100.00**

Source: Production Department, 2007/08

2.1.13 Transport and Communication

The biggest mode of transport in the district is road transport use of cars and motor cycles and the railway transport which is going to be reconstructed Mode of communication include: mail through one main Post Office in Busolwe Town. Telephone services are available in the District (UTL, MTN, Celtel and UTL land lines). However the networks are available with sufficient signals in a few areas. Many people communicate through the radio followed by television set and mobile phones which are owned by few individuals.

2.1.14 Source of energy for cooking and lighting

The main source of cooking in the District is by wood fuel constituting 99.8%, leaving electricity/ Biogas and paraffin with 0.1% and 0.1% respectively. Most people in the District use paraffin for lighting (92.5%), while electricity/gas and wood fuel is 5.28% and 2.12% respectively. Firewood is the dominant energy resource for households, small scale industries like brick, pot and tile making and a number of agro-based industries.

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, floods, landslides, human, animal and crop diseases, pests, wildlife animal attacks, earthquakes, fires and conflicts among others. 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 (District Environment Officer, District Production Officer and District Agricultural Officer) was held at Butaleja District Headquarters (). At Sub-county level key informants included: Sub-county and parish chiefs and Community Development Officers.

FGDs were carried out in four purposively selected sub-counties that were ranked with the highest vulnerability. FGDs comprising of an average of 12 respondents (crop farmers, local leaders and cattle keepers) were conducted at Busabi Sub-county (), Nawanjofu Sub-county (), Himutu Sub-county () andMazimasa Sub-county (). 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 District Specific Multi-hazard Risk and Vulnerability Profiles

3.2.1 Data analysis and integration

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

3.2.2 Data verification and validation

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

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

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

RESULTS FROM MULTI-HAZARD RISK, VULNERABILITY MAPPING

4. Multi-hazards

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

In the case of Butaleja 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 there were no incidences of landslides and rock falls in Butaleja district. However, participants reported cases of soil erosion along the Manafwa, Mpologoma and Namatala rivers in Himutu, Kachonga, Mazimasa, Nwanjofu, Butaleja and Butaleja Town council. The most affected sub-counties include Mazimasa, Himutu and Kachonga in order of severity. 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).

Soil erosion causes silting of rice garden channels, washing away crops and causing soil fertility loss and consequent poor crop yield. The most affected crops by soil erosion include maize, rice, beans and cassava. It was indicated that livestock are also affected by soil erosion by washing away pasture and silting water source points.

Some of the interventions on soil erosion include: JICA and World Vision trainings on flood resistant house construction, conservation of buffer zones for wetlands, evacuating people in case of incidence is done by Red Cross and OPM.

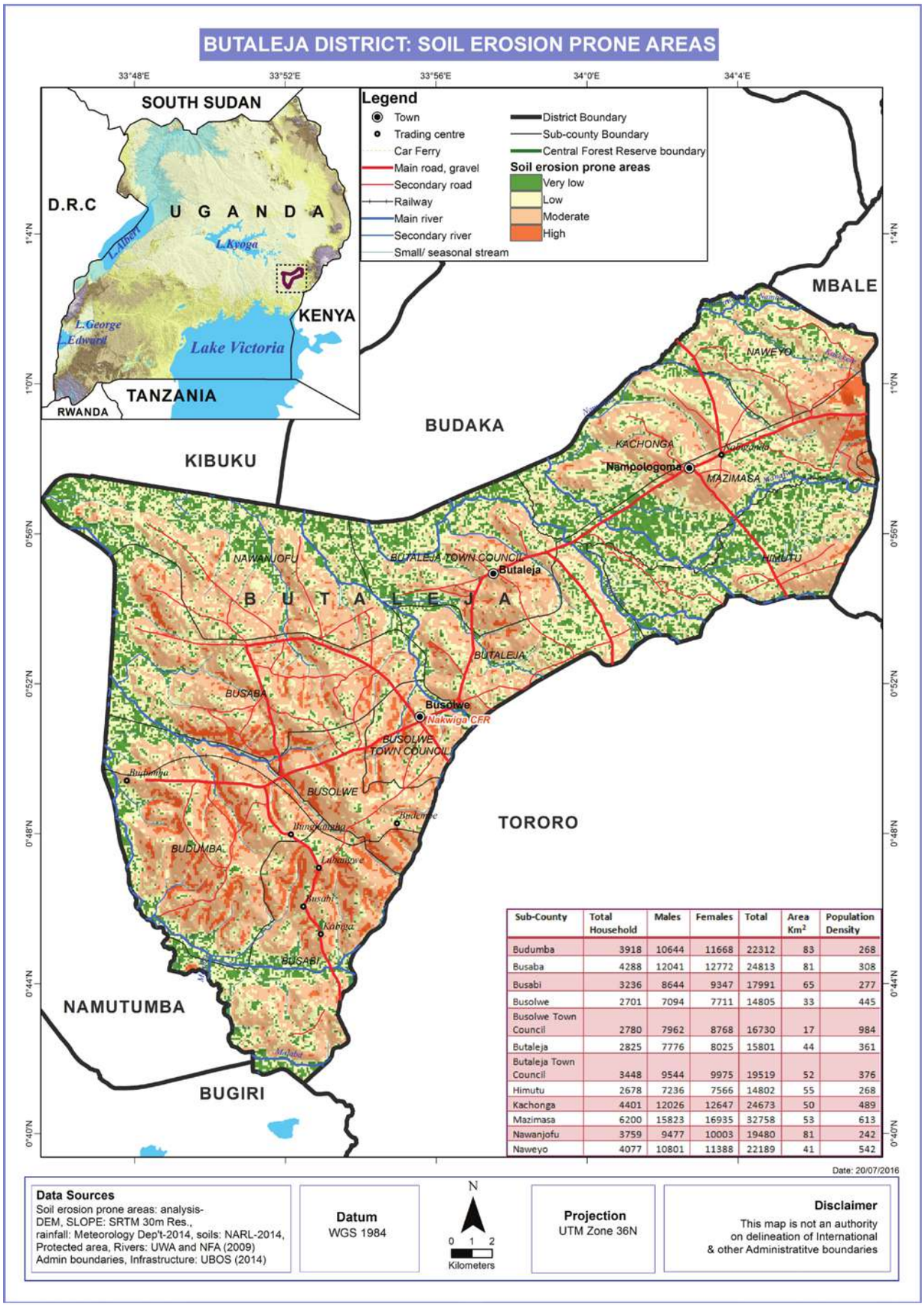


Figure 7: Soil erosion Prone areas, Butaleja District

4.1.2 Earthquakes and faults

Participants of the focus group discussion indicated that earthquakes weren't a serious problem in Butaleja district. However, it was observed that the entire district only experiences minor tremors. Figure 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).

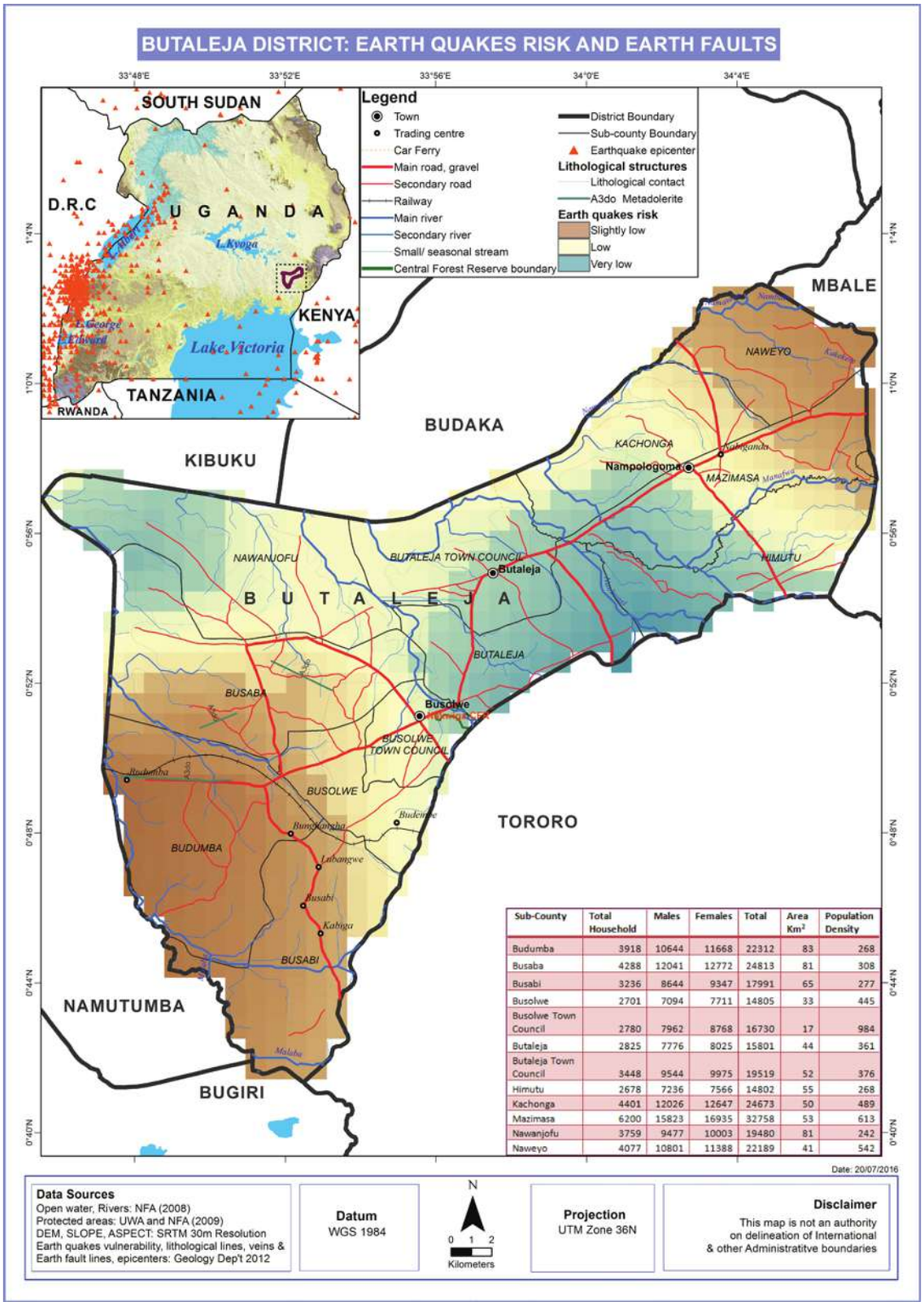


Figure 8: Earth quakes Vulnerability, Fault lines, Butaleja District

4.2 Climatological and Meteorological Hazards

4.2.1 Floods

Results from the focus group discussions revealed that floods is the biggest challenge especially during the rainy seasons in district as the biggest part of the district lies in low altitude areas. Participants observed that floods wash away and at times submerge crops such as beans, sweet potatoes and maize thus causing food insecurity and considerable economic losses. It was also reported that Doho – Namatala wetland system Naweyo, Kachonga, Nawanjofu and Butaleja town council was prone to flooding every wet season. 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).

Plate 1: Flood area in Butaleja Town council

Plate 2: Flooded Namatala wetland

Plate 3: Flooded area without wetland plants

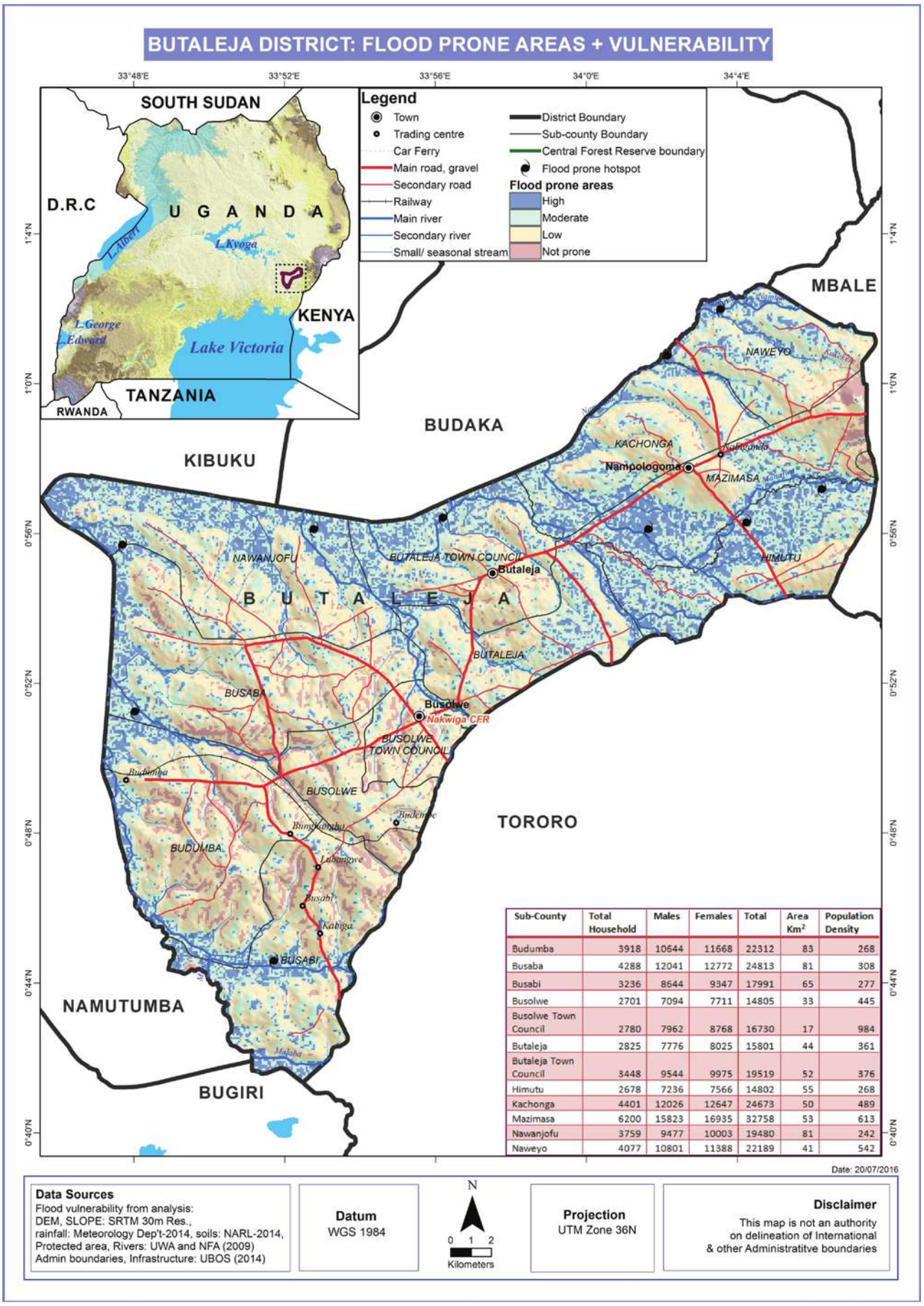


Figure 9: Flood prone areas and Ranking, Butaleja District

4.2.2 Prolonged Dry spells

Participatory assessments through focus group discussions indicated that prolonged dry spells is a serious problem in Butaleja district affecting almost entire district. Most of the water sources dry up during the prolonged dry spells especially in Kachonga Naweyo and Mazimasa sub-counties. Participants observed that drought and prolonged dry spells have caused scarcity of water and pastures, low milk and crop production and increased incidences of pests especially aphids. The participants also mentioned that termite infestation on pastures is always high in the dry season.

Some of the interventions on prolonged dry spells include: water harvesting especially at schools, health centers, markets. Some of the government interventions include: provision of Gravity Flow Scheme, tree planting campaign, construction of deep Boreholes, shallow wells. Some of the interventions by Non-Governmental Organizations include World Vision support to water harvesting, tree planting and creation of environmental awareness.

Dry spell vulnerability map generated from Rainfall and Temperature (Uganda National Meteorological Authority, 2014) using spatial modeling using socio-ecological spatial data using the Standardized Precipitation Index (Figure 10).

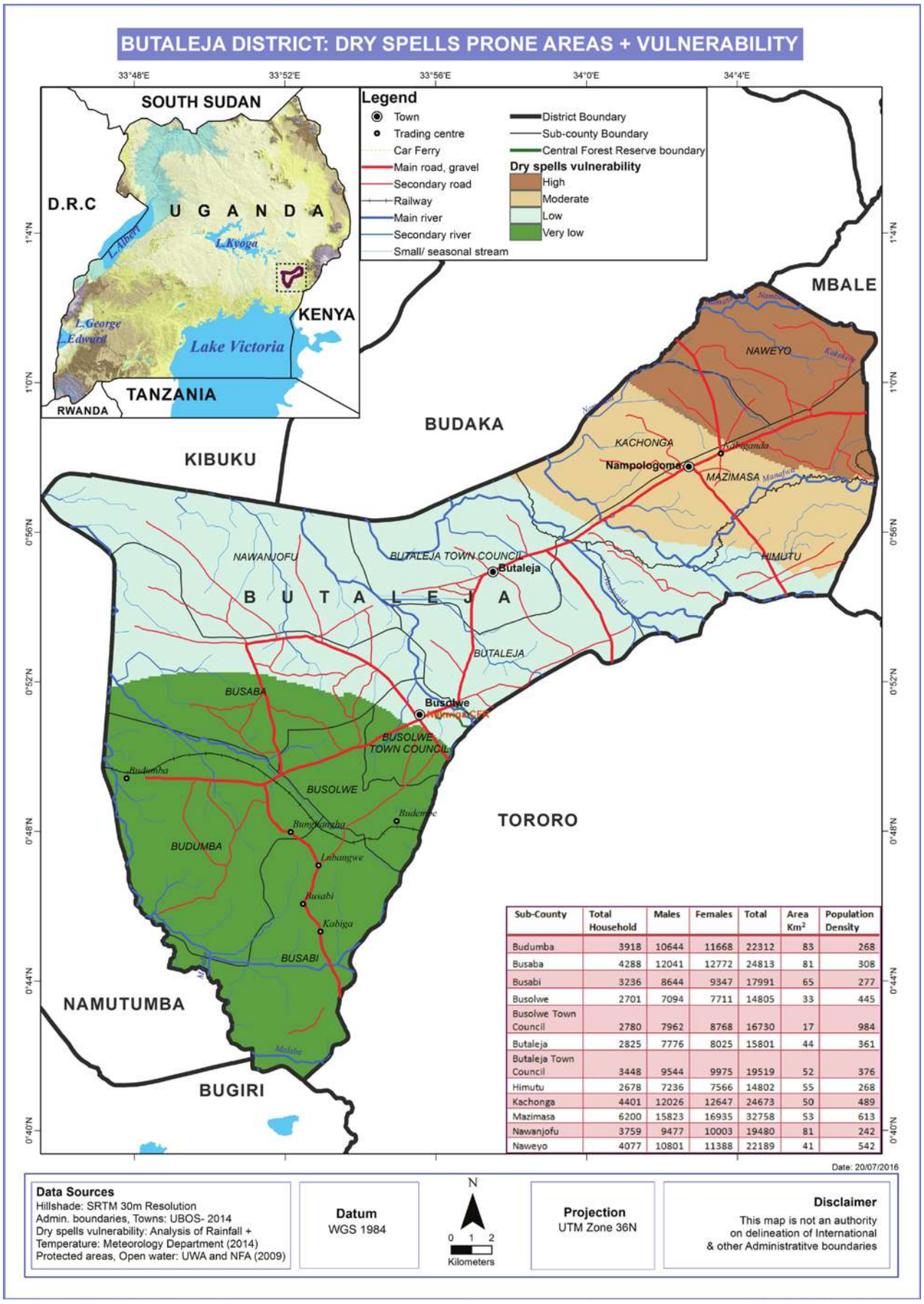


Figure 10: Drought Prone areas and Vulnerability Ranking, Butaleja District

4.2.3 Hailstorms

Results from the participatory assessments indicate that hailstorms are common occurrence at beginning of rainy seasons affecting almost entre district. Participants observed that hailstorms come along with strong winds that destroy crops especially maize, cassava and banana plantations thus causing food insecurity (Figure 11).

Plate 4: Houses destroyed by strong winds and hailstorms in Himutu

Plate 5: Houses destroyed by strong wind and hail storms in Himutu

Hail storms in Himutu S/C which claimed the life of one child in April 2016

4.2.4 Strong winds

The participants of the focus group discussions reported that strong winds are experienced at the onset of the rainy seasons. It was observed that strong winds blow off roof tops of houses and schools and also uproot trees and banana plantations. Like Hailstorms, strong winds also affect the entre district.

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. Results from the participatory assessments indicated that there have been increased incidences of lightning occurrences in Butaleja district. Participants reported that in 2014, lightning killed 2 pupils at Hisega Primary school in Butaleja Sub-county. Other incidences reported: in 2014, lightning killed 1 person in Kangalaba village, in Kangalaba parish, Himutu Sub-

county, in Feb 2016, an S.2 student was killed in Busabi area and also lightning incidence reported in 2016 in Wanjofu sub-county. Most of the schools in Butaleja district do not have lightning conductors and risk being struck by lightning.

The recent interventions on Lightning from Government is the lightning arrestors policy in the Bills of quantities (BoQ) in this policy, every newly constructed public facilities must have a lightning arrestor, and also the old public facilities are expected to have lightning arrestor. Recommend: Planting tall trees around homes, staying in doors during rain, putting on rubber shoes, lightning arrestors for schools that do not have yet, not shelter under trees during rains

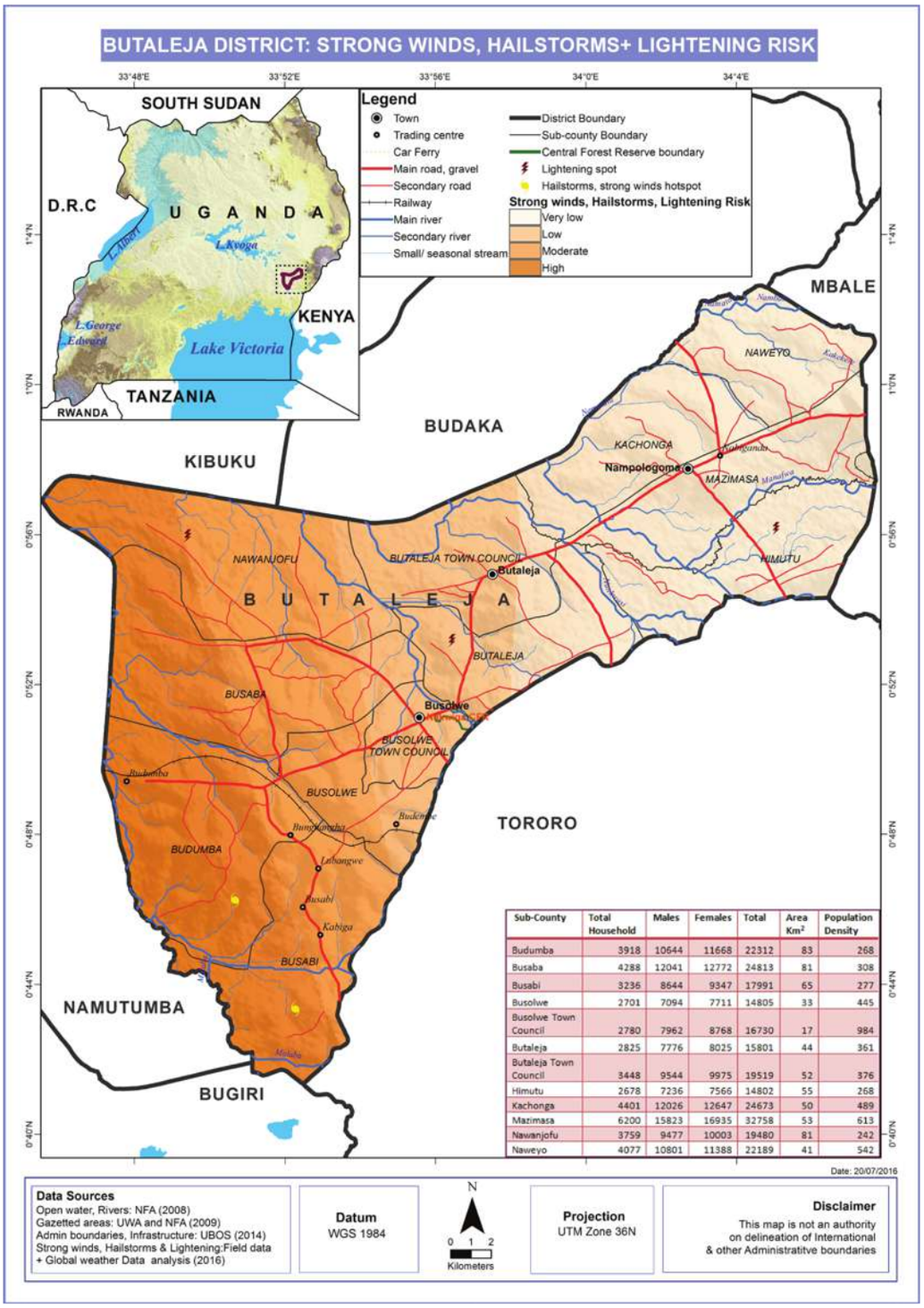


Figure 11: Strong winds, Hailstorms and Lightning Hotspots and Vulnerability, Butaleja District

4.3 Ecological and Biological Hazards

4.3.1 Crop Pests and Diseases

Participatory assessments through focus group discussions indicated that the entire Butaleja district was vulnerable to crop pests and diseases. Banana and coffee plantations were the most affected by crop pests and diseases. The most prominent crop diseases are indicated as below in Table 3. It was reported that almost entire district is affected by crop pests and diseases (Figure 12).

Some of the interventions on crop pests and diseases include: use of manure to make soils fertile and planting of disease resistant varieties particularly for cassava mosaic. The government through the Crop extension officers has been doing awareness especially on most BBW control measures and cassava mosaic.

Table 4: Common Crop diseases and pests

CROP	DISEASES	PESTS
Banana	Fusarium wilt and Banana Bacterial Wilt	**Banana weevils,** weaver birds**, and Nematodes**
Maize	Maize streak virus, maize lethal disease	**Weevils, striga** maize stalk borer
Beans	Bean root rot	**Weevils, aphids**
Vegetables	Blight, wilts and leaf spots	**Cut worms, Boll borers, Aphids**
G. nuts	Rosette disease	Aphids and Shrimps
Cassava	Cassava mosaic, Cassava Brown Streak Disease	**Mites**
Rice	Rice blast	weaver birds
Sweet potatoes	Viral disease	**Weevils and caterpillars**
Mangoes		**Fruit flies**

Source: Department of Agriculture 2015

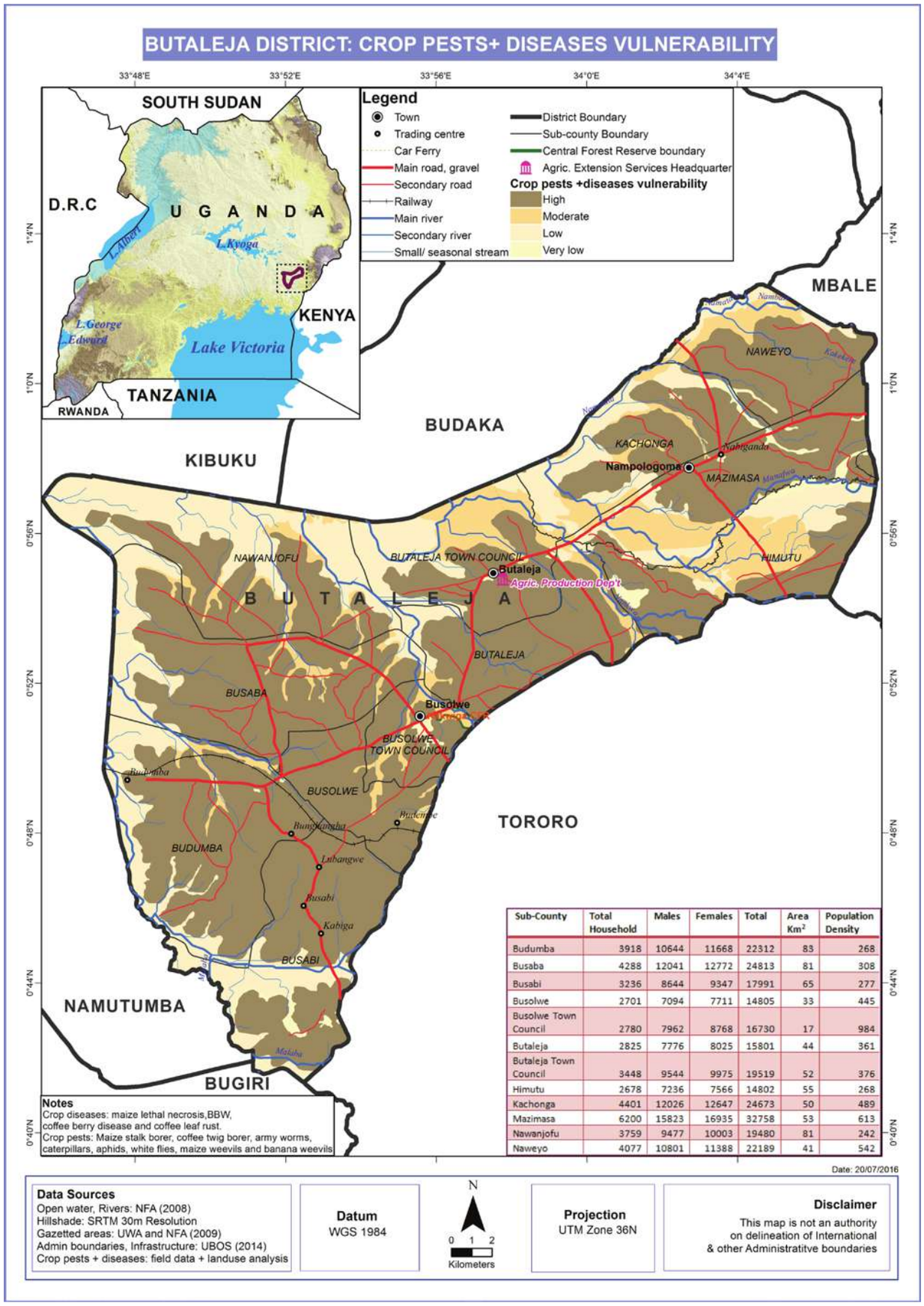


Figure 12: Crop Pests and Diseases Vulnerability, Butaleja District

4.3.2 Livestock Parasites, Vectors and Diseases

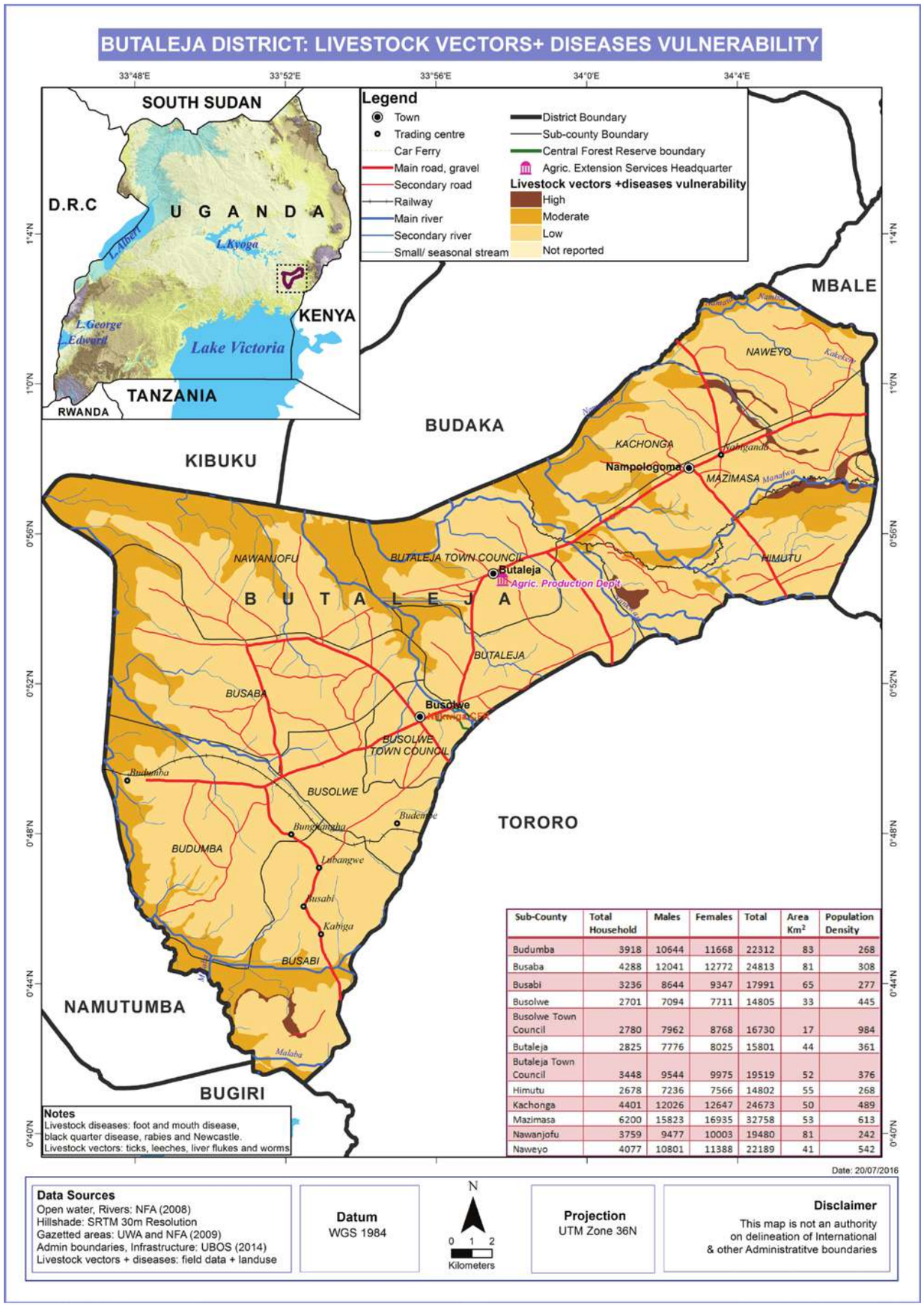
Results from the focus group discussions indicated that livestock parasites and diseases are a serious problem in Butaleja district especially during rainy seasons. Table 5 indicates the common Livestock Parasites, Vectors and Diseases and sub-countities where they have been reported. Figure 13 indicates the Livestock Parasites, Vectors and Diseases Vulnerability of Butaleja district.

Some of the interventions on Livestock parasites and diseases include: massive spraying organized by District Veterinary Department. The district also has recruited about 5 Veterinary officers.

Table 5: Common Livestock Diseases and Pests

LIVESTOCK	DISEASE	PARASITES, VECTORS	Location
Cattle, goats, sheep	Nagana, Trypanosomiasis Foot rot	Tsetse flies, intestinal worms and flukes	Budumba, Busaba, Nawanjofu, Butaleja, Mazimasa, Kachonga and Busolwe
Poultry	Newcastle, Fowl pox	Mites and fleas	Budumba, Busaba, Nawanjofu, Buteleja, Maziamsa, Kachonga and Busolwe

Source: Department of Production 2015



Sub-County	Total Household	Males	Females	Total	Area Km²	Population Density
Budumba	3918	10644	11668	22312	83	268
Busaba	4288	12041	12772	24813	81	308
Busabi	3236	8644	9347	17991	65	277
Busolwe	2701	7094	7711	14805	33	445
Busolwe Town Council	2780	7962	8768	16730	17	984
Butaleja	2825	7776	8025	15801	44	361
Butaleja Town Council	3448	9544	9975	19519	52	376
Himutu	2678	7236	7566	14802	55	268
Kachonga	4401	12026	12647	24673	50	489
Mazimasa	6200	15823	16935	32758	53	613
Nawanjofu	3759	9477	10003	19480	81	242
Naweyo	4077	10801	11388	22189	41	542

Figure 13: Livestock Parasites, Vectors and Diseases Vulnerability, Butaleja District

4.3.3 Human Diseases outbreaks

Over 80% of the top ten causes of ill-health among the population of Butaleja district are preventable by providing a good living environment including adequate supply of clean water, clean, dust-free, insect free sleeping areas/shelter, shade, sanitation and a balanced diet. Safe water coverage studies indicate only Busaba Sub-county meets the national standard of 65% and of all lower local governments while Busolwe Sub-county has the lowest (21%) safe water coverage.

According to the Health management information system (HMIS), malaria was the highest ranked cause of morbidity in Butaleja district in the period 2007 - 2009 (malaria accounts for 46% of OPD attendance and 23% of admissions); other human diseases indicated as: acute respiratory infections (ARI); diarrheal diseases; intestinal worms; malnutrition; trauma; pregnancy related diseases; eye conditions; and skin disease. Some environmental health problems have been exacerbated by the mushrooming of trading centres and towns, which were setup without physical planning or establishment of solid waste disposal systems. Markets lack latrines and roadside eating houses operate under unhygienic conditions. Also, some homes lack pit latrines, and school sanitation is below the expected standard. Meanwhile, no vigorous supervision of good health status as yet exists in the district (Butaleja DDP, 2008).

Table 10 shows that of all people who fell sick, about eight in every ten persons had experienced malaria/ fever symptoms. Diarrhea (8.67%), skin infections (6.71%), injury (5.45%) followed. Cholera outbreak was realized severely in 2008/09 and the number of the victims totaled to 111. Respiratory infections increased from 21 persons in 2007/08 to 563 persons in 2008/09.

Table 6: Causes of Illnesses in Butaleja District

Illness	2007/08	Percentage (%)	2008/09	Percentage (%)
Malaria/ Fever	147,471	79.16	155,633	75.57
Respiratory infections	21	0.01	563	0.27
Diarrhea	16,161	8.67	21,973	10.67
Skin infections	12,499	6.71	16,526	8.02
Injury	10,148	5.45	11,135	5.41
Cholera	0	0.00	111	0.05
Total	**186,300**	**100**	**205,941**	**100**

Source: DDHS

This study has indicated the most recent human diseases outbreaks in Butaleja district as cholera and dysentery. Cholera outbreaks reportedly 7 people died out of the 233 cases diagnosed with cholera early 2016. The most affected sub-counties by cholera outbreak include: Kachonga, Mazimasa, Naweyo, Himutu and Busolwe Town council. In response to the cholera outbreak, the District Health Office established an isolation centre at Kachonga that has been there update in case of further cases. Dysentery cases were reported on the increase during rainy seasons as the area experience severe floods during the season. Reports indicated that HIV/AIDS prevalence rates are highest in commercial centres of Nampologoma, Busolwe and Butaleja towns. Figure 14 indicates the Human Disease Outbreaks Vulnerability.

Some of the government interventions on Human diseases include: massive immunization for immunisable diseases, distribution of mosquito nets and establishment of Cholera isolation centre at Kachonga and Health services provision through the established 24 Health centres. The 24 health centres include: 1 Hospital, 12 Health centre IIIs and 10 Health centre IIs. It was reported that health centres occasionally organize health talks especially encouraging testing for HIV/AIDS, counseling, distribution of preventive condoms and enrolment on ARVs palliative treatment.

Table 7: Health centres Distribution in Butaleja District

Sub County/ Town Council	Number of Hospitals	Health sub Districts	Number of HC IIIs	Number of HC IIs	Number of beds	Number of staff houses
Budumba	0		1	3		4
Busolwe	0			1		0
Butaleja	0			1		0
Butaleja Town Council	0		1			10
Busolwe Town Council	1	1				32
Busaba	0		1(private)	1		4
Kachonga	0		1	2		0
Mazimasa	0		2	2		0
Nawanjofu	0		1	2		2

Source: DDHS

Accessibility of Health services

Busolwe ub-county has the best health services brought nearer to the people because 89% move only up to 5 Kms. In Budumba Sub-county 55% of the population moves over 5 kms to access the health services. Generally 70% of the population in Butaleja district move up to 5 kms to access the health services. Most people move long distances to access health services but others who do not get means to reach the health centers end up dying on the way. In addition there is a serious challenge of recruiting and retaining of doctors in the district. However there are 2 practicing doctors serving a population of 198,500. The recent recruitment has increased the number of Nurses from 13 to 23 and that of clinical officers to 11. The OPD utilization stands at 90% as most of the people cannot afford to get services in private clinics.

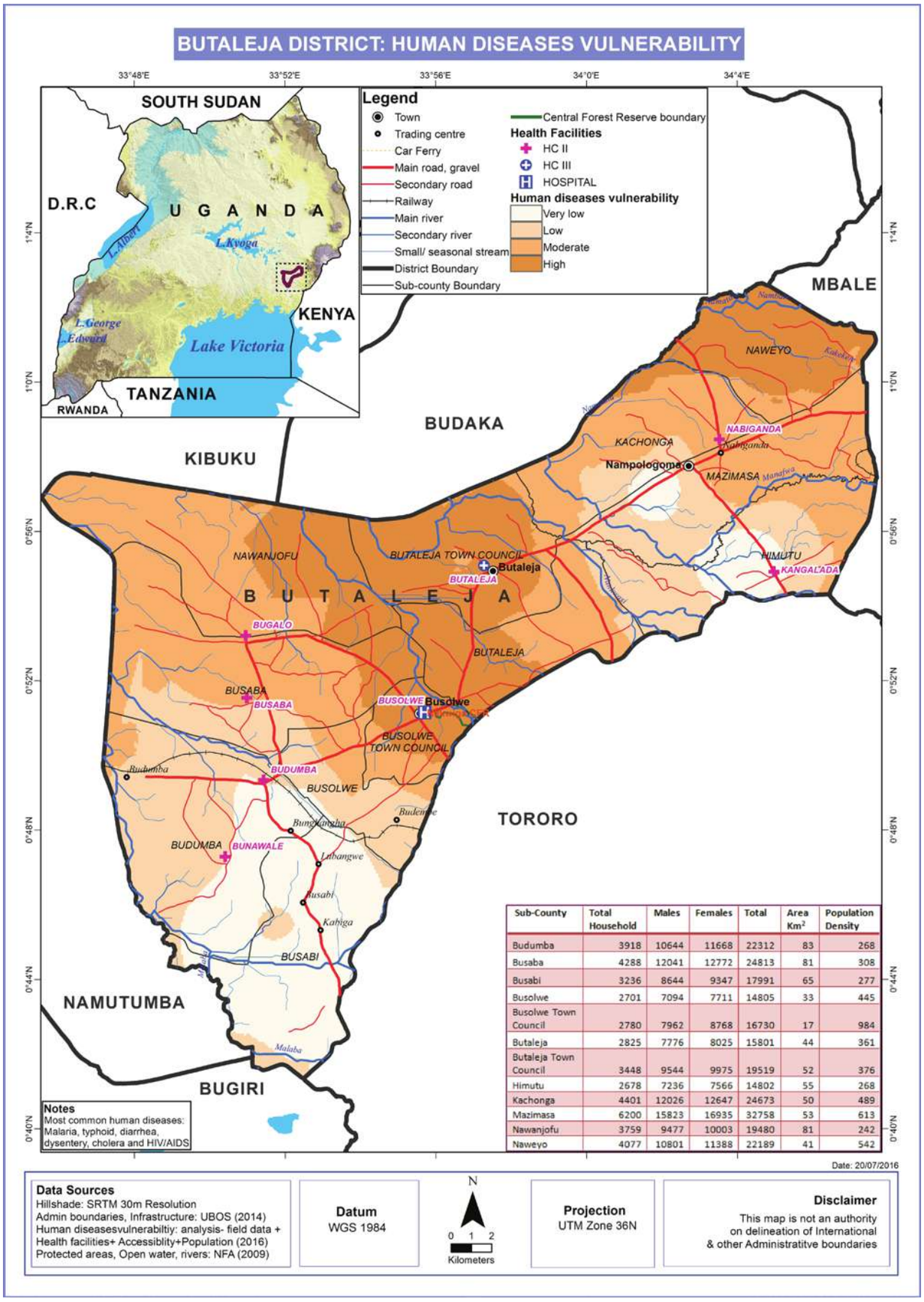


Figure 14: Human Disease Outbreaks Vulnerability, Butaleja District

4.3.4 Vermin and Wild-life Animal Attacks

Participatory assessments through focus group discussions revealed that vermin and wildlife animal attacks were not a serious problem in Butaleja district. A few cases reported wild dogs, squirrels, snakes in rice fields and mole rats strewn all through the district. Stray dogs were reported as a danger to the human population as they bit people and also eating small ruminants. Figure 15 indicates Vermin, Wild-life animal attacks vulnerability. Put on gum boots to guard against snake bits, plant local herbs to scare snakes. Black stones, hospitals. Recommend plant tobacco around rice gardens

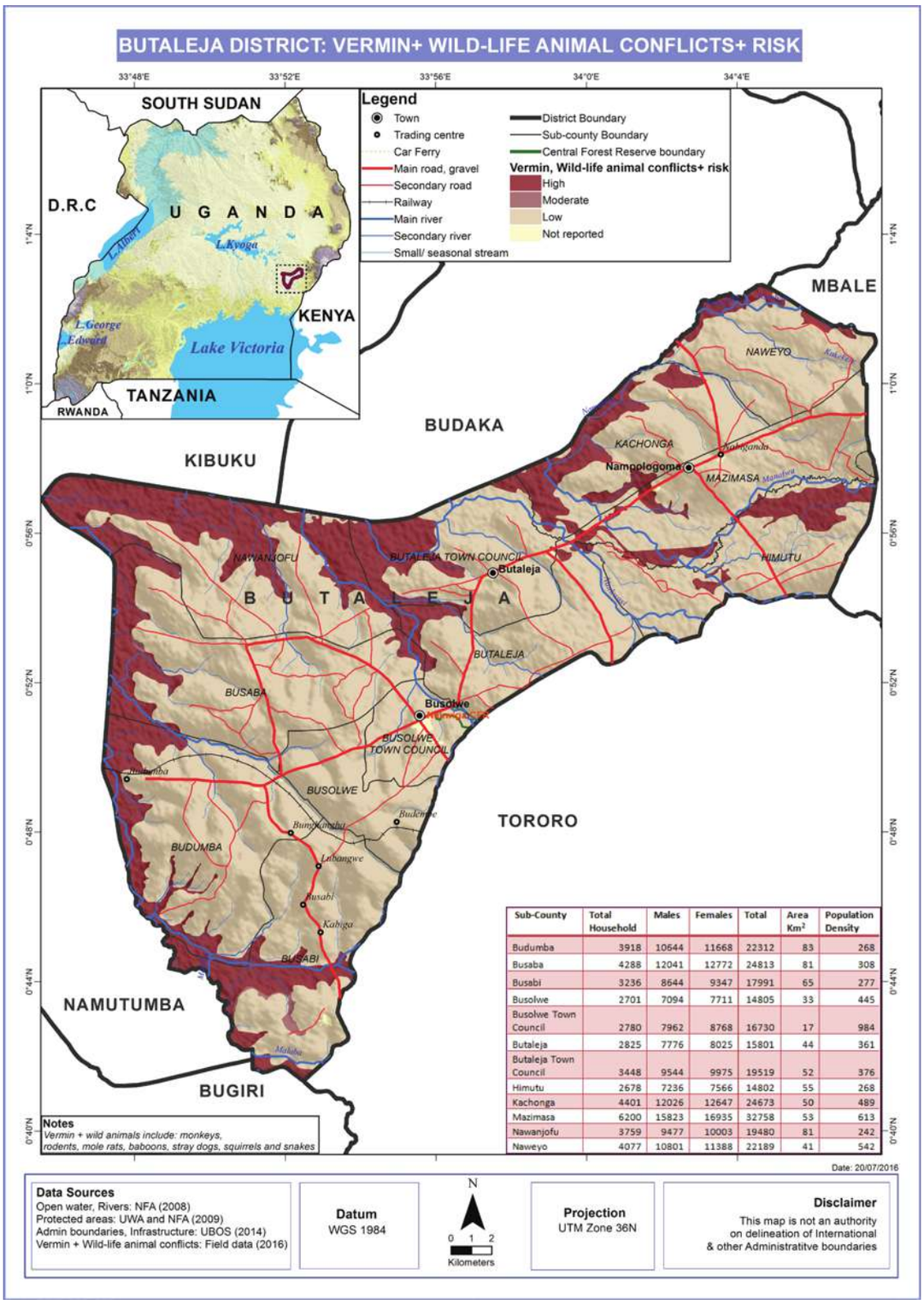


Figure 15: Vermin, Wild-life animal attacks vulnerability, Butaleja District

4.3.5 Invasive species

Results from the discussions indicated that Lantana camara, water hyacinth and Striga spp. are the most common invasive species in Butaleja district. Participants mentioned that Lantana camara invasive species normally dominate grazing lands and thus destroy pastures that would have been palatable for animals. Water hyacinth wide spread along the Namatala wetland system covering the open waters and affecting organisms in the waters such as mud fishes. Some observed occurrences of Euchornia spp. Water hyacinth in Butaleja Town council just along the major Namatala wetland system. Figure 15 indicates Invasive Species Ranking in Butaleja district.

Plate 6: Water hyacinth in Namatala wetland

Plate 7: Water use of Namatala wetland with invasive species

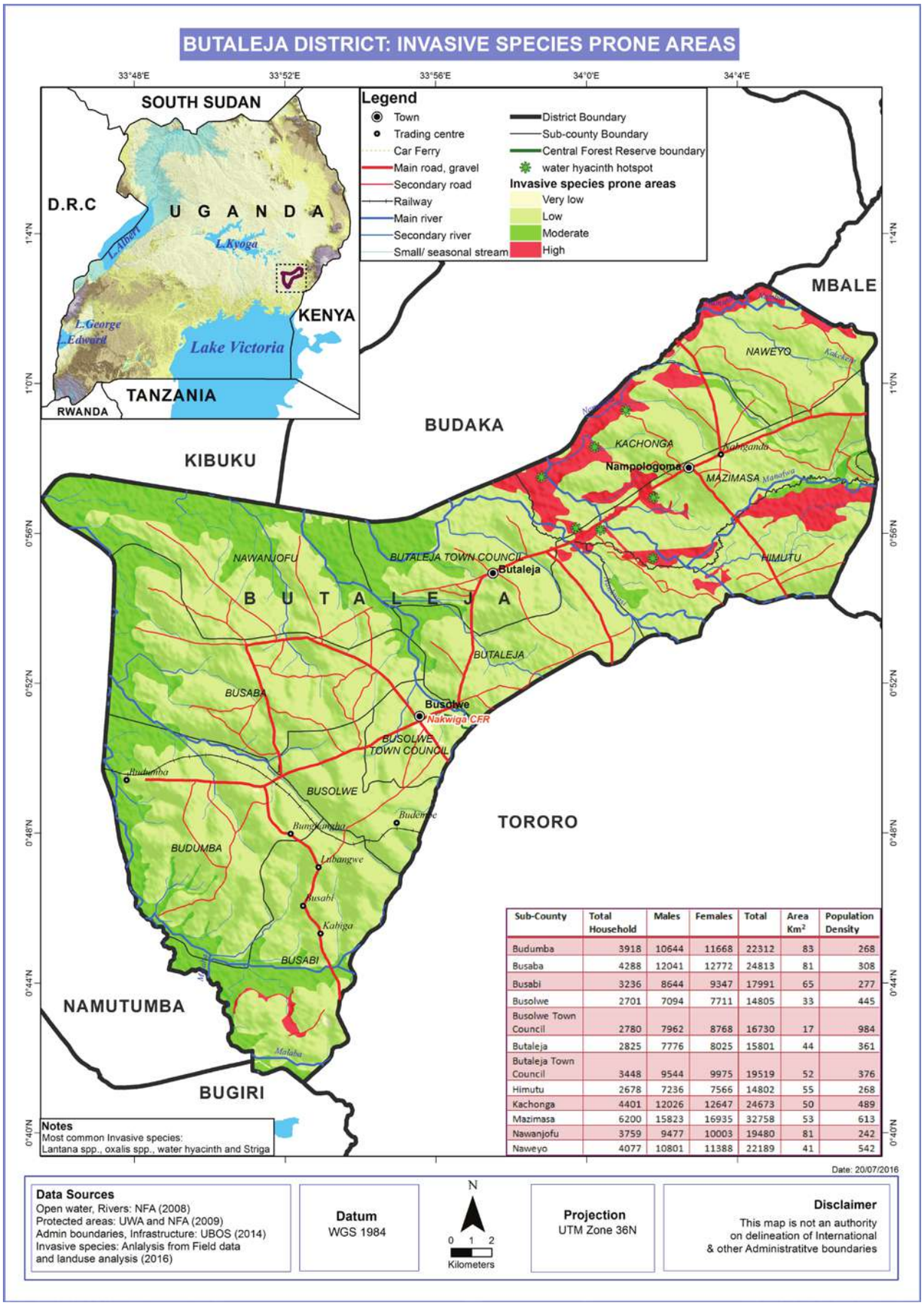


Figure 16: Invasive Species Ranking, Butaleja District

4.4 Human Induced and Technological Hazards

4.4.1 Fires

Results from participatory assessments indicated a few cases of bush burning in Butaleja district towards end of the dry seasons for regeneration of fresh pastures at the onset of the rainy season. Hunting habits have been reported as cause of swamp burning citing incidences in Budumba sub-county, Bunawale village where a big eucalyptus plantation was burnt in 2015 and the case still at Police. Figure 16 indicates bush fire risk areas and ranking in Butaleja district.

Some of the government interventions on bush fires include: sensitization and awareness on dangers of bush fires done by the environment department of Butaleja district and enforcement through Police. Control measures: Fire breaks, clearing boundary (fire line), keep the undergrowth short, vigilant during dry seasons, fire guards,

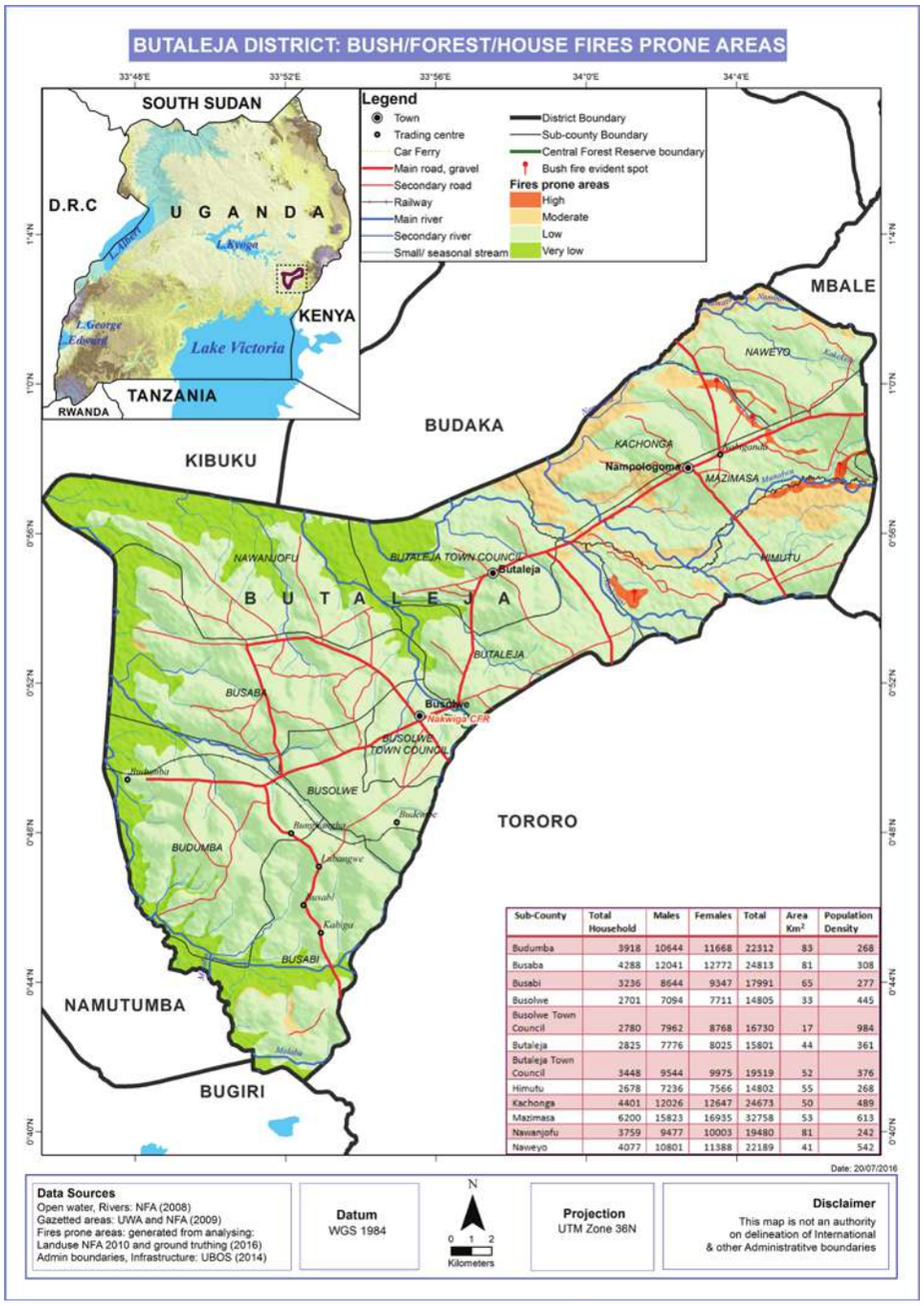


Figure 17: Bush fires Hotspot areas and Vulnerability Ranking, Butaleja District

4.4.2 Land conflicts

The total land area of Butaleja district, 644 sq-kms, is held under three land tenure systems (Butaleja District Council, 2007). These include Leasehold (1%); Freehold (9%); and Customary (90%) (Butaleja District Planning Unit, 2007). Participants indicated that land disputes were a serious problem in the entire Butaleja district. Most of the registered land conflicts are between land lords and squatters. Other land conflicts include inter-border conflicts beteween Tororo and Butaleja districts, Mbale and Butaleja districts, Budaka and Tororo districts. Boundaries are located in the Wetlands which are being used for cultivation without definite boundaries which causes conflict in their utilization. In addition sub-county boundary conflicts were reported for Budumba and Busabi sub-counties. Community land conflicts were reported between Haji Koire massive estates and the squatters on those estates causing loss of lives to a few. Generally land disputes were reported for the entire district. Figure 16 indicates land conflicts ranking in Butaleja district.

Some of the government interventions on land disputes include: strengthening of security organs, courts of law, community dialogues especially for inter-border conflicts. Recommend boundary opening by Ministry of Lands and surveys.Wetland restoration and demarcation.

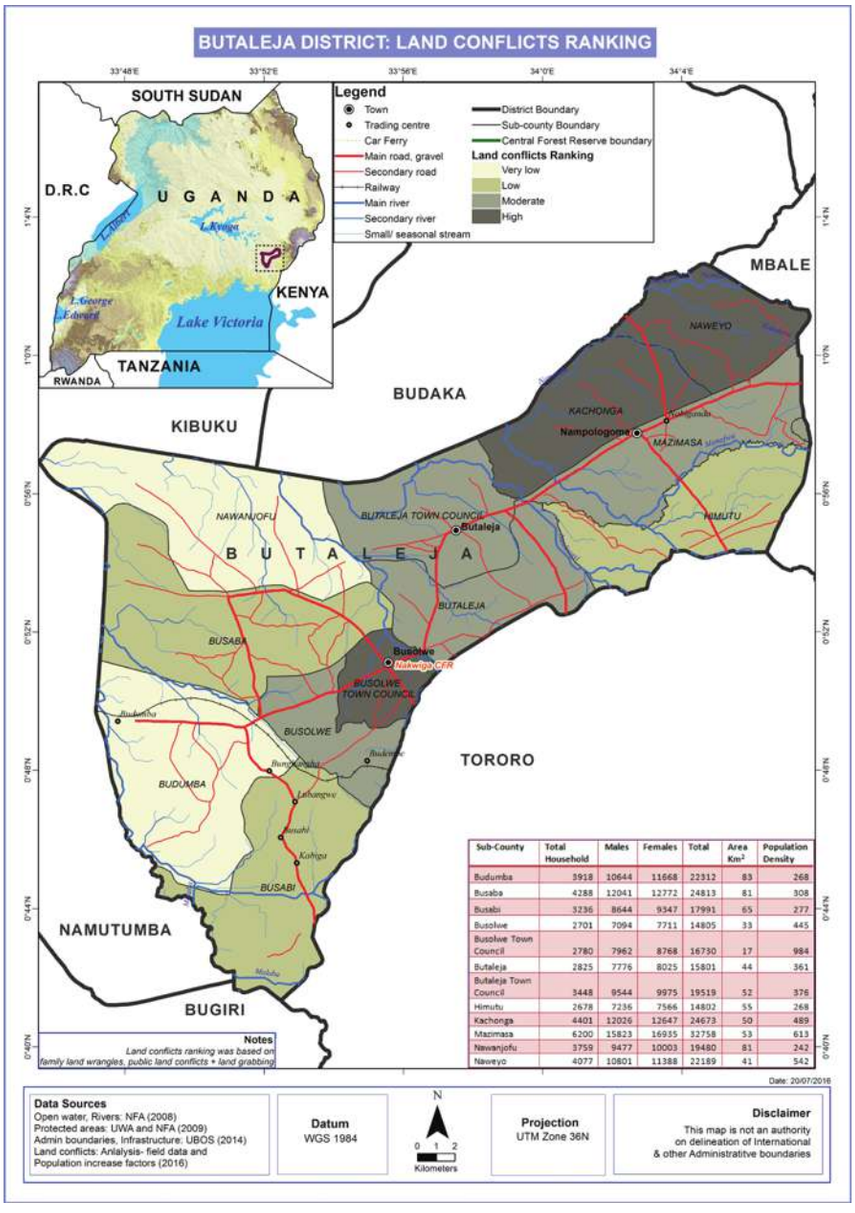


Figure 18: Land Conflicts Ranking, Butaleja District

4.4.3 Environmental Degradation

The most reported forms of environmental degradation in Butaleja district included: wetland reclamation and conversion for rice growing, deforestation, overgrazing, brick making and sand mining. Deforestation has caused disappearance of Mpolyabigere forest in Naweyo subcounty and Nakwiga forest rserve in Busolwe Town council.

Population pressure on uplands for crop production has pushed the community to convert wetlands for paddy rice production. The pressure has grown as the demand for rice within the country, along with the price, has grown. The upland areas, in some places like Mazimasa sub-county, have been virtually abandoned and the population is expanding into the wetland by diverting river water flow to irrigate more land close to the wetland (NEMA/UNEP, 2008).

According to the 2002 census report, 63.2% of the population live in grass thatched dwelling units; 90.4% of the housing units have floors of rammed earth; 72.3% of the dwelling units are made up by mud and poles. Forests and wetlands have been encroached in search for building materials despite the significant contribution of wetlands, forests, and land to the economy of the District and more so policies and laws to protect these resources exist. The Elephants that used to exist in Nawanjofu sub-county can no longer be traced.

Due to the removal of vegetation and cultivation without fallow in most of the parishes, there is increased soil erosion and silting especially along the river banks of Manafwa and Namatala wetland systems. The leaching of soil nutrients has caused soil fertility decline is observable through evidence of declining crop and pasture yields (NEMA/UNEP, 2008). Soil analysis reports indicate low organic matter, below 6.8% which is the critical level (Pali et al., 2005). Figure 16 indicates environmental degradation ranking in Butaleja district.

Some of the government interventions on environmental degradation include: sensitization campaigns against wetland encroachment, wetland zoning and creation of buffers, national program on restoration of wetlands through farm income and forest restoration (FIEFOC) lot of tree planting 2003 – 2012.

Plate 8: Rice growing in Namatala wetland

Plate 9: Rice growing in Namatala wetland

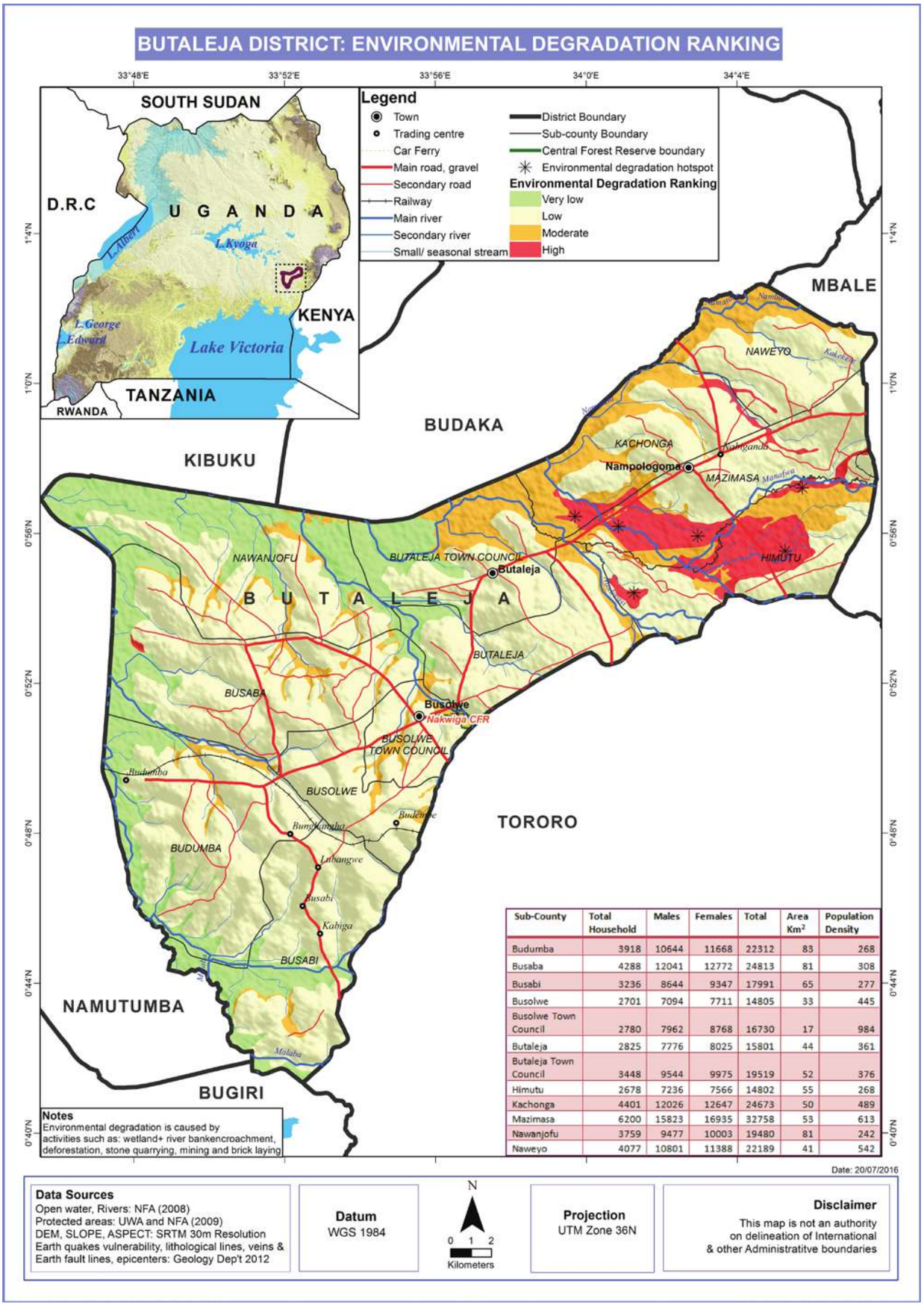


Figure 19: Environmental Degradation Ranking, Butaleja District

4.4.4 Accidents (Road, Railway and Water)

It was reported that road accidents such as head on collisions and vehicles overturning occasionally reported along Mbale – Butaleja road and Busolwe – Tororo road. Boda-boda accidents reported as biggest form of road accidnets in Butaleja district espasoially in Butaleja and Busulowe town councils. Most recent road accident reported overturn of vehicle along Mbale – Butaleja road in Butaleja town council early 2016. Figure 16 indicates road accident hotspots and risk areas in Butaleja district.

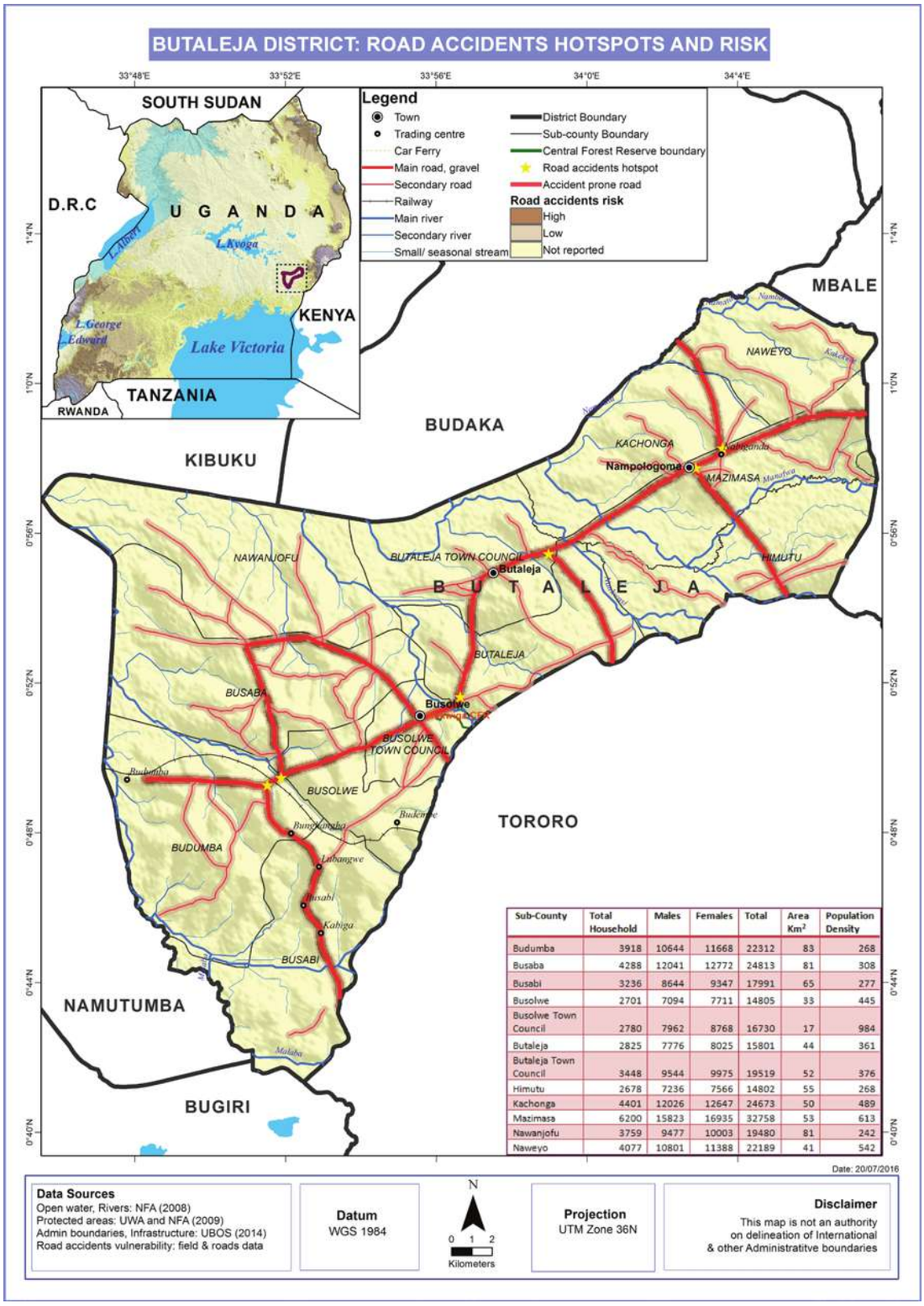


Figure 20: Road Accidents Hotspots and Vulnerability, Butaleja District

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 Butaleja 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 2).

Table 3 (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 3). Table 4 shows Hazard assessment for Butaleja District.

Table 8: Components of Vulnerability in Butaleja 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 school	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 - Foot rot - 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 - Spread of livestock epidemics - Livestock mortalities	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
	Livestock Pests and Diseases	-Livestock (cattle, goats etc.)	District	- Loss of livestock - Reduced livestock Productivity -Reduced incomes	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
Socio-economic component	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 -some are poisonous to livestock	District	- Cut and burn -Sensitization on Invasive species management - Spray with herbicides e.g 2,4 D	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 -Loss of lives	Sub-county	-Sensitization - Fire control measures: firebreaks, fire lines and fire fighting equipments	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 -retards development	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 and Vermin Officer - 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 -increased incidences of env't related diseases	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	
	Earth quakes	- Infrastructure e.g. houses, schools	District	- Loss of lives - Destruction of Infrastructure e.g. houses, schools	District	-No much measure so far	
	Floods	- Livestock adjacent to flood plain - Crops on flood plain - Infrastructure e.g. houses, schools, roads adjacent to flood plain	Parish	- Livestock loss - Destruction of crops - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain	Parish	-Migration -Sensitization on wetland conservation -Dig trenches	
	Drought	- Livestock - Crops - Human population	Village	- Hunger & poverty - Livestock loss - Crop failure - Shortage of pasture - Shortage of water	Village	-Migration -Sensitization on tree planting -Buy food from elsewhere	
	Hailstorms, strong winds and Lightning	- Human and livestock populations - Crops - Infrastructure e.g. houses, schools, health centres	Parish	- Loss of lives - Destruction of crops - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain	Parish		

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

Table 9: Vulnerability Profile for Butaleja 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	4	20	Himutu, Mazimasa, Kachonga,Naweyo, Nawanjofu, Busabi
Droughts	5	4	20	Sub counties of Kachonga, Naweyo, Mazimasa, himutu, Butaleja TC, Butaleja S/C, Busolwe TC, Busolwe S/C,
Soil erosion, rock falls and landslides	4	4	15	Kachonga, Naweyo, Mazimasa, himutu, Butaleja TC
Hail storms, lightning and strong winds	5	3	15	Busabi, Himutu, Butaleja TC, Butaleja S/C, Mazimasa, Naweyo
Bush fires	4	4	5	Kachonga, Naweyo, Mazimasa, himutu, Butaleja TC, Butaleja S/C, Busolwe TC, Nawanjofu, Busolwe, Busaba, S/C, Budumba,and Busabi
Crop pests and diseases	5	4	20	Kachonga, Naweyo, Mazimasa, himutu, Butaleja TC, Butaleja S/C, Busolwe TC, Nawanjofu, Busolwe, Busaba, S/C, Budumba,and Busabi
Livestock pests and diseases	5	4	20	Kachonga, Naweyo, Mazimasa, himutu, Butaleja TC, Butaleja S/C, Busolwe TC, Nawanjofu, Busolwe, Busaba, S/C, Budumba,and Busabi
Human Diseases outbreaks	5	4	20	Kachonga, Naweyo, Mazimasa, himutu, Butaleja TC, Butaleja S/C, Busolwe TC, Nawanjofu, Busolwe, Busaba, S/C, Budumba, and Busabi
Land conflicts	4	4	15	Kachonga, Naweyo, Mazimasa, himutu, Butaleja TC, Butaleja S/C, Busolwe TC, Nawanjofu, Busolwe, Busaba, S/C, Budumba,and Busabi
Vermin and Wild-life animal attacks	2	2	2	Kachonga, Naweyo, Mazimasa, himutu, Butaleja TC, Butaleja S/C, Busolwe TC, Nawanjofu, Busolwe, Busaba, S/C, Budumba,and Busabi
Earthquakes and faults	1	1	1	Kachonga, Naweyo, Mazimasa, himutu, Butaleja TC, Butaleja S/C, Busolwe TC, Nawanjofu, Busolwe, Busaba, S/C, Budumba,and Busabi
Road accidents	4	3	15	Kachonga, Naweyo, Mazimasa, himutu, Butaleja TC, Butaleja S/C, Busolwe TC, Nawanjofu, Busolwe, Busaba, S/C, Budumba,and Busabi
Environmental degradation	5	5	20	Kachonga, Naweyo, Mazimasa, himutu, Butaleja TC, Butaleja S/C, Busolwe TC, Nawanjofu, Busolwe, Busaba, S/C, Budumba,and Busabi
Invasive species	4	3	15	Kachonga, Naweyo, Mazimasa, himutu, Butaleja TC, Butaleja S/C, Busolwe TC, Nawanjofu, Busolwe Busaba, S/C, Budumba,and Busabi

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 10: Hazard Risk Assessment

Hazard	Kachonga	Naweyo	Mazimasa	Himutu	Butaleja	Butaleja TC	Busolwe TC	Busolwe SC	Nawanjofu	Busaba	Budumba	Busabi
Floods	H	H	VH	VH		H	H		VH			
Drought	VH	VH	VH	VH	VH	VH	H	H				
Landslides, Rock falls and Erosion												
Strong winds, Hailstorms and Lightning												
Crop pests and Diseases												
Livestock pests and Diseases												
Human disease outbreaks												
Vermin and Wildlife animal attacks												
Land conflicts												
Bush fires												
Environmental degradation												
Earthquakes and faults												
Road accidents												
Invasive species												

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 11: Gender and age groups mostly affected by hazards

Hazard	Gender and Age mostly affected
Drought	Affects mostly women and girls 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	All gender and age groups
Human disease outbreaks	Children
Vermin and Wildlife animal attacks	All gender and age groups
Land conflicts	Men
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 6).

Table 12: Coping strategies to the Multi-hazards in Butaleja District

No	Multi-Hazards		Coping strategies
1	Geomorphological or Geological	Soil erosion	• Plant trees to control Silting • Zoning of the wetland areas • Plant grass in banana plantations on hill slopes
3	Climatological or Meteorological	Floods	• Digging up of trenches in the flood plains • Planting trees to control water movement to flood plains • Migration to safer areas • Seek for government food aid • Soil and water conservation measures • Early Warning systems
4		Prolonged Dry spells	• Leave wetlands as water catchments • Plant trees as climate modifiers • Buy food elsewhere in case of shortage • Pay for cost of water distribution • Food Storage especially dry grains • Plant drought resistant crops • Recommend water harvesting
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 • 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 • Clean plant materials • Plant disease and pest resistant varieties

7	Ecological or Biological	Livestock Parasites and Diseases	• Spraying parasites • Vaccinations • Burying animals that have died from infection • Quarantine
8		Human epidemic Diseases	• Mass immunisation • Visiting health centres • Use of mosquito nets • Indoor residual spraying
9		Vermin and Wild-life animal attacks	• Guarding the gardens • Poisoning • Hunt and kill • Recommend vermin guards
10		Invasive species	• Uproot • Spray with herbicides (e.g 2-4-D for broad-leaved plants) • Cut and burn • Sensitization on Invasive species management
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) • Wetland management planning at community level
12		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 and ordinances and enforcement • Sensitization on dangers of fires • Recommend controlled burning
13		Accidents (Road and Water)	• 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 • Vigilance for water accidents
14		Environmental degradation	• Leave wetlands as water catchments • Plant appropriate tree species as climate modifiers • Get Approval of the physical planning committee before construction • Sensitization • Bye-laws • Enforcement • Gazatte and demarcate wetlands • Restore wetlands and other fragile ecosystems • EIA for new developments • No land titles for wetland areas • Cancellation of existing wetland land titles • Developing land use plans and enforce them

GENERAL CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

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

Results from the participatory assessment indicated that Butaleja 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 prolonged dry spells and flooding were identified as most serious problem in Butaleja 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 Butaleja district increase their vulnerability to hazard exposure necessitating urgent external support.

Hazards experienced in Butaleja 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. The government through MAAIF and the District Production Office should promote drought and disease resistant crop seeds.

viii. The government through OPM and Meteorology Authority should increase importation of lightning conductors and also reduce taxes on their importation.

ix. The government through OPM and Meteorology Authority should support establishment of disaster early warning systems.

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

xi. The government through OPM should improve communication between the disaster department and local communities.

xii. The government through MWE should promote Tree planting along road reserves.

xiii. The government through MAAIF should fund and recruit extension (facilitate them) works at sub-county level.

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APPENDIX I: DATA COLLECTION TOOLS

FOCUS GROUP DISCUSSION GUIDE FOR DISTRICT DISASTER RISK MANAGEMENT FOCAL PERSONS

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

No.	Name of Participants	Designation	Contact	Signature

Introduction

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

17. What impacts have been caused by earth quakes?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

34. In which way are crops affected by drought?

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

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

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

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

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

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

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

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

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

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

challenges?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

71. What impacts have been caused by wildlife attacks?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

87. What impacts have been caused by environmental degradation?

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

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

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

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

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

93. What impacts have been caused by land conflicts?

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

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

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

the challenges mentioned?

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

98. Which roads have experienced Road accidents?

99. What impacts have been caused by Road accidents?

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

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

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

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

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

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

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

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

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

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

FOCUS GROUP DISCUSSION GUIDE FOR LOCAL COMMUNITIES

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

No.	Name of Participants	Designation	Contact	Signature

Introduction

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

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

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

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

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

1. Which crops are majorly grown in your community?

2. Which domestic animals are dominant in your community?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

17. What impacts have been caused by earth quakes?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

34. In which way are crops affected by drought?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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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?

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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?

SPATIAL DATA COLLECTION SHEET FOR HAZARD VULNERABILITY AND RISK MAPPING

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

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

Sub- county:

Parish:

Village:</td><td colspan="3">Coordinates</td></tr>
<tr><td>X:</td><td colspan="2"></td></tr>
<tr><td>Y:</td><td colspan="2"></td></tr>
<tr><td>Altitude</td><td colspan="2"></td></tr>
<tr><td colspan="2">Slope characterization</td><td colspan="2">Bio-physical characterization</td><td colspan="2">Vegetation characterization</td><td rowspan="6">Land use type (tick)
Bush
Grassland
Wetland
Tree plantation
Natural forest
Cropland
Built-up area
Grazing land
Others</td></tr>
<tr><td>Slope degree (e.g 10, 20, …)</td><td></td><td>Soil Texture</td><td></td><td>Veg. cover (%)</td><td></td></tr>
<tr><td>Slope length (m) (e.g 5, 10, …)</td><td></td><td>Soil Moisture</td><td></td><td>Tree cover (%)</td><td></td></tr>
<tr><td>Aspect (e.g N, NE…)</td><td></td><td>Rainfall</td><td></td><td>Shrubs cover (%)</td><td></td></tr>
<tr><td>Elevation (e.g high, low…)</td><td></td><td>Drainage</td><td></td><td>Grass / Herbs cover (%)</td><td></td></tr>
<tr><td>Slope curvature (e.g concave, covex…)</td><td></td><td>Temperature</td><td></td><td>Bare land cover</td><td></td></tr>
<tr><td colspan="7">Area Description (Susceptibility ranking: landslide, mudslide, erosion, flooding, drought, hailstorms, lightning, cattle disease outbreaks, human disease outbreaks, land conflicts, wildlife conflicts, bush fires, earthquakes, faults/ cracks, pictures, any other sensitive features)</td></tr>
</table>

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