THE REPUBLIC OF UGANDA

Mbale 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.

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

My appreciation also goes to Mbale District Team:

1. Mr. Issa.K. Ziwedde - Deputy CAO Mbale District
2. Mr. Opusi Joseph - Natural Resources Officer
3. Ms. Anna Nakayenze - Senior Environmental Officer
4. Mr. Mayeku Isaac

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

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

EXECUTIVE SUMMARY

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

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

Stakeholder engagements
Stakeholder engagements were carried out in close collaboration with OPM's DRM team and the District Disaster Management focal persons with the aim of identifying the various hazards ranging from drought, to floods, landslides, human and animal disease, pests, animal attacks, earthquakes, fires, conflicts etc. Stakeholder engagements were done through Focus Group Discussions (FGDs) and key informant interviews guided by checklist tools (Appendix I). At district level Key Informants included: District Agricultural Officer, 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 Busano, Wanale, Nyondo and Bukonde Sub-counties. Each Parish of the selected Sub-counties was represented by at least one participant and the selection of participants was engendered. FGDs were conducted with utmost consideration to the various gender categories (women, men) with respect to age groups since hazards affect both men and women though in different perspectives irrespective of age.

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

Geo-referencing and ground-truthing
The identified hazard hotspots in the community profile maps were ground-truthed and geo-referenced using a handheld Spectra precision Global Positioning System (GPS) unit, model: Mobile Mapper 20 set in WGS 1984 Datum. The entities captured included: hazard location, (Sub-county and parish), extent of the hazard, height above sea level,

slope position, topography, neighboring land use among others. Hazard hot spots, potential and susceptible areas will be classified using a participatory approach on a scale of “not reported/ not prone”, “low”, “medium” and “high”.

Data analysis and integration

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

Data verification and validation

In collaboration with OPM, a five days regional data verification and validation workshop was organized by UNDP in 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 Mbale 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 Mbale 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 Mbale 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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LIST OF ACRONYMS

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

DEFINITION OF KEY TERMS

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

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

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

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

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

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

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

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

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

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

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

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

INTRODUCTION

1.1 Background

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

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

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

This final draft report details methodological approach for HRV profiling and mapping for Mbale 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 Mbale District, 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 Mbale 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 Chapters: Chapter 1 provides Introduction on the assignment. Chapter 2 elaborates on the overview of Mbale district. Chapter 3 focuses on the methodology employed. Chapter 4 elaborates the Multi-hazard, Risks and Vulnerability profile and Coping strategies for Mbale district. Chapter 5 describes Conclusions and policy related recommendations.

OVERVIEW OF MBALE DISTRICT

2.1 Location

Mbale is one of the districts in the Eastern region of Uganda. It is bordered by Bukedea district in the Northwest, Sironko and Bulambuli districts in the North, Budaka and Pallisa in the west, Tororo and Butaleja districts in the south-west, Manafwa and Bududa districts District in the east. It lies between latitudes 00450 North and longitudes 340 East and 350 East. Mbale District headquarters are situated at Malukhu ward, industrial division and the district has a total area of 538.16 sq. km and a population density of 915 persons per square km. This district has three constituencies which include Mbale municipality, Bungokho North and Bungokho South. It has 19 sub counties, 1 town council, 1 municipality and 3 divisions.

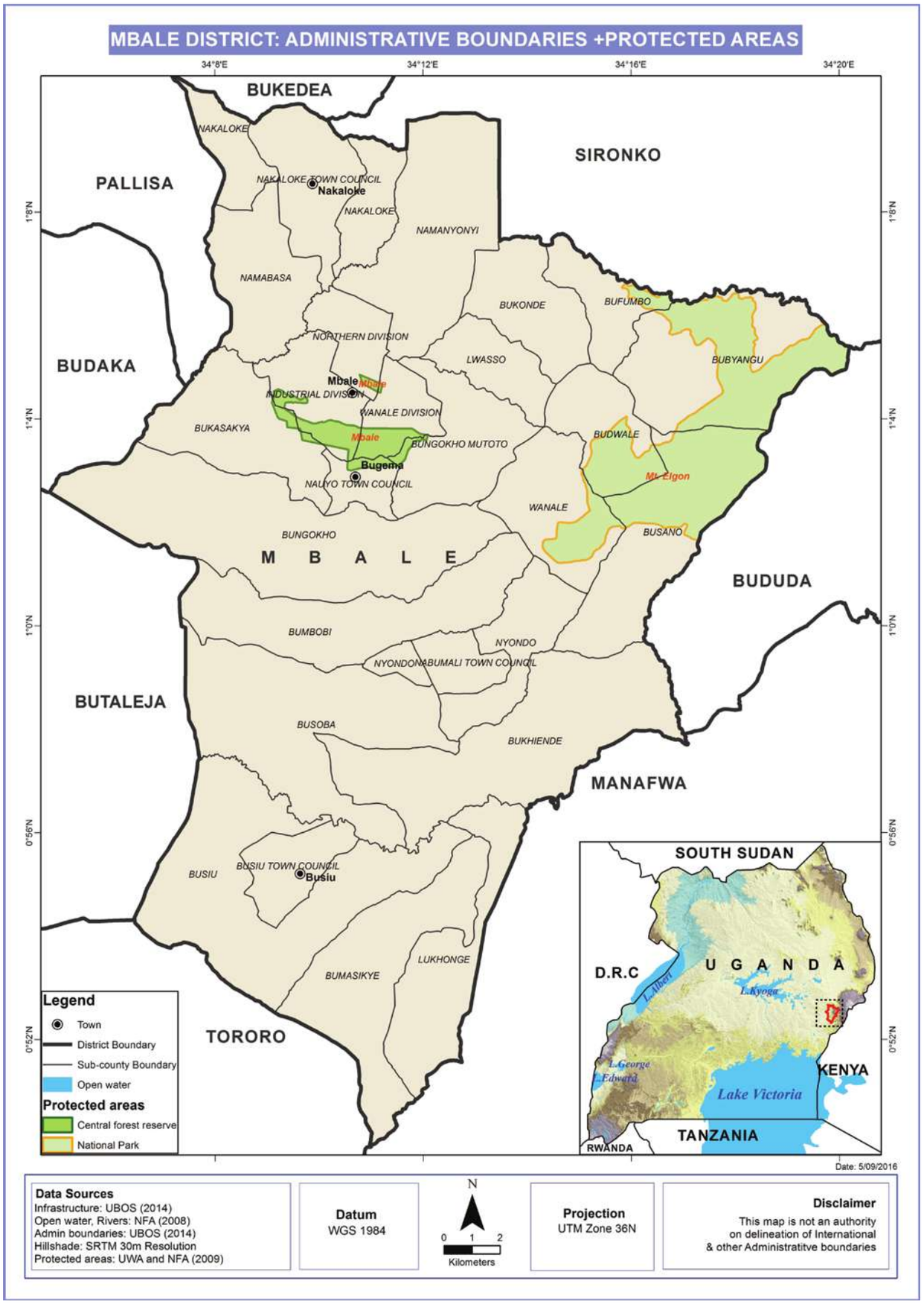


Figure 1: Shows the Administrative boundaries and gazetted areas of Mbale District.

2.1.1 Topography

The topography of Mbale is divided into three distinct types namely: Mbale plain or terrace, the upland and the mountain landscapes. The topography of Mbale district can also be divided into highlands, midlands and lowlands. Generally, the soils in the highlands are clay; the midlands have clay loam while the lowlands mainly have sandy soils. The district is mainly comprised of Pre-Cambrian rock system and the cainozoic rock formations. The Pre-Cambrian rock system is mainly wholly granitised or high to medium metamorphosed formations consisting of undifferentiated gneisses and elements of partly granitised and metamorphosed formations. Cainozoic formations consist of Pleistocene to recent sediment, alluvium, black soils and moraines.

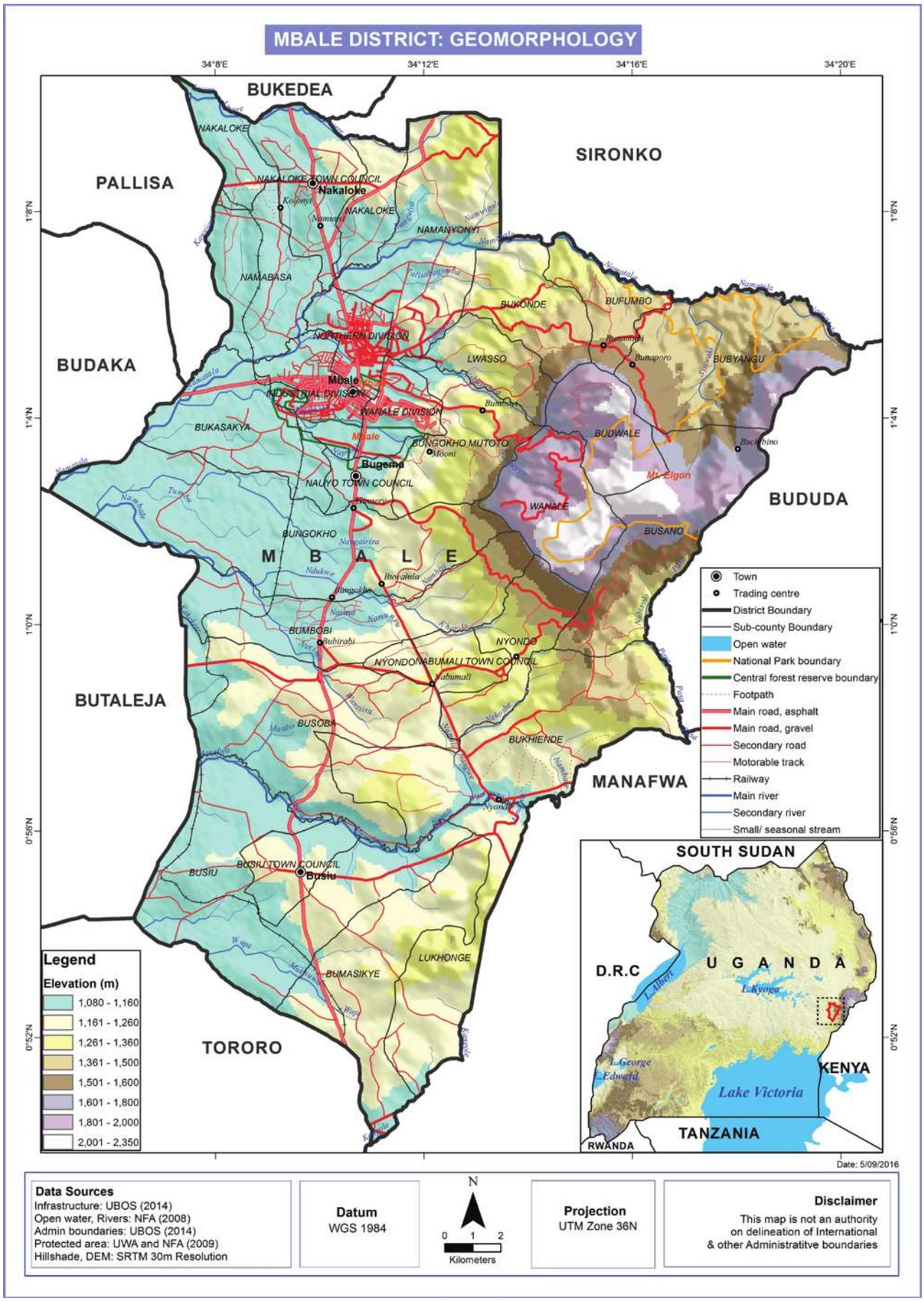


Figure 2: Geomorphology, Mbale District

2.1.2 Hydrology

The water resources in the district are comprised of surface water and ground water. Surface water mainly occurs in rivers such as Manafwa, Namatala and Nabuyonga; and small streams that flow in most parts of the district. On the other hand, ground water is found beneath the earth's surface where it is contained by an impermeable layer or aquiclude. The ground water flows to wells, springs or other points of recovery. Apart from surface water and ground water, rainfall is also an important water resource in the district. Peak rainfall occurs in the months of April-June and August –November. The largest catchment area for all surface water is Mt. Elgon forest reserve and peaks. This therefore, forms a continuous hydrological cycle.

2.1.3 Vegetation

The Mbale district is heavily cultivated, with little to no remnants of natural vegetation in the lower and mid elevation areas. Natural vegetation remains in the higher elevation areas, most of which fall within the Mt. Elgon Forest National park. The supra-tropical forests up the mountain are dominated by with Camphor, *Aningeria adolfi-friederici, Podocarpus latifolius, Olea hochestetteri* and *Prunus africana* (Hamilton and Perrott, 1981). Generally, the natural vegetation in the district varies from forest in the East to aquatic grassland and swamp towards Namatala-Mpologoma system in the South -west.

2.1.4 Population Density

The total population of Mbale district was estimated to be 492, 804 as of the 2014 national census. The population density of Mbale district was also estimated to be 587 persons per square kilometer and an average household size of 4.6. The main ethnic group in the district is the Bamasaba or the Bagisu. The main language spoken in the district is Lugisu also known as Lumasaba. Other languages spoken in the district include Luganda, English and Swahili. According to NPHC (2014), the sex ratio of Mbale is at 93.1% and population growth rate of 2.3%. The total fertility rate is 7 while the life expectancy is 47 years. The largest proportion (about 51.8%) of the population is less than 15 years of age which makes the District's total dependency ratio high. The District's population is distributed as 90.2% rural and 9.8% urban. Fuel wood (Fire Wood) is the dominant source of energy as it is used by about 89% of the population in Mbale district. This is then followed by charcoal which is used by about 10.3% of the population. A very small percentage (0.7%) of the population in Mbale district uses gas and electricity as their source of energy because they are not affordable to most people.

Table 1: Population Distribution in Mbale District

SUB-COUNTY	HOUSEHOLDS		POPULATION				
	Number	*Average*	*Males*	*Females*	*Total*	*Area*	*Population Density*
Bufumbo	3117	5.5	8107	8945	17052	8.8	1931.1
Bukasakya	7802	4.2	15888	17096	32984	20.9	1575.9
Bukhiende	4708	4.7	10765	11407	22172	40.1	552.4
Bukonde	3958	4.9	9288	9983	19271	13.8	1399.5
Bumbobi	3459	4.6	7620	8176	15796	24.5	644.0
Bungokho	6277	4.5	13475	14628	28103	49.1	572.8
Bungokho Mutoto	8255	4.2	16904	17843	34747	18.5	1878.2
Busiu	5058	4.7	11675	12177	23852	49.6	480.7
Nakaloke	4553	4.9	10747	11947	22694	30.8	735.9
Nakaloke Town Council	5661	4.8	12994	14538	27532	14.3	1928.0
Nyondo	2529	4.7	5881	6406	12287	17.5	703.3
Industrial Division	10722	3.8	20638	21672	42310	9.9	4278.1
Wanale Division	3606	4.0	6853	7950	14803	6.9	2133.0
Lwasso	1712	5.3	4475	4550	9025	8.8	1024.4
Wanale	2699	4.9	6510	6751	13261	16.3	812.1
Northern Division	5975	3.9	10717	12762	23479	7.3	3238.5
Bubyangu	4274	4.9	10114	10783	20897	30.8	679.4
Namanyonyi	6736	4.5	14971	15741	30712	29.0	1059.4
Busoba	4596	4.7	10511	11329	21840	38.6	565.5
Bumasikye	2497	4.8	5856	6258	12114	27.5	440.5
Lukhonge	2065	4.7	4755	5027	9782	18.7	524.5
Budwale	1575	4.9	3838	3919	7757	11.0	703.3
Busano	3132	4.7	7305	7432	14737	25.9	569.2
Namabasa							
Nabumali Town council							
Busiu Town council							
TOTAL	**104966**		**229887**	**247320**	**477207**	**519**	**920**

Source: *UBOS Census 2014 Get information from population officer*

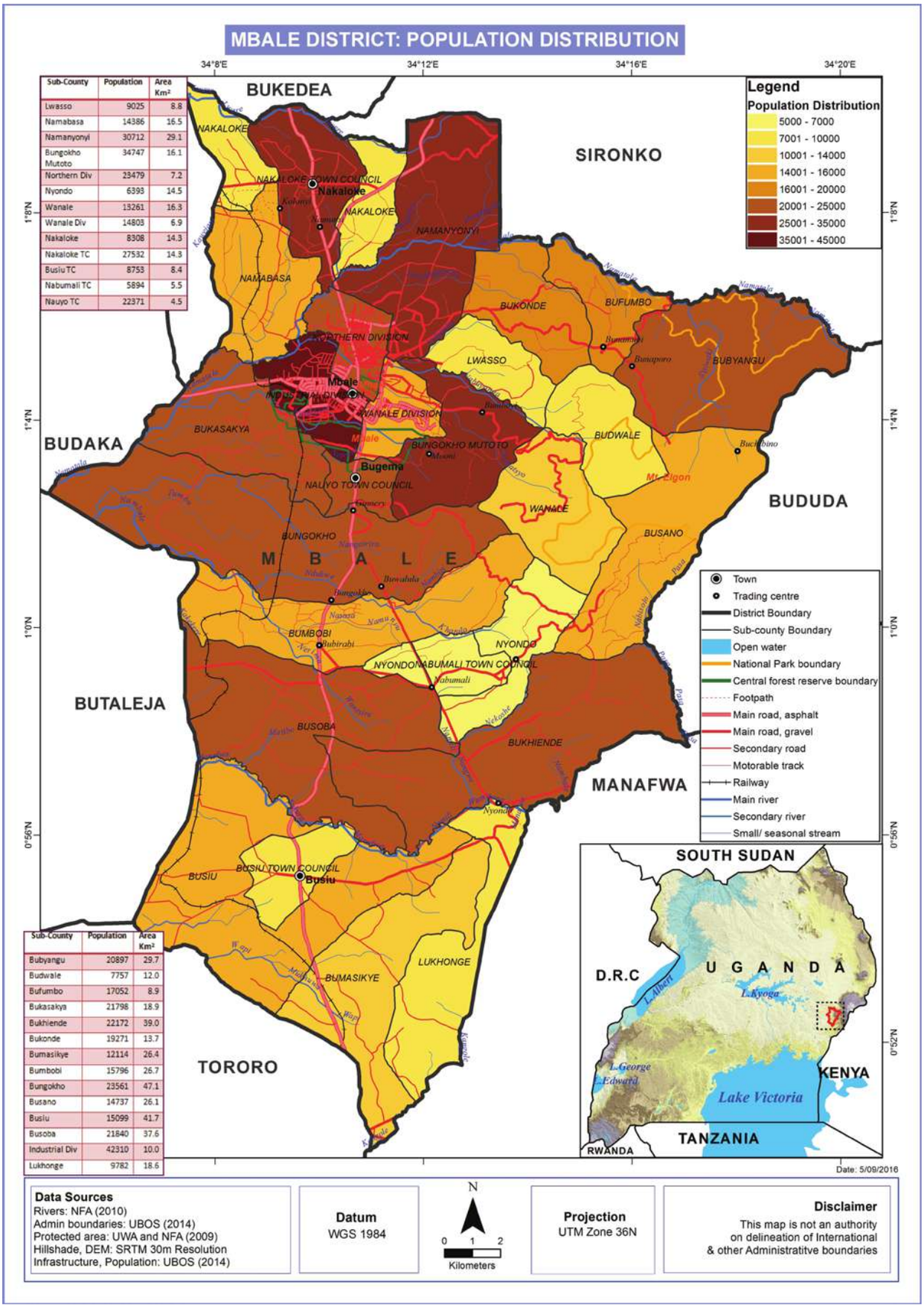
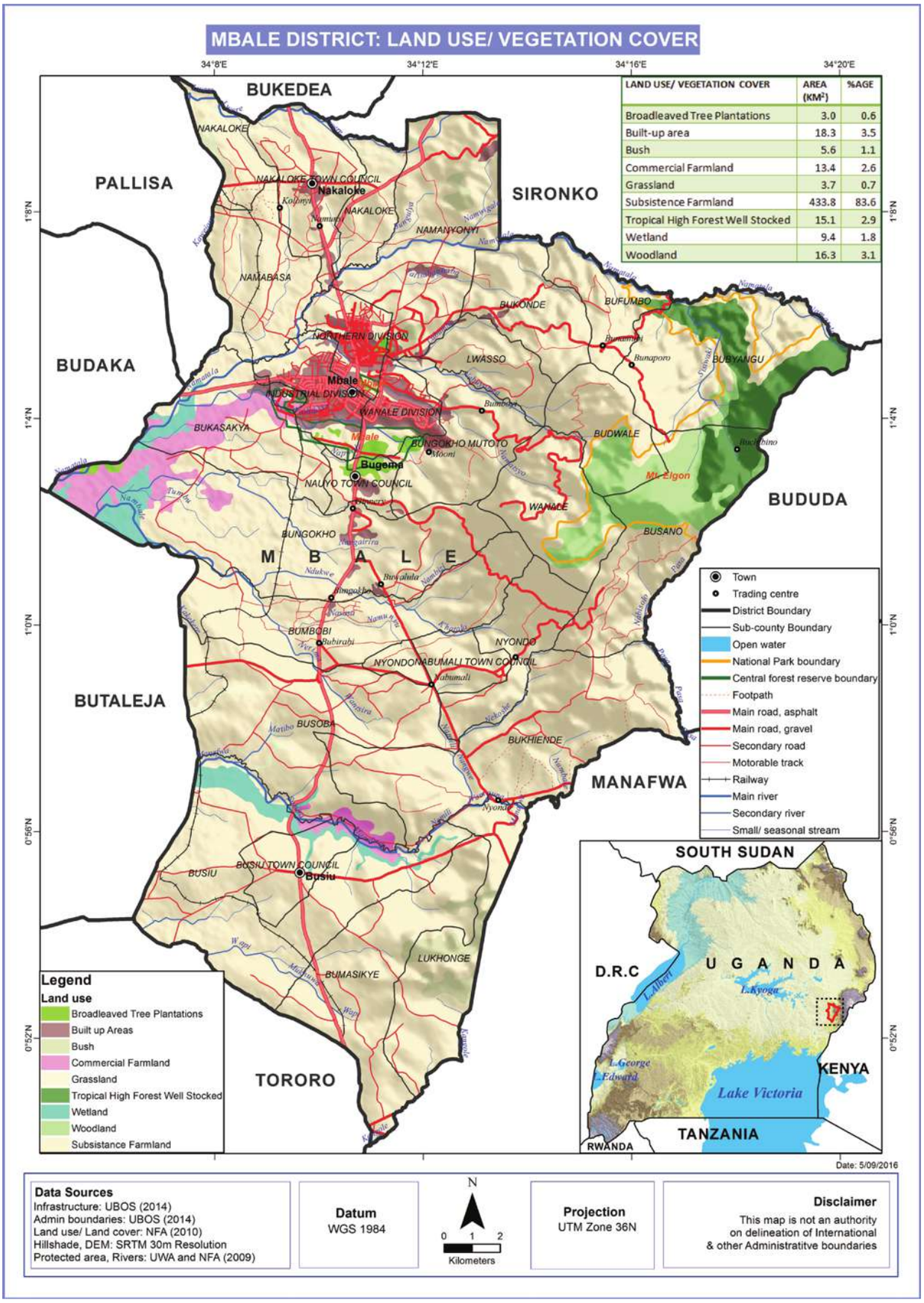


Figure 3: Population Distributions, Mbale District

Land use Stratification



LAND USE/ VEGETATION COVER	AREA (KM²)	%AGE
Broadleaved Tree Plantations	3.0	0.6
Built-up area	18.3	3.5
Bush	5.6	1.1
Commercial Farmland	13.4	2.6
Grassland	3.7	0.7
Subsistence Farmland	433.8	83.6
Tropical High Forest Well Stocked	15.1	2.9
Wetland	9.4	1.8
Woodland	16.3	3.1

Figure 4: Land use Stratification, Mbale District

2.1.4 Climate

The climate in Mbale is humid tropical with a fairly uniform average temperature of 23.0 °C throughout the year, as expected; temperatures in lower elevation areas in Mbale Region are warmer than high elevation areas up the Mount Elgon. There is wide temperature range from the low elevation such as west of Mbale town to the high elevation areas within the Mt. Elgon National Park in the eastern part. Average rainfall around Mbale town varies from 880 to 1775mm per year with a mean of 1186mm (Source: Mbale rainfall records 1908-1970). The average rainfall increases to 2000 mm on Mt Elgon where the rivers of the district originate. This climate supports the extensive agriculture being carried out in the district. With the changes in climate, there has been a shift towards climate change.

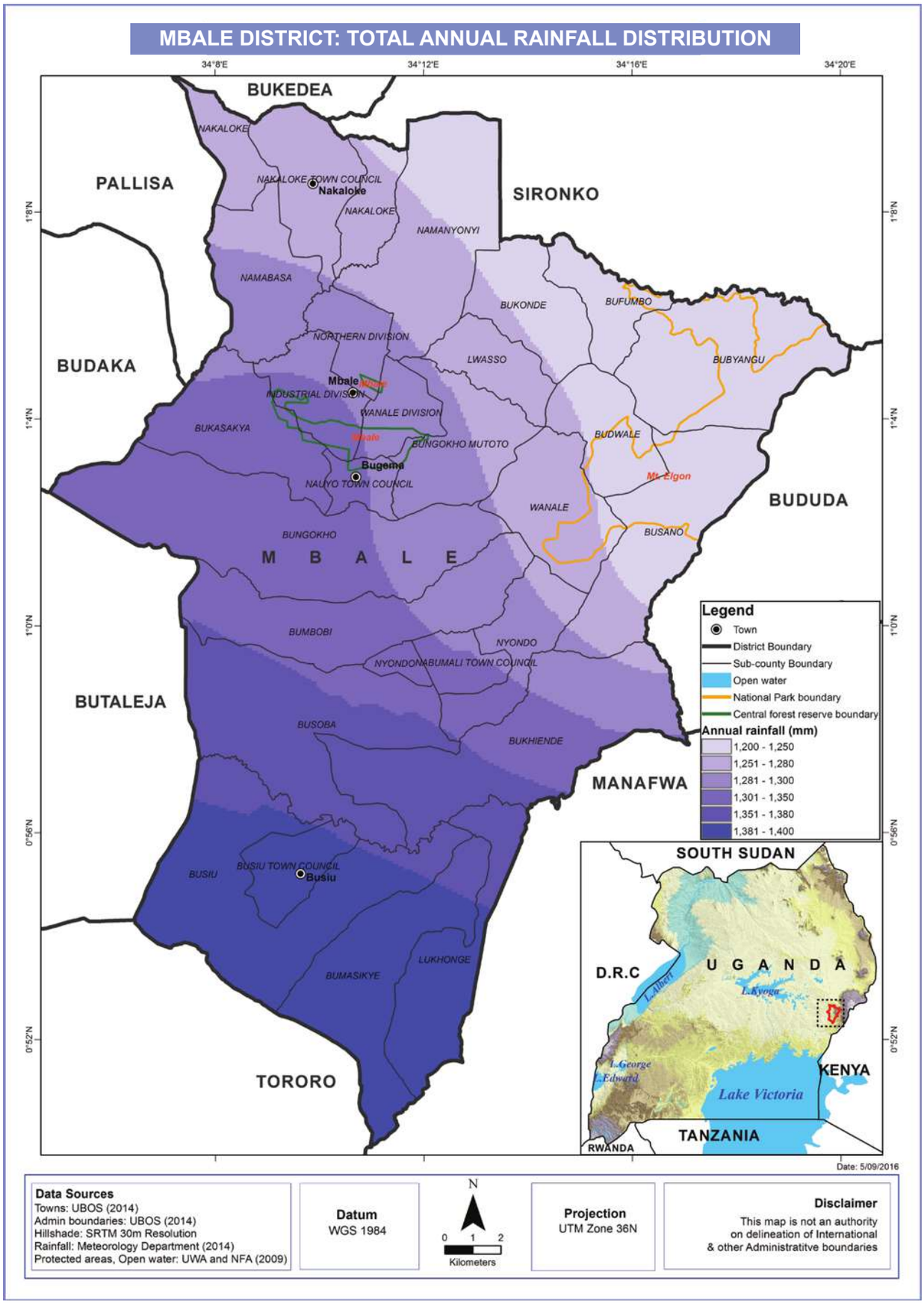


Figure 5: Total Annual Rainfall Distribution, Mbale District

2.1.9 Economic activities

The main economic activity in the district is agriculture which employs about 82 per cent of the population. This is because most of the land is arable or under cultivation. The main crops grown are mainly; coffee, bananas, beans, maize, sweet potatoes, sorghum and cassava. Other economic activities in Mbale district are also presented in Table 2 below.

Table 2: Economic activities carried out in Mbale district

Economic Activity	Percentage of population
Agriculture	82.4%
Processing Industry	2%
Construction	1.5%
Mining	0.02%
Fishing	0.05%
Trade	6%
Cottage Industry	0.72%
Loan applicants	5%
Property income	5.4%
Others	4.01%

Source: *Mbale DDP 2015*

METHODOLOGY

3.1 Collection and analysis of field data using GIS

3.1.1 Preliminary spatial analysis

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

3.1.2 Stakeholder engagements

Stakeholder engagements were carried out in close collaboration with OPM's DRM team and the district disaster management focal persons with the aim of identifying the various hazards ranging from drought, to floods, landslides, human and animal disease, pests, animal attacks, earthquakes, fires, conflicts etc. Stakeholder engagements were done through Focus Group Discussions (FGDs) and key informant interviews guided by checklist tools (Appendix I). At district level, One Key Informant Interview comprising of number of respondents (Officers from District Agricultural Office, District Natural Resources Office, District Health Office, District Planner among others) was held at Mbale District Headquarters (629882; 118245). At sub-county level Key informants included: Sub-county and parish chiefs, community Development mobilizers and health workers.

FGDs were carried out in five purposively selected sub-counties that were ranked with highest vulnerability. FGDs comprising of an average of 12 respondents (crop farmers, local leaders, nursing officers, police officers and cattle keepers) were conducted at Wanale Sub-county, Bumasikye Sub-county, Busiu Sub-county, and Bukasakya 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 Develop District Specific Multi-Hazard Risk and Vulnerability Profiles

3.2.1 Data analysis and integration

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

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

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

3.2.2 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.

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 Mbale district, hazards were classified following main controlling factors:

i. Geomorphological or Geological hazards including landslides, rock falls and soil erosion
ii. Climatological or Meteorological hazards including floods, drought, hailstorms, strong

winds and lightning

iii. Ecological or Biological hazards including crop pests and diseases, livestock pests and diseases, human epidemic diseases, vermin attacks and wildlife animal attacks,

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

4.1 Geomorphological and Geological Hazards

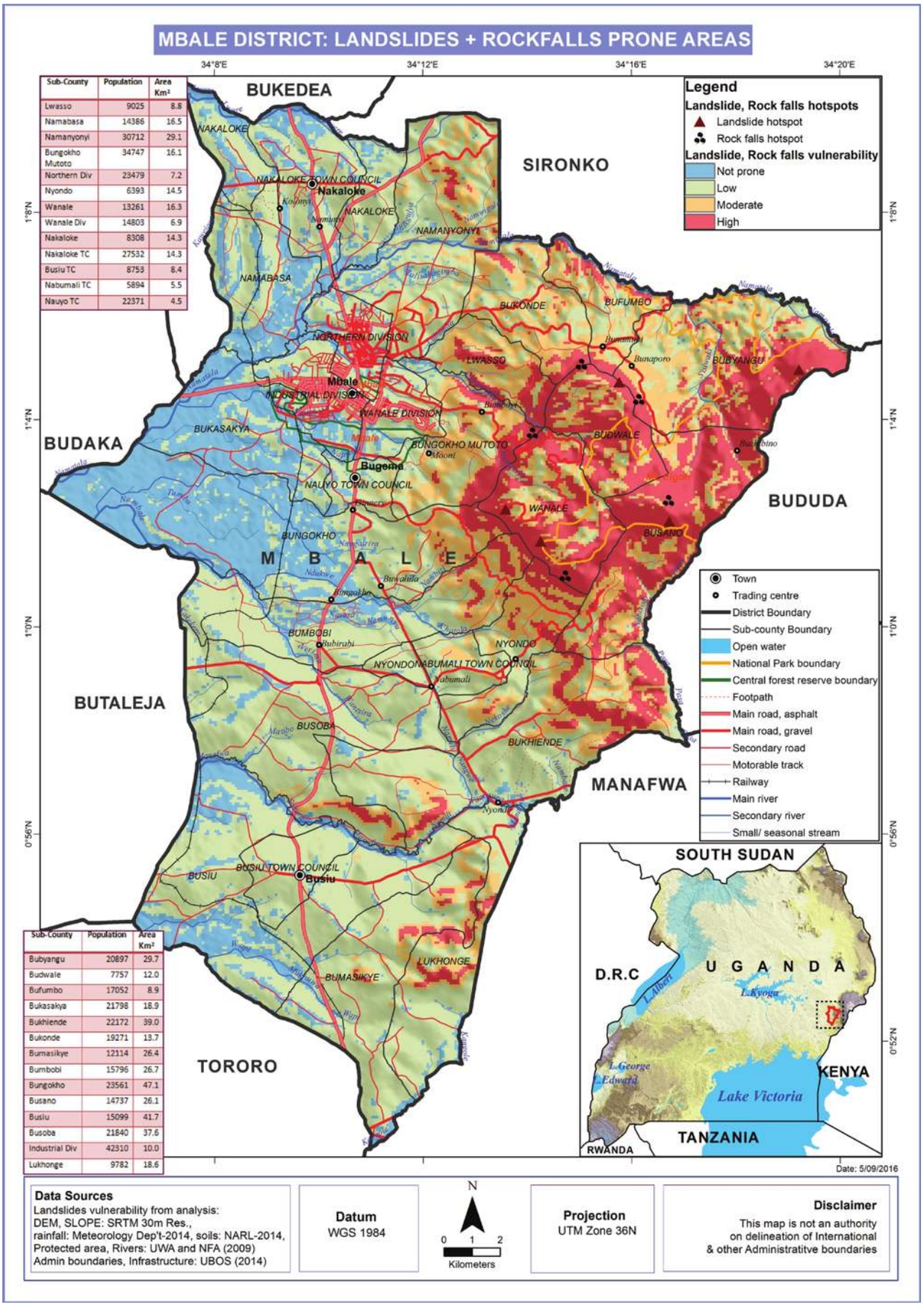
4.1.1 Landslides, rock falls and soil erosion

Results from the participatory assessments indicated that landslides, mudslides, rock falls and soil erosion were experienced in Mbale district. It was observed that landslides occur in the rainy season. It was reported that when landslides occur, houses and crops are severely destroyed and roads are also blocked. Participants reported that landslides usually block the Mbale- Wanale road in Budwale and Wanale sub-counties. However other areas were landslides and mudslides occur are; Bufumbo and Bubyangu Sub counties. The rock falls are most common in Wanale and Budwale Sub-Sub-counties 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 6).

Plate 1: *Rock fall spot along Budwale_ Wanala road*

Plate 2: *Landslide spot in Budwale Sub County*

Plate 3: *Cracks observed at Bushowo Village, Mugini Parish in Wanale Sub county*



Sub-County	Population	Area Km²
Lwasso	9025	8.8
Namabasa	14386	16.5
Namanyonyi	30712	29.1
Bungokho Mutoto	34747	16.1
Northern Div	23479	7.2
Nyondo	6393	14.5
Wanale	13261	16.3
Wanale Div	14803	6.9
Nakaloke	8308	14.3
Nakaloke TC	27532	14.3
Busiu TC	8753	8.4
Nabumali TC	5894	5.5
Nauyo TC	22371	4.5

Sub-County	Population	Area Km²
Bubyangu	20897	29.7
Budwale	7757	12.0
Bufumbo	17052	8.9
Bukasakya	21798	18.9
Bukhlende	22172	39.0
Bukonde	19271	13.7
Bumasikye	12114	26.4
Bumbobi	15796	26.7
Bungokho	23561	47.1
Busano	14737	26.1
Busiu	15099	41.7
Busoba	21840	37.6
Industrial Div	42310	10.0
Lukhonge	9782	18.6

Figure 6: Landslides, Rock fall and Soil erosion Prone Areas, Mbale District

4.1.2 Earthquakes and faults

Participants in the focus group discussions indicated that Mbale district experiences earth tremors (Figure 7). It was noted that earth tremors are minor and have never caused any significant impacts.

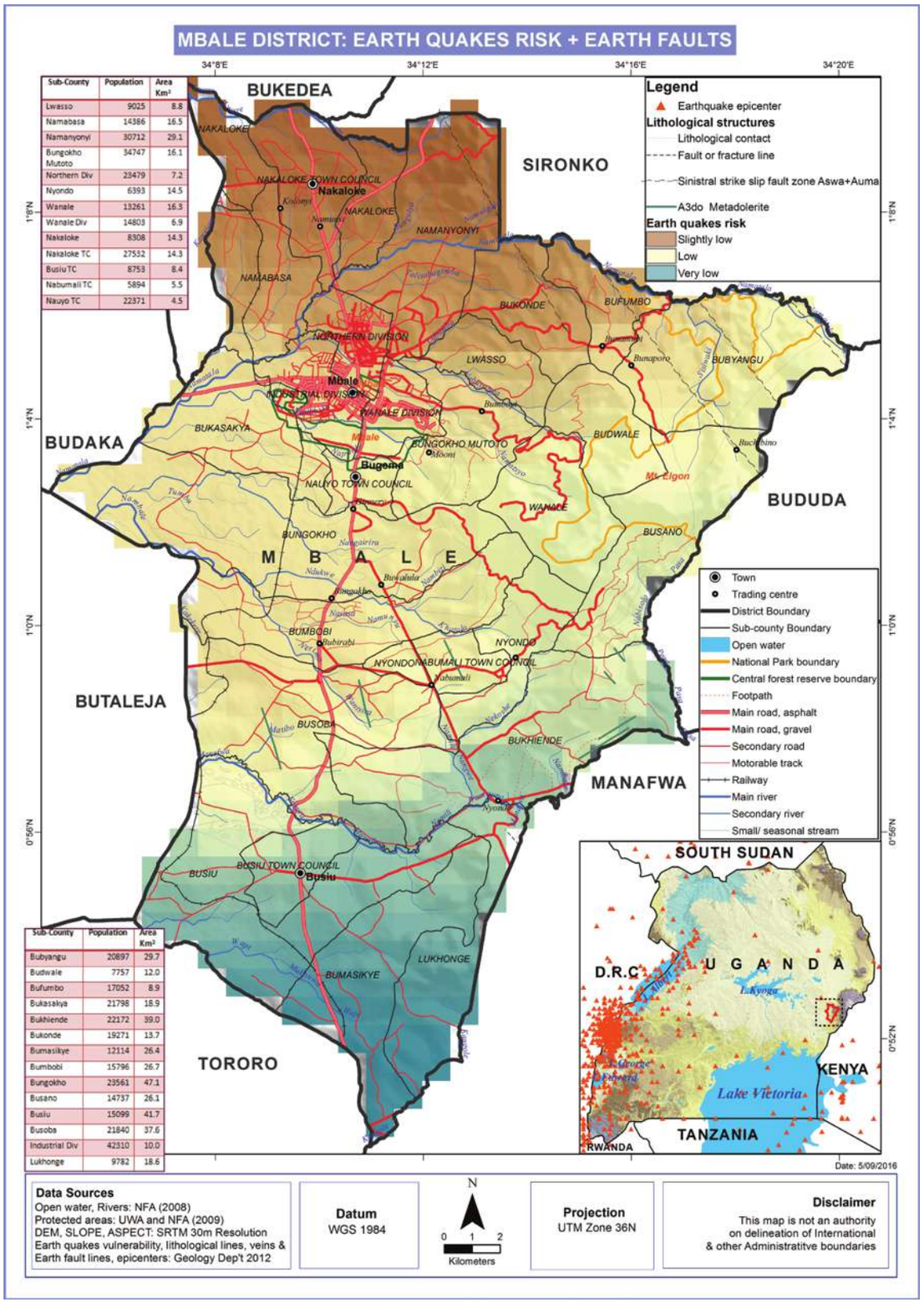


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Figure 7: Earthquakes Vulnerability and Fault lines, Mbale District

4.2 Climatological and Meteorological Hazards

4.2.1 Floods

Participants in the focus group discussions indicated that floods are a common occurrence in Mbale district during the rainy seasons. It was noted that these floods mainly occur along rivers and in the lowland areas. It was reported that River Nashibiso in Bungokho-Mutoto which traverses via the Mbale central reserve at one time flooded and swept most off the gardens along it. Other rivers in the district that flood are; River Manafwa in Busiu and River Namatala in Bukasakya, Nakaloke and Namanyonyi sub-counties among others. This information was integrated with the spatial modelling using socio-ecological spatial data i.e. Soil texture (data for National Agricultural Research Laboratories – Kawanda (NARL) 2014, Rainfall (Meteorology Department 2014), Digital Elevation Model (DEM), SLOPE, ASPECT (30m resolution data from SRTM Shuttle Radar Topography Mission (SRTM) to generate flood susceptibility map. Figure 8 shows areas susceptible to floods.

Plate 4: *Impact of flooding along river Mukhuwa in Busiu.*

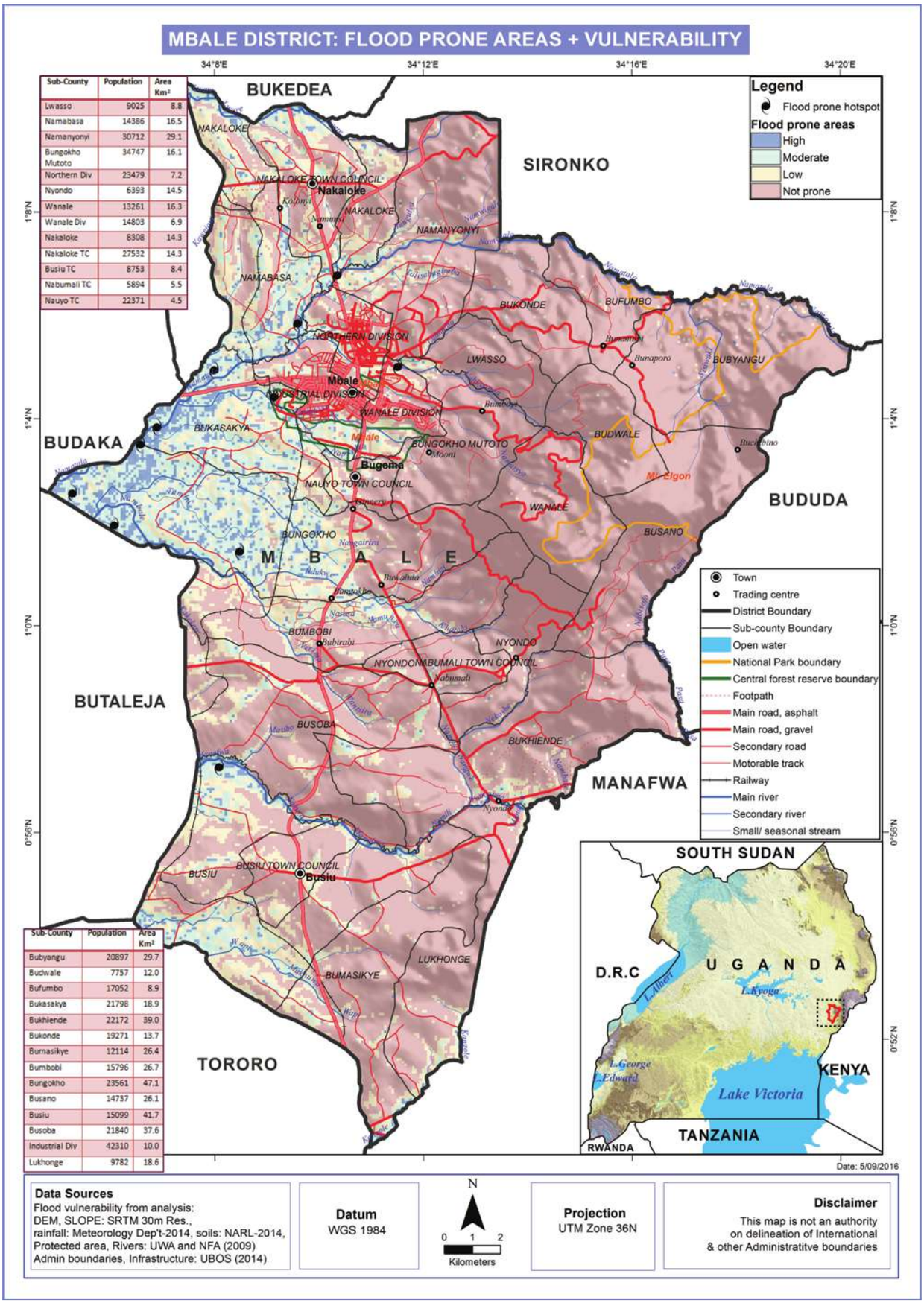


Figure 8: Flood Prone Areas and Vulnerability Ranking, Mbale District

4.2.2 Prolonged dry spells

Results from participatory assessments indicated that droughts in form of prolonged dry spells without rain are experienced in Mbale district. It was reported that the entire district is affected by these prolonged dry spells. However, it was pointed out that Bukhiende, Namabasa, Busiu and Bukonde sub-county are the most affected by the prolonged dry spells. Some of the effects of dry spells include; crop failures, lack of water and pastures for livestock and increased incidences of pests and diseases and drying of springs. This information was integrated with spatial modelling using socio-ecological spatial data i.e. Rainfall and Temperature (Uganda National Meteorological Authority, 2014) using the Standardized Precipitation Index (SPI) to generate drought vulnerability map. Figure 9 shows areas that are affected by drought and their ranking.

Plate 5: *One of the protected springs which dries up during prolonged dry spells in Budwale Sub county*

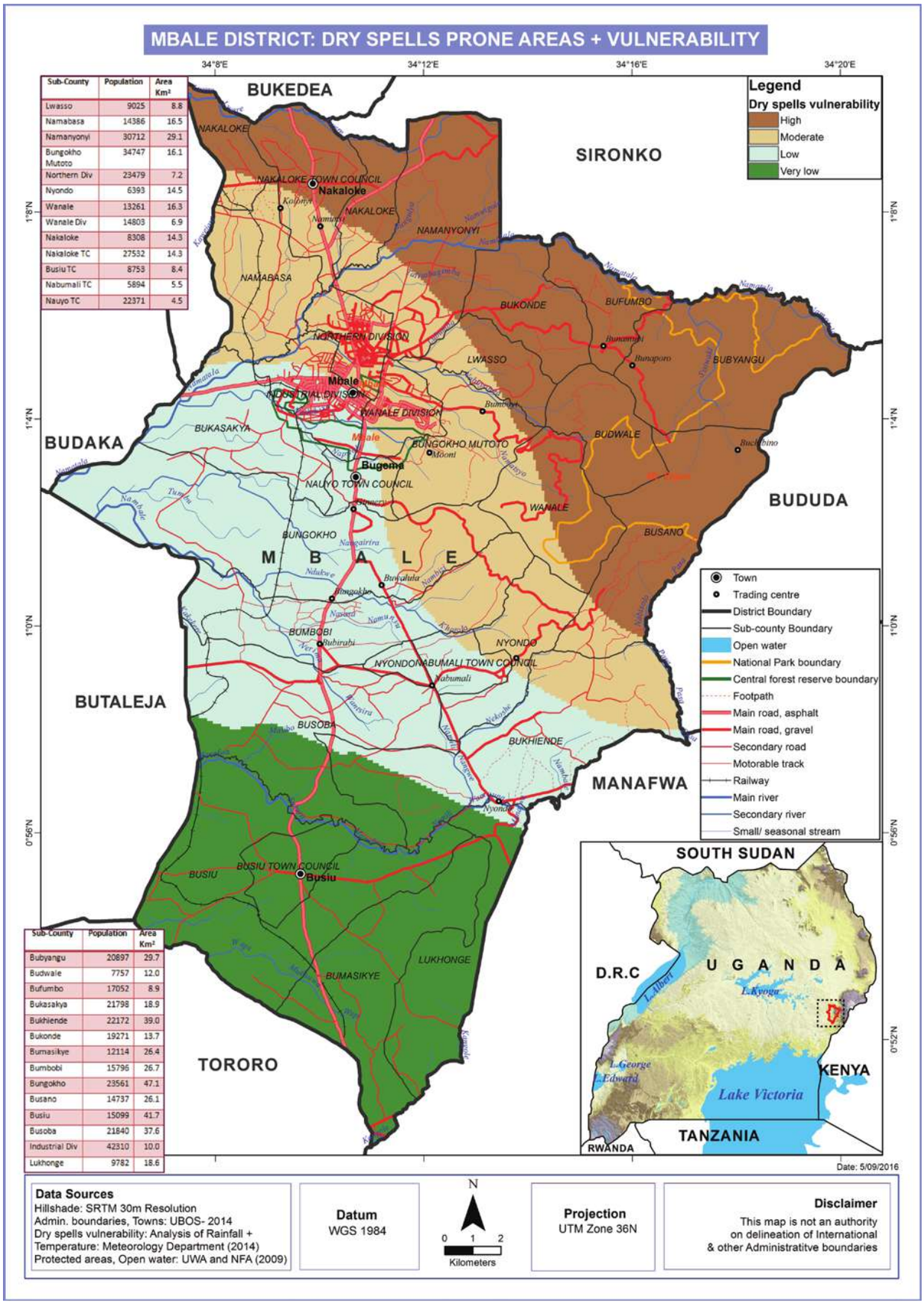


Figure 9: Prolonged dry spells Prone Areas and Vulnerability Ranking, Mbale District

4.2.3 Hailstorms

Participatory assessments through the focus group discussions indicated that hailstorms are a common occurrence in Mbale district and are experienced during rainy seasons. Participants reported that hailstorms usually cause serious damage to crops especially banana plantations. It was reported that the most affected sub-counties are; Namabasa and Bukonde.

4.2.4 Strong winds

Results from participatory assessments showed that strong winds were also a serious problem in the district during rainy seasons. It was reported that strong winds blew off the roofs at Namabasa Parish 2013 and 2016.

4.2.5 Lightning

Lightning is a sudden high-voltage discharge of electricity that occurs within a cloud, between clouds, or between a cloud and the ground. The distribution of lightning on Earth is far from uniform. The ideal conditions for producing lightning and associated thunderstorms occur where warm, moist air rises and mixes with cold air above. Participants in the focus group discussions mentioned that lightning was a serious problem in the district. It was reported that lightning is common in Mulukhu ward and Bukonde Sub County were Bubeta primary school was hit.

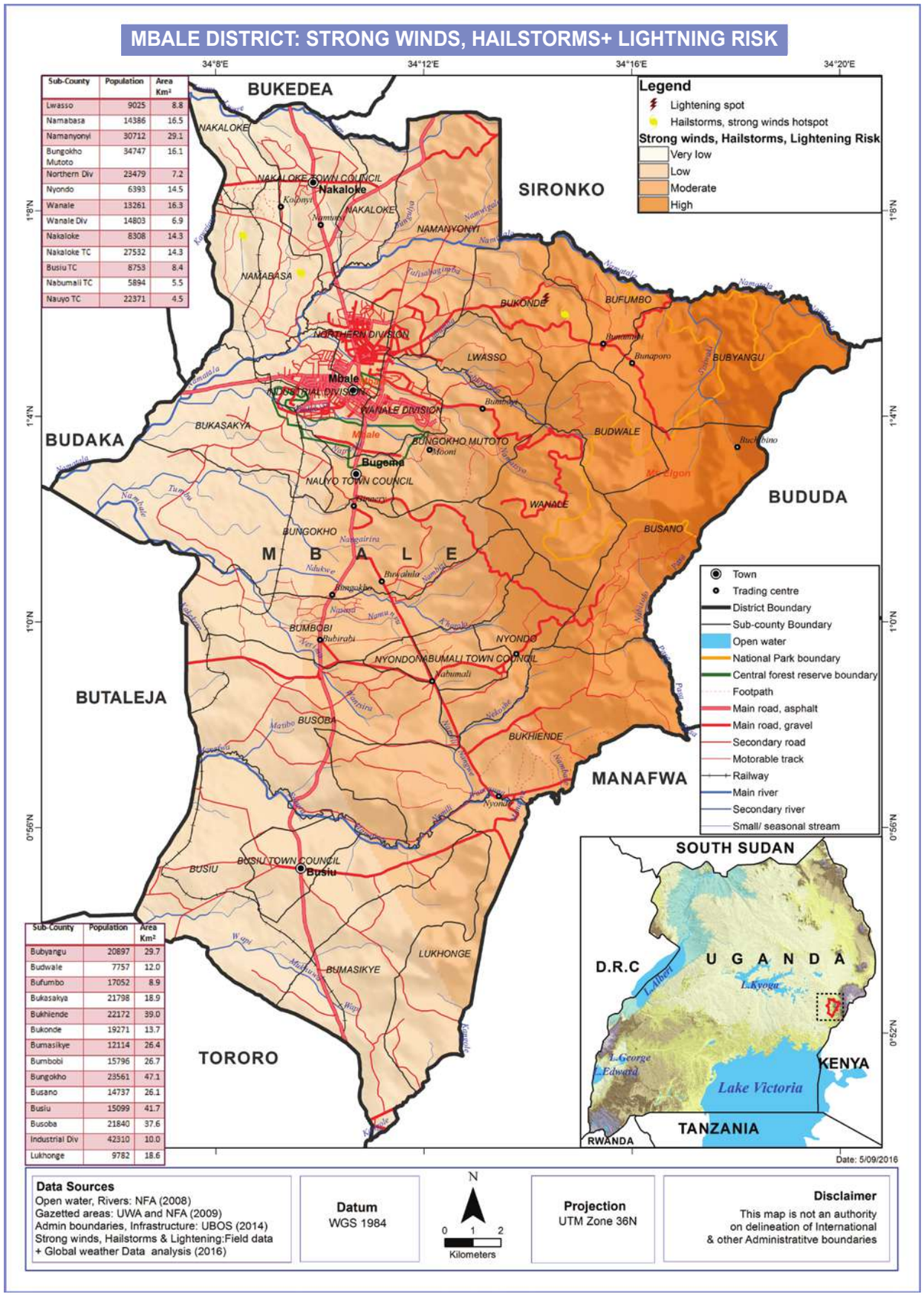


Figure 10: Strong winds, Hailstorms and Lightning Hotspots Vulnerability, Mbale District

4.3 Ecological and Biological Hazards

4.3.1 Crop Pests and Diseases

Results from participatory assessments indicated that Mbale district is prone to crop pests and diseases and (Figure 11). The most common crop pests and diseases in the district are shown in the table below;

Table 3: Common Crop diseases and pests

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

Plate 6: *A banana plantation infested with sigatoka in Bukasakya Sub County*

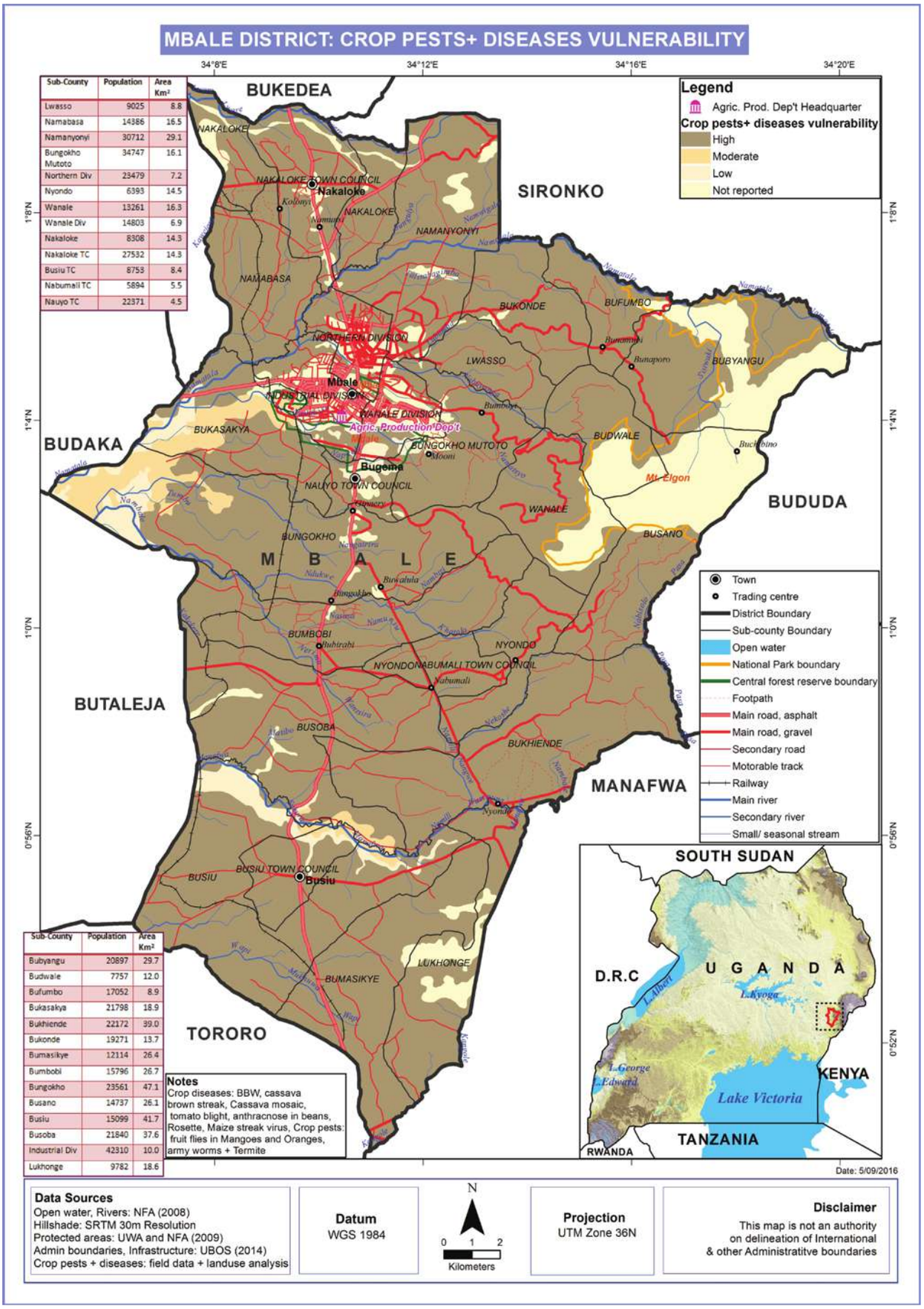


Figure 11: Crop Pests and Diseases Vulnerability, Mbale District

4.3.2 Livestock parasites and Diseases

Results from the focus group discussions showed that livestock pests and diseases were a common occurrence in the entire Mbale district (Figure 12). The most common livestock pests and diseases in the district are shown in the table below;

Table 4: Common Livestock Diseases and Pests

LIVESTOCK	DISEASE	Parasite/ vector
Cattle Goats Sheep	Lumpy skin, Tick borne disease, pink eye trypanasomiasis (Nagana) and brucellosis, Foot and mouth Disease	Intestinal worms, flukes, mites, ticks, nasal flies, tsetse flies, flees and nuisance flies.
Poultry	Coccidiosis, Newcastle	Mites
Bees	Fungal diseases	Birds, lizards, snakes, bats, moths, mites and baboons, beetles, rats, termites and ants.

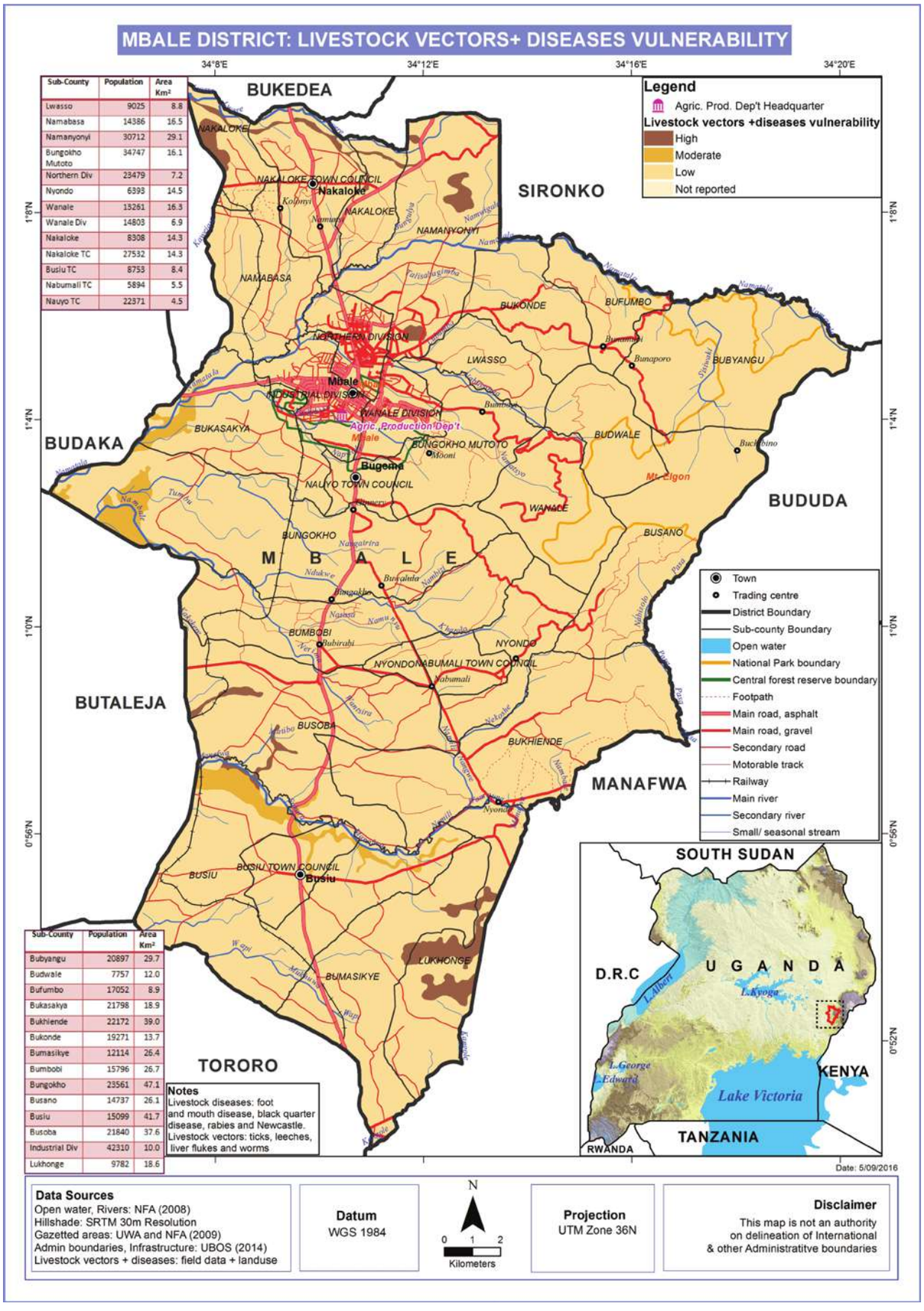
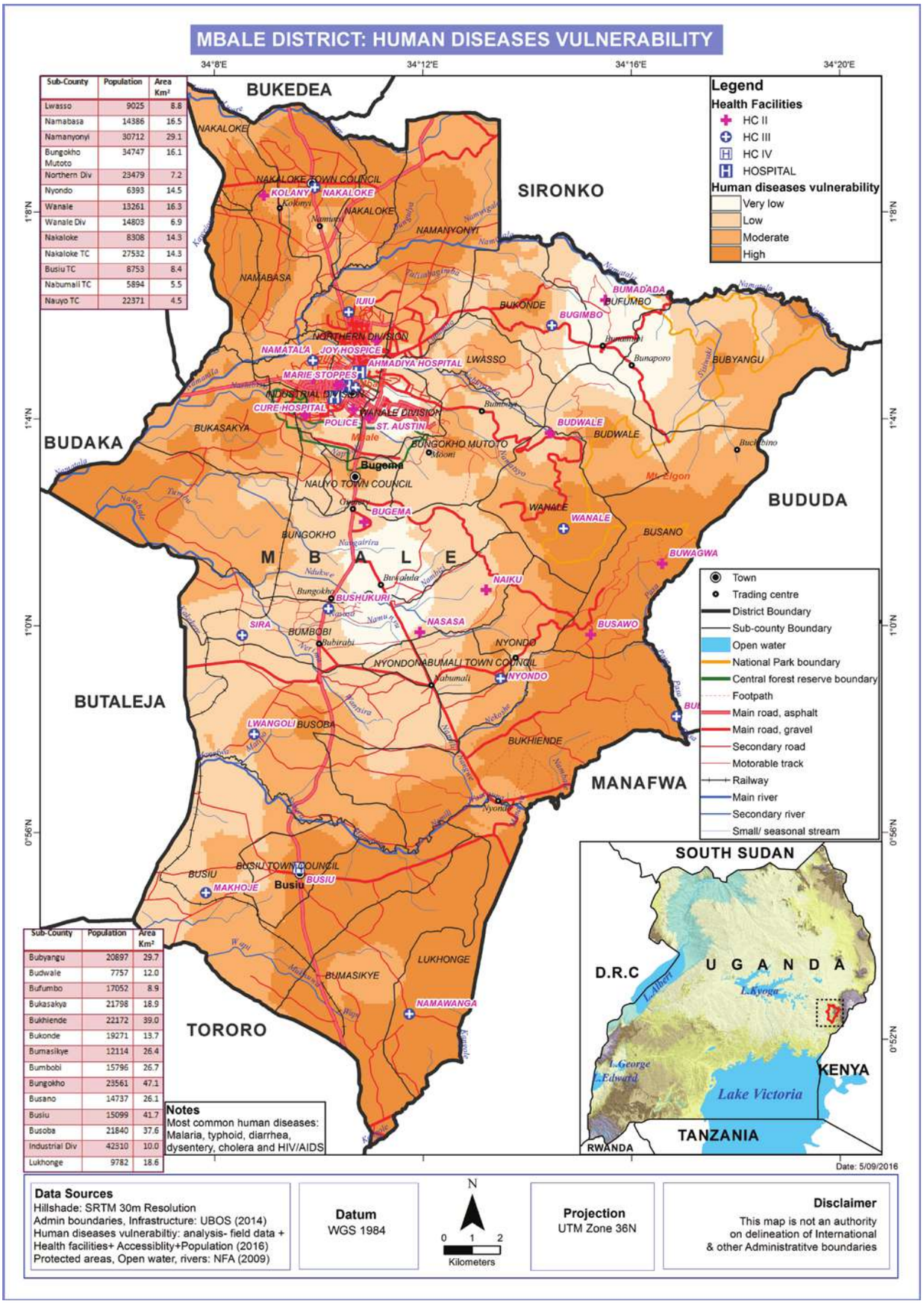


Figure 12: Livestock Pests and Diseases Vulnerability, Mbale District

4.3.3 Human Diseases

A number of human diseases were listed by Mbale District Health Department which include: cholera with registered cases in Nakaloke, Namanyonyi, Bukasakya, Nyondo where the first case (index case) was registered in Bubyangu in 2015 which eventually summed to 143 cases in the entire district and 8 deaths were registered, other diseases in the district include malaria, dysentery, Anemia , bilharzias, UTI's and HIV/ AIDS Where the district identified hot spots for high HIV/AIDS prevalence rate in the trading centers of Nkoma, Namakwekwe, Namatala, Moni, Busiu and Naboa Road in the municipality among others.



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Industrial Div	42310	10.0
Lukhonge	9782	18.6

Figure 13: Human Disease Prevalence and Health Facilities, Mbale District

4.3.4 Vermin and Wildlife Animal Attacks

Human wildlife conflicts are Minimal in the district especially to the local communities near Elgon National Park. Participants reported that wild animals such monkey raid crops in the sub-counties of Wanale Sub County in Bubwenze Prish. Efforts to control crop raiding have been done by Uganda Wildlife Authority and the district to control these wild animals (vermin).

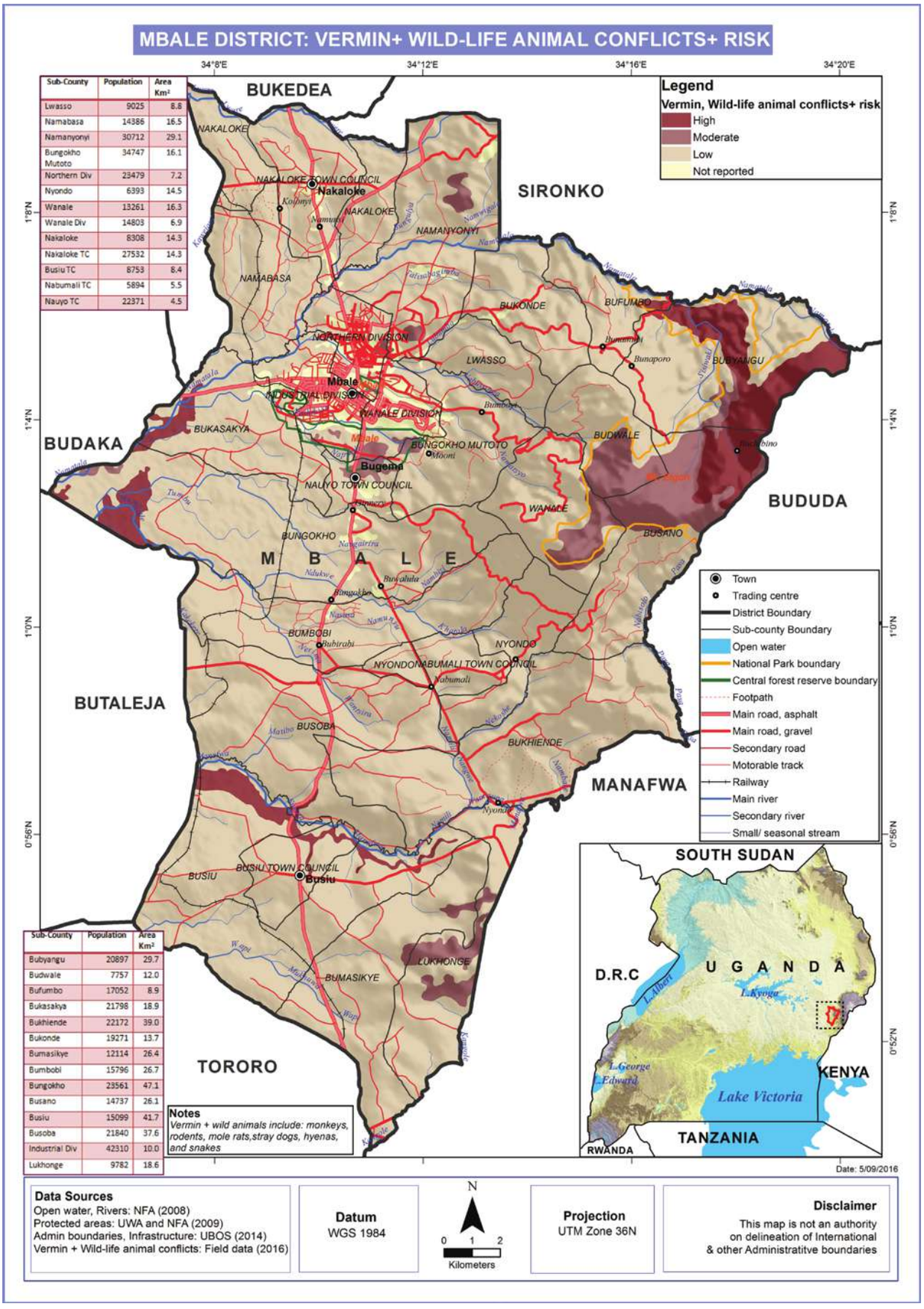

Figure 14: Vermin and Wildlife Animal Conflicts and Vulnerability, Mbale District

4.3.5 Invasive species

The most reported invasive species in Mbale district are; *Lantana camara*, *Oxalis latifolia* and Tithonia *diversifolia* (Figure 15). Participants noted that *Lantana camara* destroys grazing land by suppressing the growth of good pastures.

Plate 7: *Lantana camara in Busiu sub county*

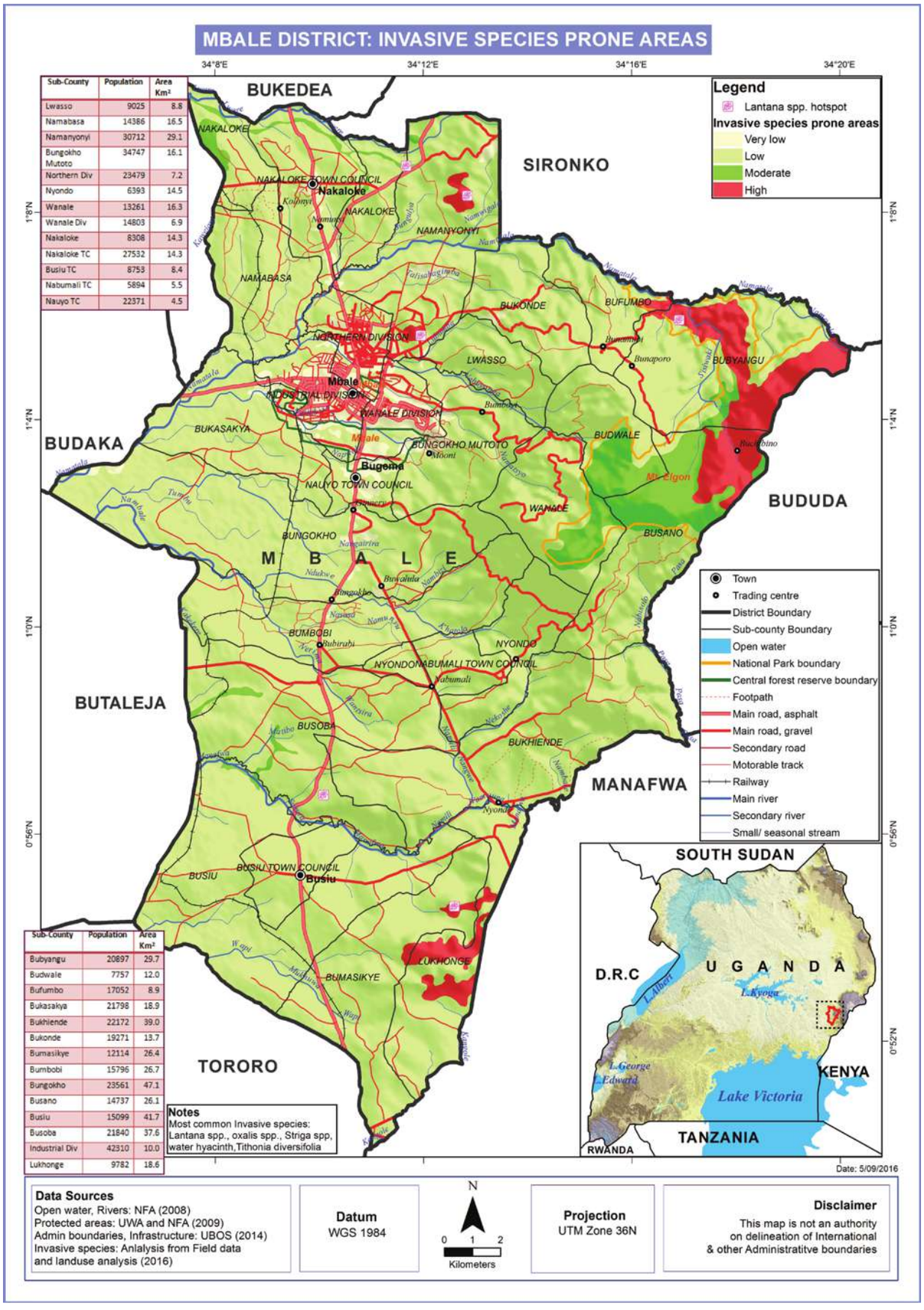

Figure 15: Invasive Species Vulnerability, Mbale District

4.4 Human Induced and Technological Hazards

4.4.1 Fire outbreaks

Participants in the focus group discussions indicated that there have been cases of bush fires were some of the Mbale central forest reserve sections were burnt by the local community in 2006 during presidential campaigns. Besides bush fires, other cases of fires outbreaks were reported for example Mbale central market which got burnt in 2012 and Kimwanga local market in 2010. Cases of house fire outbreaks were also reported, for example in Namatala ward (industrial division) 30 huts were burnt in 2016.

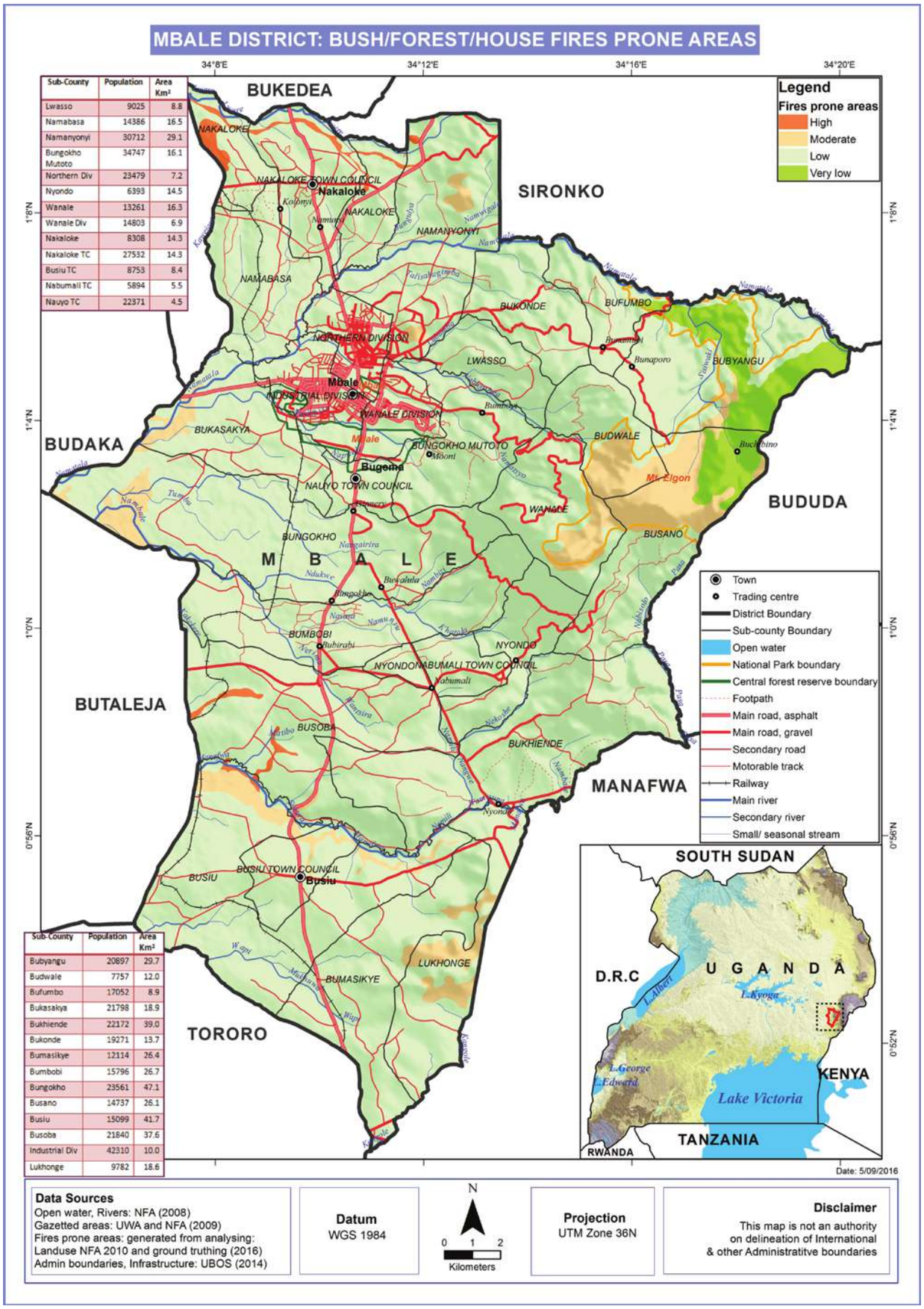

Figure 16: Bush/Forest fires Hotspot Areas and Vulnerability, Mbale District

4.4.2 Land conflicts

Results from the participatory assessments indicated that land conflicts were a serious problem in Mbale district. It was observed that land conflicts are the major causes of domestic violence and conflict in the entire district. It was also reported that there are boundary conflicts between Mbale and Budaka district, and Mbale - Butaleja on Namatala wetland. This border conflicts has often resulted in bloody rifts leading to serious incidences of tribal wars and even death. In 2013 some families were involved bloody conflict where 3 people were hacked to death due the conflict. The participatory assessments also indicated that there are land conflicts between Wanale Sub County and Elgon national park.

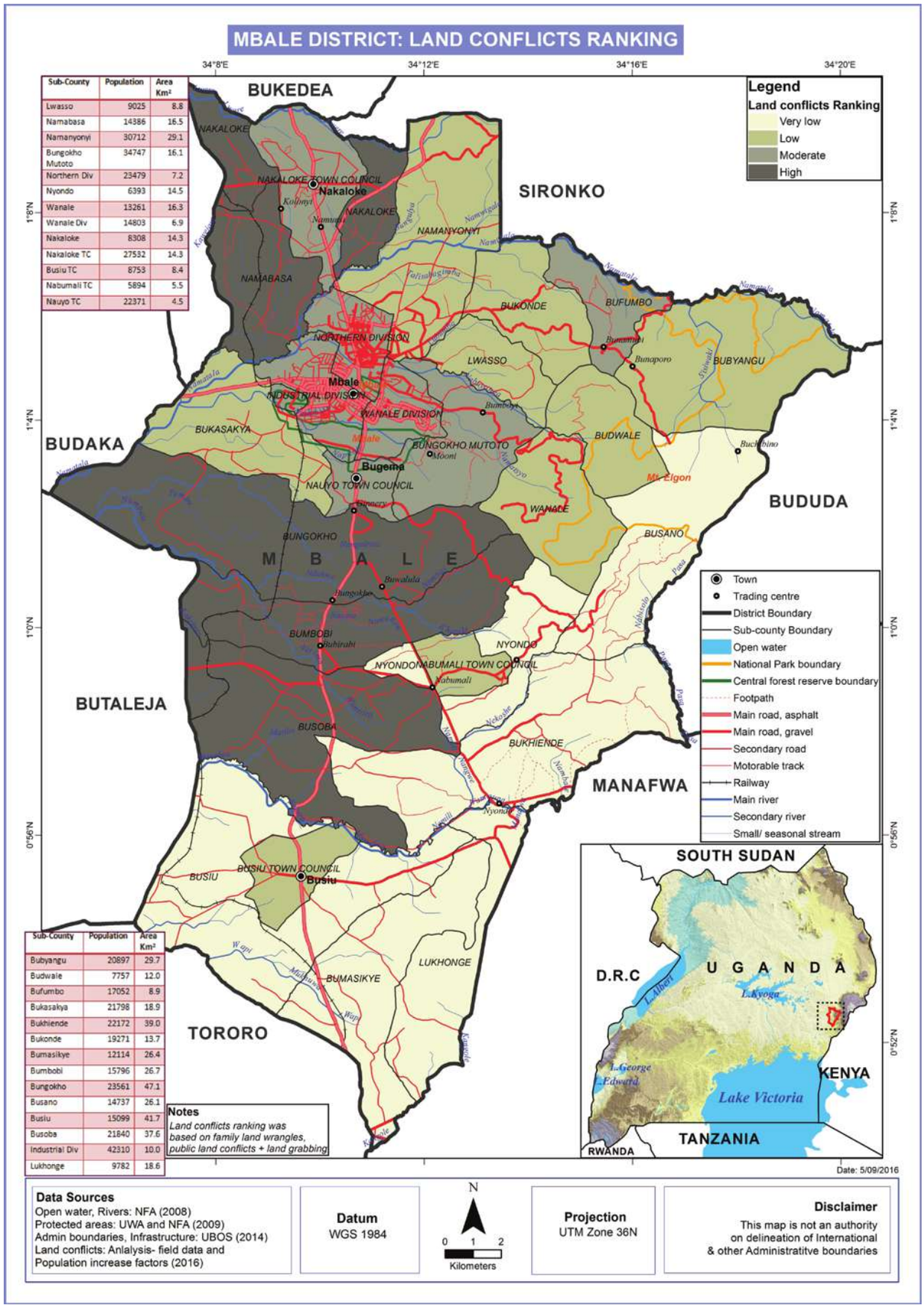

Figure 17: Land Conflicts Ranking, Mbale District

4.4.3 Environmental Degradation

Participatory assessments indicated that the most common forms of environmental degradation in Mbale district are; deforestation, planting of eucalyptus tree species near water source and wetlands, conversion of wetlands into agricultural land and sand mining in Busiu sub county and brick laying in Namabasa parish.

Plate 8: *Sand Mining in Busiu Sub-county in river Manafwa*

Plate 9: *Wetland degradation in Mamatala, wetland converted into paddy rice field*

Plate 10: *Waragi distillation activities in Musoto affecting the quality of water*

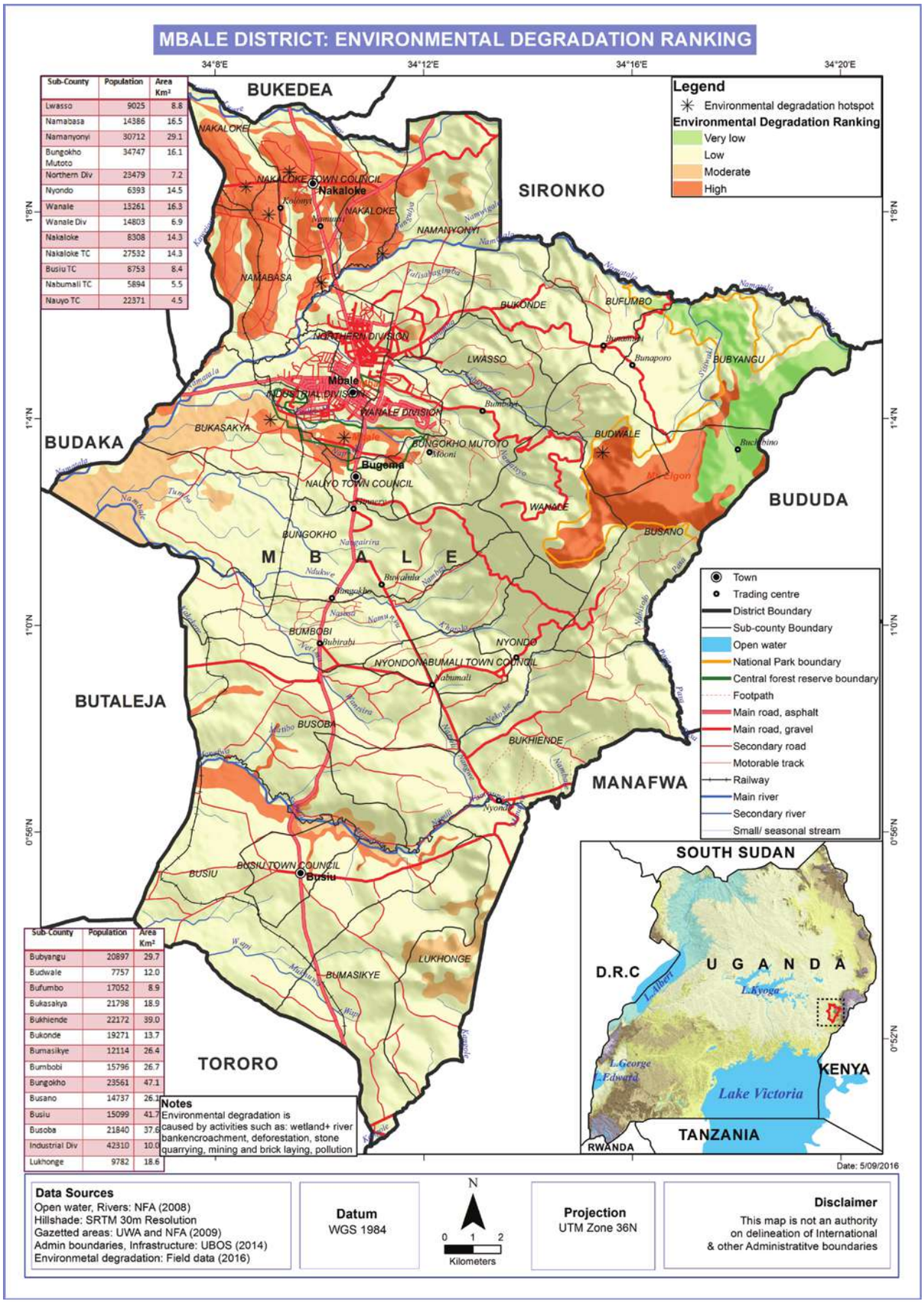

Figure 18: Environmental Degradation Ranking, Mbale District

4.4.4 Road and other Accidents

It was observed that road accidents mostly occur along the Kumi- Mbale- Tororo road especially at the junction that negotiates to St Paul College Gangama and Mbale-Tirinyi road.

Other accidents are associated with illegal electricity connections in rural Mbale for intense Busano and Bumasikye which has claimed people's lives termed as "snake bites ".

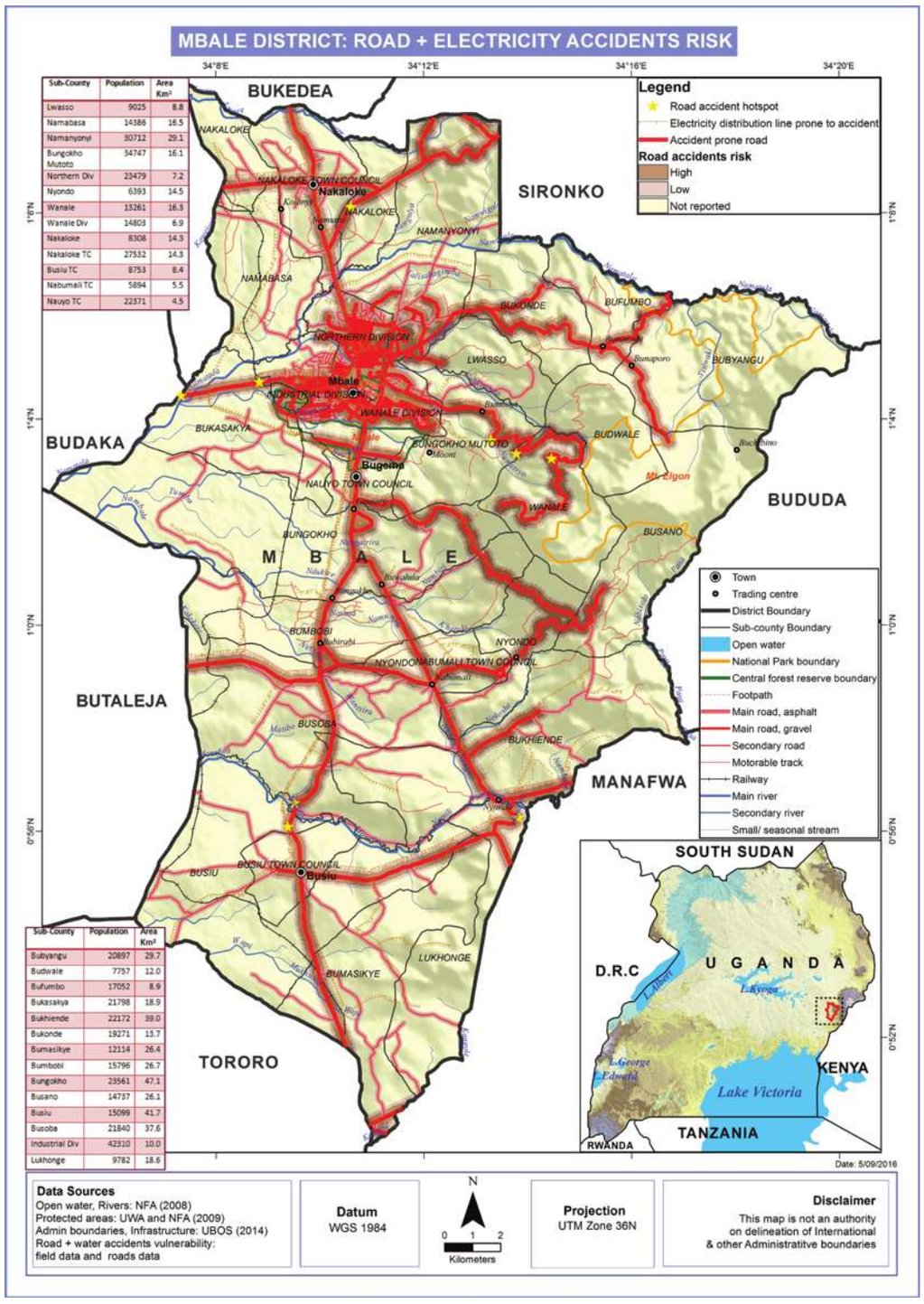

Figure 19: Road Accidents Hotspots and Vulnerability, Mbale District

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

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

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

Table 5: Components of Vulnerability in Mbale District

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

Vulnerability	Exposure			Susceptibility			Resilience
Socio-economic Component	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	District	- Vaccination - Burry and burn animals that have died from infection - Quarantine	District
	Human Disease outbreaks	- Human Population	District	- Loss of lives	District	- Mass Immunization - Use of mosquito nets	District
	Invasive species	- indigenous species - Animals	District	- Outcompete the indigenous spp., suppress growth of indigenous species - Loss of indigenous species. - Complete crop Failure - suppress growth of pasture	District	- Cut and burn - Sensitization on Invasive species management	District

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

Vulnerability	Exposure			Susceptibility			Resilience
Environmental Component	Landslides, Rock falls and Soil erosion	- Human and livestock adjacent to hill slopes - Crops on hill slopes - Infrastructure e.g. houses, schools, roads adjacent to hill slopes	Parish	- Loss of lives - Complete crop failure - Destruction of infrastructure e.g. homes, and schools	Parish	- Migration - Sensitization by both government and non-governmental agencies	
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Vulnerability	Exposure			Susceptibility			Resilience
Environmental Component	Hailstorms, strong winds and Lightning	- Human and livestock populations - Crops - Infrastructure e.g. houses, schools, health centers	Parish	- Loss of lives - Destruction of crops - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain	Parish		
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Vulnerability	Exposure			Susceptibility			Resilience
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	Environmental degradation	- Human and livestock populations - Crops - Natural vegetation	Sub-county	- Crop failure - Shortage of pasture - Shortage of water - Decline of water quality	Sub-county	- Sensitization on wetland conservation - Sensitization on tree plating - Setting bi-laws	

Table 6: Vulnerability Profile for Mbale 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	Nakaloke, Namabasa, Namanyonyi, Bukasakya, Busiu,Bungokho, Bungokho-Mutoto, Industrial division
Dry spells	4	4	16	Nakaloke, Namabasa, Namanyonyi, Bukasakya, Busiu,Bungokho, Bungokho-Mutoto, Industrial division
Soil erosion, rock falls and landslides	5	4	20	Wanale, Bufumbo, Busano, Budwale, Bukonde
Hail storms, lightning and strong winds	4	3	12	Nakaloke, Namabasa, Namanyonyi, Bukasakya, Busiu,Bungokho, Bungokho-Mutoto, Industrial division
Bush fires	4	3	12	Industrial area, Wanale division, Northern Division, Nakaloke T.C

Crop pests and diseases	4	3	12	Nakaloke, Namabasa, Namanyonyi, Bukasakya, Busiu,Bungokho, Bungokho-Mutoto, Industrial division
Livestock pests and diseases	4	3	12	Nakaloke, Namabasa, Namanyonyi, Bukasakya, Busiu,Bungokho, Bungokho-Mutoto, Industrial division
Human Diseases outbreaks	5	3	15	Nakaloke, Namabasa, Namanyonyi, Bukasakya, Busiu,Bungokho, Bungokho-Mutoto, Industrial division
Land conflicts	4	3	12	Entire district
Vermin and Wild-life animal attacks	5	4	20	Wanale, Bufumbo, Budwale
Earthquakes and faults	3	1	3	Not serious
Road accidents and Water accidents	4	2	8	Muncipality, Busiu, Bungokho, Bungokho-Mutoto, Nakaloke
Environmental degradation	4	4	16	Entire district
Invasive species	4	2	8	Not very serious

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

Key for Relative Risk

	High
	Medium
	Low
	Not reported/ Not prone

Table 7: Hazard Risk Assessment

Hazard	gBufumbo	Bukassakya	Bukhiende	Bukonde	Bumboi	Bungokho	Bungokho-Mutoto	Busiu	Nakaloke	Nakaloke T.C.	Industrial Division	Wanale Division
Floods	L	H	L	L	L	H	H	M	H	M	M	L
Dry spells	VL	M	L	VL	L	M	M	M	M	M	M	L
Landslides, Rock falls and Erosion	H	L	M	H	M	VL	VL	VL	VL	VL	VL	M
Strong winds, Hailstorms and Lightning	L	M	L	L	L	H	H	H	H	H	H	L
Crop pests and Diseases	M	M	M	L	M	M	M	M	M	M	M	M
Livestock pests and Diseases	L	H	L	L	L	M	H	M	H	H	M	M
Human disease outbreaks	L	M	M	L	L	M	H	H	H	H	H	H
Vermin and Wild-life animal attacks	H	M	M	H	M	L	L	L	VL	VL	VL	M
Land conflicts	H	L	L	M	M	H	H	H	M	M	M	M
Bush fires	L	M	L	L	L	M	H	M	M	L	H	M
Environmental degradation	H	H	H	H	H	H	H	H	H	M	H	H
Earthquakes and faults	VL	VL	VL	VL	VL	VL	VL	VL	VL	VL	VL	VL
Road and Water accidents	M	M	M	M	M	M	H	H	H	H	M	M
Invasive species	L	M	M	L	L	M	M	M	M	VL	VL	L

Hazard	Nothern Division Lwaso	Namanyonyi	Busoba	Lukonge	Budwale	Namabasa	Nabumali T.C.	Busiu T.C.	Bubyangu	Busano	Nyndo	Bumasikye
Floods	L	M	H	L	L	L	H	L	M	L	L	L	L
Dry spells	VL	L	M	L	L	L	M	L	M	L	L	L	L
Landslides, Rock falls and Erosion	H	L	L	M	M	H	VL	M	VL	H	H	M	M
Strong winds, Hailstorms and Lightning	L	M	M	L	L	L	H	L	M	L	L	M	M
Crop pests and Diseases	M	M	M	M	M	M	H	M	M	M	M	M	M
Livestock pests and Diseases	L	M	M	M	M	M	H	M	M	M	M	M	M
Human disease outbreaks	M	M	H	M	M	M	H	M	M	M	M	M	M
Vermin and Wild-life animal attacks	M	M	L	M	M	M	M	L	L	H	M	M	L
Land conflicts	M	M	M	M	M	M	H	M	M	M	M	M	M
Bush fires	L	M	M	L	L	L	H	L	L	L	L	L	L
Environmental degradation	H	H	H	H	H	H	H	M	H	H	H	H	H
Earthquakes and faults	VL	VL	VL	VL	VL	VL	VL	VL	VL	VL	VL	VL	VL
Road and Water accidents	M	M	M	M	M	M	M	M	H	H	M	M	M
Invasive species	L	L	L	L	L	L	M	L	L	L	L	L	L

Key

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

4.5.1 Gender and Age groups mostly affected by Hazards

Table 8: Gender and age groups mostly affected by hazards

Hazard	Gender and Age mostly affected
Dry spells	Affects mostly women and children since most water wells dry up increasing distance for fetching water
Erosion	All age groups and gender are affected
Hailstorms Lightning	All gender and age groups Children in schools are mostly affected
Crop pests and Diseases	All gender and age groups
Livestock pests and Diseases	All gender and age groups
Human disease outbreaks	All gender and age groups
Vermin and Wildlife animal attacks	All gender and age groups
Land conflicts	All gender and age groups
Bush fires	All gender and age groups
Environmental degradation	All gender and age groups
Road accidents	All gender and age groups

4.5.2 Coping Strategies

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

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

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

6	Ecological or Biological	Crop pests and Diseases	• Spraying pests • Cutting and burying BBW affected crops • Burning of affected crops • Vigilance
7		Livestock pests and Diseases	• Spraying pests • Vaccinations • Burying animals that have died from infection • Quarantine
8		Human epidemic Diseases	• Mass immunisation • Visiting health centres • Use of mosquito nets
9		Vermin and Wild-life animal attacks	• Guarding the gardens • Poisoning • Hunt and kill • Report to UWA • Hugo group • Mauritius thorns • Plant tea as buffer • Dig trenches • Chain link • Plant red pepper as buffer • Recommend vermin guards • Elect / construct electric fences
10		Invasive species	• Uproot • Spray with herbicides (e.g 2-4-D) • Biological control (e.g beetles) • Cut and burn • Sensitization on Invasive species management • Blacklisting exotic species

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

GENERAL 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 Mbale district has over the past two decades increasingly experienced hazards including rock falls, soil erosion, floods, drought, hailstorms, strong winds, lightning, crop pests and diseases, livestock pests and diseases, human disease outbreaks, vermin, wildlife animal attacks, invasive species, bush fires and land conflicts putting livelihoods at increased risk. Generally, landslides and flooding were identified as most serious problem in Mbale 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 Mbale district increase their vulnerability to hazard exposure necessitating urgent external support.

Hazards experienced in Mbale 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 early 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 programs aimed at disaster risk reduction.
iv. The government should increase awareness campaigns aimed at sensitizing farmers/ communities on disaster risk reduction initiatives and practices.
v. The government should revive disaster committees at district level and ensure funding of disaster and environmental related activities.
vi. The government through UNRA and the District Authority should fund periodic maintenance of feeder roads to reduce on traffic accidents.
vii. Government should increase funding to the road sector to districts and decentralize most roads in the district to district for ease of maintenance.
viii. Government should speed up the process of acquiring the new road equipment to the district.
ix. The government through MAAIF and the District Production Office should promote drought and disease resistant crop seeds.
x. The government through relevant Ministries should increase importation of lightning conductors and also reduce taxes on their importation.
xi. The government through OPM and Meteorology Authority should support establishment of disaster early warning systems.
xii. The government through MWE increase funding and staff to monitor wetland degradation and non-genuine agro-inputs.
xiii. The government through OPM should improve communication between the disaster department and local communities.
xiv. The government through MWE should promote Tree planting along road reserves.
xv. The government through MAAIF should fund and recruit extension works at sub-county level
xvi. To fund research on drought and disease resistant crops
xvii. Government should conduct elections for LCI and LCII's to handle cases of customary land conflicts as courts of first instance.
xviii. There should be special conditional grants to handle acquisition of land titles for all government lands, the local government should enforce soil and water conservation measures such as terracing, contour farming , Plant trees to control water movement on hill slopes, mulching in banana plantations, plant grass in banana plantations on hill slopes , removal of stones from banana farmlands.

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APPENDIX I: DATA COLLECTION TOOLS

Key informant interview at Mbale district headquarters

FOCUS GROUP DISCUSSION GUIDE FOR DISTRICT DISASTER RISK MANAGEMENT FOCAL PERSONS

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

No.	Name of Participants	Designation	Contact	Signature

Introduction

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

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

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

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

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

1. Which crops are majorly grown in your area of jurisdiction?
2. Which domestic animals are dominant in your area of jurisdiction?
3. What challenges are faced by farmers in your area of jurisdiction?
4. Have you experienced landslides and rock falls in the past 10 years in your area of jurisdiction?

5. Which villages, parishes or sub-counties have been most affected by landslide and rock falls?
6. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
7. Which crops are majorly affected by landslides and rock falls in your area of jurisdiction?
8. In which way are the crops affected by landslides and rock falls?
9. Which domestic animals are majorly affected by landslides and rock falls in your area of jurisdiction?
10. In which way are the domestic animals affected by landslides and rock falls?
11. Which agricultural practices are being adopted by farmers in a bid to mitigate the above challenges?
12. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?
13. Do you have any earth faults or earth cracks as lines of weakness in your area of jurisdiction?
14. Have you experienced any earth quakes in the past 10 years in your area of jurisdiction?
15. Which particular villages, parishes or sub-counties have been majorly affected by earth quakes in your area of jurisdiction?
16. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
17. What impacts have been caused by earth quakes?
18. To what extent have the earth quakes affected livelihoods of the local communities in your area of jurisdiction?
19. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?
20. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

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

21. Have you experienced floods in the past 10 years in your area of jurisdiction?
22. Which villages, parishes or sub-counties have been most affected by floods?
23. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
24. Which crops are majorly affected by floods in your area of jurisdiction?
25. In which way are the crops affected by floods?
26. Which domestic animals are majorly affected by floods in your area of jurisdiction?
27. In which way are the domestic animals affected by floods?
28. Which agricultural practices are being adopted by farmers in a bid to mitigate the above challenges?
29. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?
30. Have you experienced drought in the past 10 years in your area of jurisdiction?
31. Which villages, parishes or sub-counties have been most affected by drought?

32. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
33. Which crops are majorly affected by drought in your area of jurisdiction?
34. In which way are crops affected by drought?
35. Which domestic animals are majorly affected by drought in your area of jurisdiction?
36. In which way are the domestic animals affected by drought?
37. Which agricultural practices are being adopted by farmers in a bid to mitigate the above challenges?
38. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?
39. Have you experienced hailstorms or lightning in the past 10 years in your area of jurisdiction?
40. Which villages, parishes or sub-counties have been most affected by hailstorms or lightning?
41. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
42. What impacts have been caused by hailstorms or lightning?
43. To what extent have the hailstorms or lightning affected livelihoods of the local communities in your area of jurisdiction?
44. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?
45. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

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

46. Have you experienced any epidemic animal disease outbreaks in the past 10 years in your area of jurisdiction?
47. Which villages, parishes or sub-counties have been most affected by epidemic animal disease outbreaks?
48. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
49. Specify the epidemic animal disease outbreaks that have majorly affected animals in your area of jurisdiction?
50. Which domestic animals are majorly affected by epidemic animal disease outbreaks in your area of jurisdiction?
51. In which way are the domestic animals affected by epidemic animal disease outbreaks?
52. Which mitigation practices are being adopted by farmers in a bid to mitigate the above epidemic animal disease outbreaks?
53. What are the relevant government's interventions focusing at helping farmers mitigate the epidemic animal disease outbreaks mentioned?
54. Have you experienced any crop pests and disease outbreaks in the past 10 years in your area of jurisdiction?
55. Which villages, parishes or sub-counties have been most affected by epidemic animal

disease outbreaks?

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

71. What impacts have been caused by wildlife attacks?

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

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

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

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

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

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

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

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

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

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

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

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

83. Have you experienced environmental degradation in your area of jurisdiction?
84. What forms of environmental degradation have been experienced in your area of jurisdiction?
85. Which villages, parishes or sub-counties have been most affected by environmental degradation?
86. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
87. What impacts have been caused by environmental degradation?
88. Which measures have been adopted by local communities in a bid to mitigate the above challenges?
89. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
90. Have you experienced land conflicts in the past 10 years in your area of jurisdiction?
91. Which particular villages, parishes or sub-counties have been majorly affected by land conflicts in your area of jurisdiction?
92. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
93. What impacts have been caused by land conflicts?
94. To what extent have the land conflicts affected livelihoods of the local communities in your area of jurisdiction?
95. Which conflict resolution measures have been adopted local communities in a bid to mitigate the above challenges?
96. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
97. Have you experienced Road accidents in the past 20 years in your area of jurisdiction?
98. Which roads have experienced Road accidents?
99. What impacts have been caused by Road accidents?
100. To what extent have the Road accidents affected livelihoods of the local communities in your area of jurisdiction?
101. Which conflict resolution measures have been adopted local communities in a bid to mitigate the above challenges?
102. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
103. Have you experienced any serious bush and or forest fires in the past 10 years in your area of jurisdiction?
104. Which particular villages, parishes or sub-counties have been majorly affected by bush and or forest fires in your area of jurisdiction?
105. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?

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

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

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

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

FOCUS GROUP DISCUSSION GUIDE FOR LOCAL COMMUNITIES

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

No.	Name of Participants	Village/ Parish	Contact	Signature

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

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

1. Which crops are majorly grown in your community?
2. Which domestic animals are dominant in your community?
3. What challenges are faced by farmers in your community?
4. Have you experienced landslides and rock falls in the past 10 years in your community?
5. Which villages and parishes have been most affected by landslide and rock falls?
6. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?
7. Which crops are majorly affected by landslides and rock falls in your community?
8. In which way are the crops affected by landslides and rock falls?
9. Which domestic animals are majorly affected by landslides and rock falls in your community?
10. In which way are the domestic animals affected by landslides and rock falls?
11. Which agricultural practices are being adopted by farmers in a bid to mitigate the above challenges?
12. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?
13. Do you have any earth faults or earth cracks as lines of weakness in your community?
14. Have you experienced any earth quakes in the past 10 years in your community?
15. Which particular villages, parishes or sub-counties have been majorly affected by earth quakes in your community?
16. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes that have been most affected?
17. What impacts have been caused by earth quakes?
18. To what extent have the earth quakes affected livelihoods of the local communities in your community?
19. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?
20. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

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

21. Have you experienced floods in the past 10 years in your community?
22. Which villages and parishes have been most affected by floods?
23. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?
24. Which crops are majorly affected by floods in your community?
25. In which way are the crops affected by floods?
26. Which domestic animals are majorly affected by floods in your community?
27. In which way are the domestic animals affected by floods?
28. Which agricultural practices are being adopted by farmers in a bid to mitigate the

above challenges?

29. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?
30. Have you experienced drought in the past 10 years in your community?
31. Which villages and parishes have been most affected by drought?
32. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?
33. Which crops are majorly affected by drought in your community?
34. In which way are crops affected by drought?
35. Which domestic animals are majorly affected by drought in your community?
36. In which way are the domestic animals affected by drought?
37. Which agricultural practices are being adopted by farmers in a bid to mitigate the above challenges?
38. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?
39. Have you experienced hailstorms or lightning in the past 10 years in your community?
40. Which villages and parishes have been most affected by hailstorms or lightning?
41. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?
42. What impacts have been caused by hailstorms or lightning?
43. To what extent have the hailstorms or lightning affected livelihoods of the local communities in your community?
44. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?
45. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

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

46. Have you experienced any epidemic animal disease outbreaks in the past 10 years in your community?
47. Which villages and parishes have been most affected by epidemic animal disease outbreaks?
48. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?
49. Specify the epidemic animal disease outbreaks that have majorly affected animals in your community?
50. Which domestic animals are majorly affected by epidemic animal disease outbreaks in your community?
51. In which way are the domestic animals affected by epidemic animal disease outbreaks?
52. Which mitigation practices are being adopted by farmers in a bid to mitigate the above epidemic animal disease outbreaks?
53. What are the relevant government's interventions focusing at helping farmers mitigate the epidemic animal disease outbreaks mentioned?

54. Have you experienced any crop pests and disease outbreaks in the past 10 years in your community?
55. Which villages and parishes have been most affected by epidemic animal disease outbreaks?
56. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?
57. Specify the crop pests and disease outbreaks that have majorly affected animals in your community?
58. Which crops are majorly affected by crop pests and disease outbreaks in your community?
59. In which way are the crops affected by crop pests and disease outbreaks?
60. Which mitigation practices are being adopted by farmers in a bid to mitigate the above crop pests and disease outbreaks?
61. What are the relevant government's interventions focusing at helping farmers mitigate the crop pests and disease outbreaks mentioned?
62. Have you experienced any epidemic human disease outbreaks in the past 10 years in your community?
63. Specify the epidemic human disease outbreaks that have majorly affected animals in your community?
64. In which way are the humans affected by epidemic human disease outbreaks?
65. Which mitigation measures have been adopted by local communities in a bid to mitigate the above epidemic human disease outbreaks?
66. What are the relevant government's interventions focusing at helping local communities mitigate the epidemic human disease outbreaks mentioned?
67. Do you have any national park or wildlife reserve in your area of jurisdiction?
68. Have you experienced wildlife attacks in the past 10 years in your community?
69. Which particular villages and parishes have been majorly affected by wildlife attacks in your community?
70. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?
71. What impacts have been caused by wildlife attacks?
72. To what extent have the wildlife attacks affected livelihoods of the local communities in your community?
73. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?
74. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
75. Are there invasive species in your community?
76. Specify the invasive species in your community?
77. Which villages and parishes have been most affected by invasive species in your community?
78. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?
79. Which crops or animals are majorly affected by invasive species in your community?
80. In which way are the crops or animals affected by invasive species?

81. Which mitigation practices are being adopted by farmers in a bid to mitigate the above invasive species?
82. What are the relevant government's interventions focusing at helping farmers mitigate the invasive species mentioned?

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

83. Have you experienced environmental degradation in your community?
84. What forms of environmental degradation have been experienced in your community?
85. Which villages and parishes have been most affected by environmental degradation?
86. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?
87. What impacts have been caused by environmental degradation?
88. Which measures have been adopted by local communities in a bid to mitigate the above challenges?
89. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
90. Have you experienced land conflicts in the past 10 years in your community?
91. Which particular villages and parishes have been majorly affected by land conflicts in your community?
92. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?
93. What impacts have been caused by land conflicts?
94. To what extent have the land conflicts affected livelihoods of the local communities in your community?
95. Which conflict resolution measures have been adopted local communities in a bid to mitigate the above challenges?
96. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
97. Have you experienced Road accidents in the past 20 years in your community?
98. Which roads have experienced Road accidents?
99. What impacts have been caused by Road accidents?
100. To what extent have the Road accidents affected livelihoods of the local communities in your community?
101. Which conflict resolution measures have been adopted local communities in a bid to mitigate the above challenges?
102. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
103. Have you experienced any serious bush and or forest fires in the past 10 years in your community?
104. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
105. What impacts have been caused by serious bush and or forest fires?
106. To what extent have the serious bush and or forest fires affected livelihoods of the local

communities in your community?

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

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

ATTENDANCE LIST FOR DISTRICT DISASTER RISK MANAGEMENT FOCAL PERSONS

	Name of Participant	**Designation**	**Contact**
1	Issa Ziwedde	D/CAO	0772470138
2	Akorimo Deogracious	M.E	0772620910
3	Mabuya George	DFO	0772479537
4	Opusi Joseph	DNRO	0772682978
5	Nakayenze Anna	SE ENVI OFFICER	0772555387
6	Madoi Ayub	DHO	0776909823
7	Masagwayi Agnes		0754492419
8	Musungu Thomas	DIO	0776564113
9	Namakhola Rajab	SAE	0782767567
10	Waniale Abdallah	DP	0772903626
11	Mayegu Isaac	SENIOR ENTOMOLOGIST	0702875602

SPATIAL DATA COLLECTION SHEET FOR HAZARD VULNERABILITY AND RISK MAPPING

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

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

Sub- county:

Parish:

Village:</td><td colspan="3">Coordinates</td></tr>
<tr><td colspan="4" rowspan="2"></td><td>X:</td><td></td><td></td></tr>
<tr><td>Y:</td><td></td><td></td></tr>
<tr><td colspan="4" rowspan="2"></td><td>Altitude</td><td></td><td></td></tr>
<tr><td colspan="2">Slope characterization</td><td colspan="2">Bio-physical characterization</td><td colspan="2">Vegetation characterization</td><td>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><td rowspan="5"></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>
</table>

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)

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