



Hoima District

Hazard, Risk and Vulnerability Profile



2016

Acknowledgment

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

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My appreciation also goes to Hoima District Team;

1. Mr. Luke L.L Lokuda – Chief Administrative Officer
2. Ms. Nyangoma Joseline – District Natural Resources Officer
3. Ms. Nsita Gertrude - District Environment Officer

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

Hon. Hilary O. Onek

Minister for Relief, Disaster Preparedness and Refugees

EXECUTIVE SUMMARY

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

Preliminary spatial analysis

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

Stakeholder engagements

Stakeholder engagements were carried out in close collaboration with OPM's DRM team and the District Disaster Management focal persons with the aim of identifying the various hazards ranging from drought, floods, landslides, human, animal and crop diseases, pests, wildlife animal attacks, earthquakes, fires and conflicts among others. Stakeholder engagements were done through Focus Group Discussions (FGDs) and Key Informant Interviews guided by checklist tools (Appendix I). At District level, Key Informants included: District Environment Officer, District Production Officer and District Fisheries Officer while at Sub-county level key informants included: Sub-county and parish chiefs and Community Development Officers.

FGDs were carried out in four purposively selected sub-counties that were ranked with the highest vulnerability. FGDs comprising of an average of 12 respondents (crop farmers, local leaders, fishermen and cattle keepers) were conducted at Kyabigambire, Buseruka, Kabwoya and Buhimba 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 hazards prone areas on the Hazard base maps. This was done during the FGDs and participants were requested through a participatory process to develop a community hazard profile map.

Geo-referencing and ground-truthing

The identified hazard hotspots in the community profile maps were ground-truthed and geo-referenced using a handheld Spectra precision Global Positioning System (GPS) unit, model: Mobile Mapper 20 set in WGS 1984 Datum. The entities captured included: hazard location, (Sub-county and parish), extent of the hazard, height above sea level, slope position, topography, neighboring land use among others. Hazard hot spots, potential and susceptible areas will be classified using a participatory approach on

a scale of “not reported/ not prone”, “low”, “medium” and “high”.

Data analysis and integration

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

Data verification and validation

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

Multi-hazards experienced in Hoima district were classified as:

- Geomorphological or Geological hazards including landslides, rock falls, soil erosion and earthquakes.
- Climatological or Meteorological hazards including floods, drought, hailstorms, strong winds and Lightning
- Ecological or Biological hazards including crop pests and diseases, livestock pests and diseases, human disease outbreaks, vermin and wildlife animal attacks and invasive species.
- Human induced or Technological hazards including bush fires, road accidents land conflicts.

General findings from the participatory assessment indicated that Hoima district has over the past two decades increasingly experienced hazards including landslides, rock falls, soil erosion, floods, drought, hailstorms, strong winds, Lightning, crop pests and diseases, livestock pests and diseases, human disease outbreaks, vermin, wildlife animal attacks, invasive species, bush fires, road accidents and land conflicts putting livelihoods at increased risk. Drought and flooding were identified as most serious problem in Hoima district with almost all sub-counties being vulnerable to the hazards. This could be due to the location of the district in the cattle corridor which is associated with prominent dry spells and droughts, but the area is also relatively flat area with slope percentage rise (0-2) which is very prone to flooding in case of heavy rains.

The ineffective adaptive capacity and high sensitivity of households and communities in Hoima district has increased vulnerability to hazard exposure necessitating urgent external support. Reducing vulnerability of these hazards at community, local government and national levels should be a threefold effort hinged on the following:

- 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 to hazards 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 Officer should promote drought and disease resistant crop seeds.
- The government through relevant ministries coordinated by OPM should increase importation of Lightning conductors and also reduce taxes on their importation.
- The government through OPM and Meteorology Authority should support establishment of disaster early warning systems.
- The government through MWE increase funding and staff to monitor wetland degradation and non-genuine agro-inputs.
- The government through OPM should improve communication between the disaster department and local communities.
- The government through MWE should promote Tree planting along road reserves.
- The government through MAAIF should fund and recruit extension workers at sub-county level and also provide staff with necessary logistics.

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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 overlies the cold waters of the Peru Current. This event has great impact on the wind, sea surface temperature, and precipitation patterns in the tropical Pacific. It has climatic effects throughout the Pacific region and in many other parts of the world. The opposite of an El Niño event is called La Niña.

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

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

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

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

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

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

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

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

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

INTRODUCTION

Background

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

The Government of Uganda is shifting the disaster management paradigm from the traditional emergency response focus toward one of prevention and preparedness. Contributing to the evidence base for Disaster and Climate Risk Reduction action, the Government of Uganda is compiling a National 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 Hoima district in Western 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 Hoima District, Western Uganda.

1.2.2 Specific Objectives

In fulfilling the above mentioned main objective the following were the specific objectives of the study:

- i. To collect and analyze field data generated using GIS in close collaboration and coordination with OPM.

- ii. To develop District specific multi-hazard risk and Vulnerability profile using a standard methodology.
- iii. To preserve the spatial data to enable use of the maps for future information.
- iv. To 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 Hoima district and quantify them through a participatory approach on a scale of "not reported/ not prone", "low", "medium" and "high".
- ii. Analysis of field data and review the quality of each hazard map which should be accompanied by a narrative that lists relevant events of their occurrence. Implications of hazards in terms of their effects on stakeholders with the vulnerability analysis summarizing the distribution of hazards in the district and exposure to multi-hazards in sub-counties.
- iii. Compilation of the entire district multi-hazard, risk and vulnerability HRV Profiles in the time frame provided.
- iv. Generating complete HRV profiles and maps and developing a database for all the GIS data showing disaggregated hazard risk and vulnerability profiles to OPM and UNDP.

1.4 Justification

The government recognizes climate change as a big problem in Uganda. The draft National Climate Change Policy (NCCP) notes that the average temperature in semi-arid climates is rising and that there has been an average temperature increase of 0.28°C per decade in the country between 1960 and 2010. It also notes that rainfall patterns are changing with floods and landslides on the rise and are increasing in intensity, while droughts are increasing, and now significantly affect water resources, and agriculture (MWE, 2012). The National Policy for Disaster Preparedness and Management (Section 4.1.1) requires the Office of the Prime Minister to "Carry out vulnerability assessment, hazard and risk mapping of the whole country and update the data annually". UNDP's DRM project 2015 Annual Work Plan; Activity 4.1 is "Conduct national hazard, risk and vulnerability (HRV) assessment including sex and age disaggregated data and preparation of district profiles."

1.5 Structure of the Report

This Report is organized into four sections: Section 1 provides Introduction on the assignment. Section 2 elaborates on the overview of Hoima district. Section 3 focuses on the methodology employed. Section 4 elaborates the Multi-hazard, Risks and Vulnerability profile and Coping strategies for Hoima district. Section 5 describes Conclusions and policy related recommendations.

OVERVIEW OF HOIMA DISTRICT

2.1 Location

Hoima District is located between coordinates: 1° 25' 0" N and 31° 5' 0" E in Mid-western Uganda. Hoima District is bordered by Buliisa District to the north, Masindi District to the northeast, Kyankwanzi District in the east, Kibaale District to the south, Ntoroko District to the southwest and Democratic Republic of the Congo across Lake Albert to the west. The district has 10 sub-counties, 1 town council and 1 municipality with 4 divisions. These are; Buhanika, Buseruka, Kigoroby, Kitoba, Kyabigambire, Bugambe, Buhimba, Kabwoya, Kiziranfumbi and Kyangwali sub-counties and Kigoroby town council. The 4 Divisions in Hoima Municipality include: Bujumbura, Busiisi, Kahoora and Mparo (Figure 1).

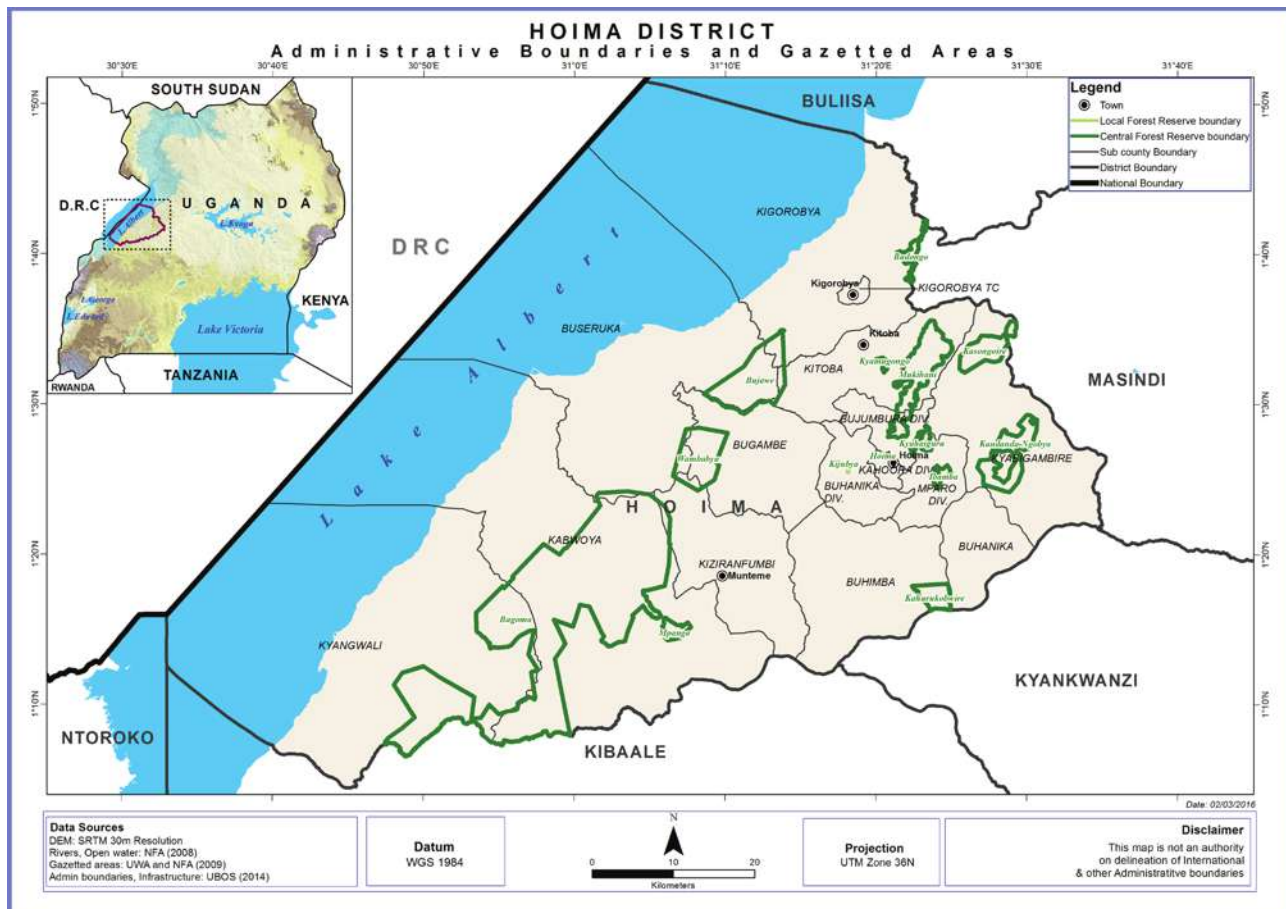


Figure 1: Administrative Boundaries and Gazetted Areas, Hoima District

2.1.1 Geomorphology

The topography of Hoima district is part of the dissected African surface characterized by broad, flat-topped ridges of about 1,000 m to 1,100 m in height, whose formation is given as upper Cretaceous (65 - 135 million years ago). The surface rises to a plateau, which ranges between 600 m and 800 m above sea level (Figure 2). Therefore, the district can be divided into three main topographic zones below:

Dissected plateau

This is the most dominant landscape in the district characterised by topography which is either flat topped and capped with lateritic duricrust or rounded and deeply weathered. The hills generally rise 30 m to 50 m or more above valleys and are remnants of the ancient Buganda surface, which experienced a slow uplift during the mid-Tertiary period and later dissected by a rejuvenated drainage system, resulting in an elevated dissected plateau.

Escarpment stretch

This zone covers a watershed running throughout its length approximately parallel to Lake Albert from Kyangwali through Buseruka to Kigoroby sub-counties and has been affected by rift valley faulting. The topography is deeply incised by streams and rivers. A typical example is River Wambabya flowing off the escarpment.

The Rift Valley

The area lying in the rift valley is occupied by Lake Albert. This is represented by early Pleistocene or Acholi surface. It is essentially a flat area of sand beaches with gradients of less than 1 percent. The rift valley is one of the most important topographical features that influence environmental processes in Hoima district. The topography of the rift valley has presented problems mainly associated with soil erosion, scarcity of land for farming and settlement. However, some parts of the district are characterized by gentle undulating hills like those found in the western part of the District. The terrain drops sharply on the rift valley escarpment to form wide valleys often occupied by wetlands.

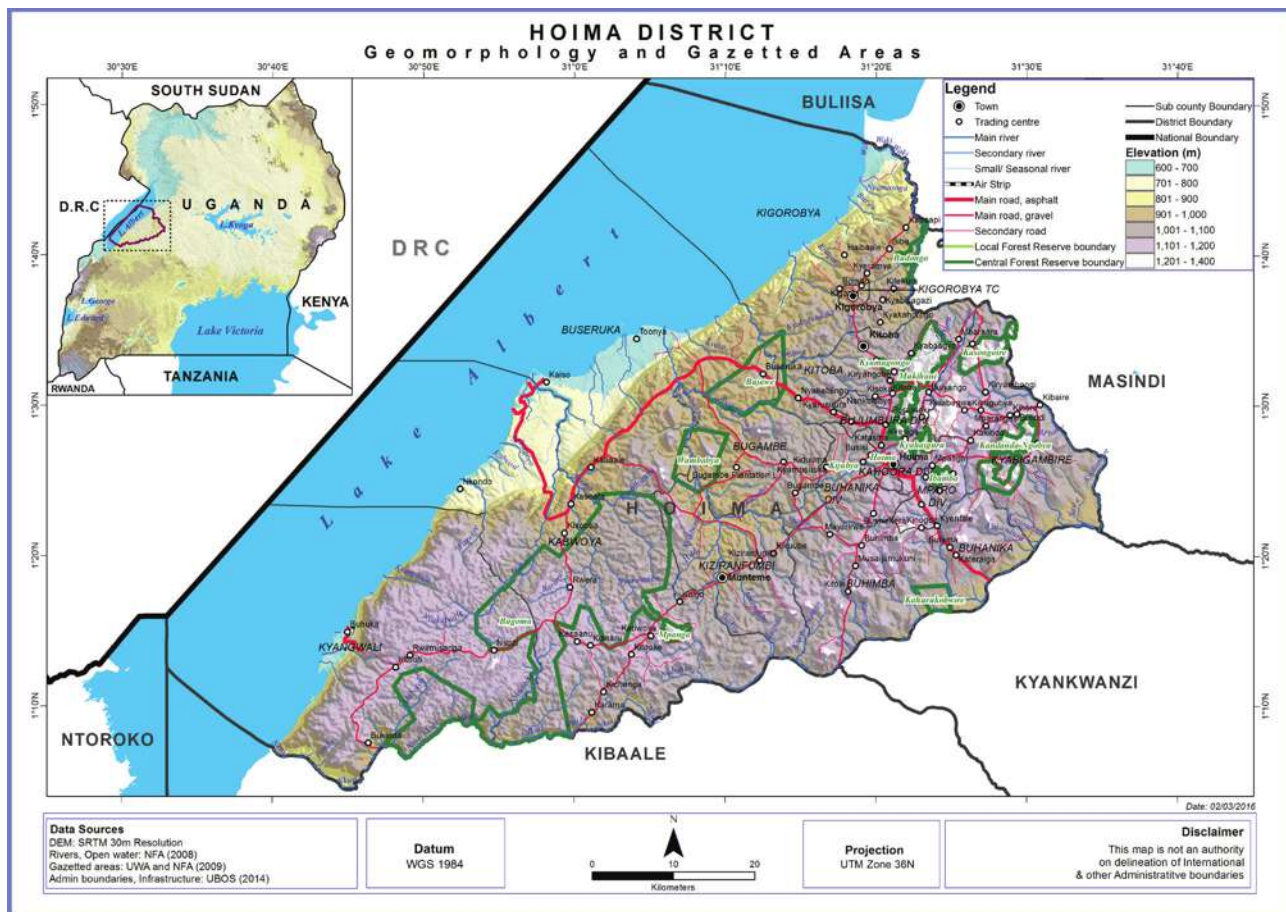


Figure 2: Geomorphology, Hoima District

2.1.2 Geology and soils

Much of the district is occupied by sedimentary beds of the Bunyoro geological series mainly represented by tillites and phyllites with subsidiary amounts of sandstones and conglomerates as basal members. These rocks are generally classified under Pre-cambrian era, which are part of the dissected African surface. Their distribution follows the weathered detritus that had accumulated prior to faulting. This has subsequently been removed by post rift valley geological erosion. Other rocks affected by post rift valley erosion include quartzites, granites and schists and occur along the southeastern boundary in Buhimba, Buhanika and Kyabigambire sub-counties. Along Lake Albert shores in Buseruka sub-county is a broad tract of river and lake alluvium laid down as rift valley floor deposits. At Kaiso in the Albert Rift a fossiliferous ferruginised bed occurs in sediments marking a period of recession during interpluvial phase when the Lake Albert was formed (Figure 3).

2.1.3 Soils

Hoima's soils are ferralitic and generally acidic. However they have adequate organic matter especially on the lower slopes and in the valleys. The soils are typically loam and deep on the valley slopes but tend to be shallower on the upper slopes. Soil erodibility is low, rainfall erosive is generally moderate. The water table is high with soils frequently water logged.

The soils of Hoima are defined by a number of parameters, which include parent rock, age of soil and climate. As already mentioned above the most dominant soil type is ferralitic soil. Productivity soils are scarce, therefore, fair and low productivity soils in Buseruka, part of Kigoroby, part of Kyabigambire, along the lakeshore and partly Buhimba must be managed effectively in order to sustain Hoima's agriculture.

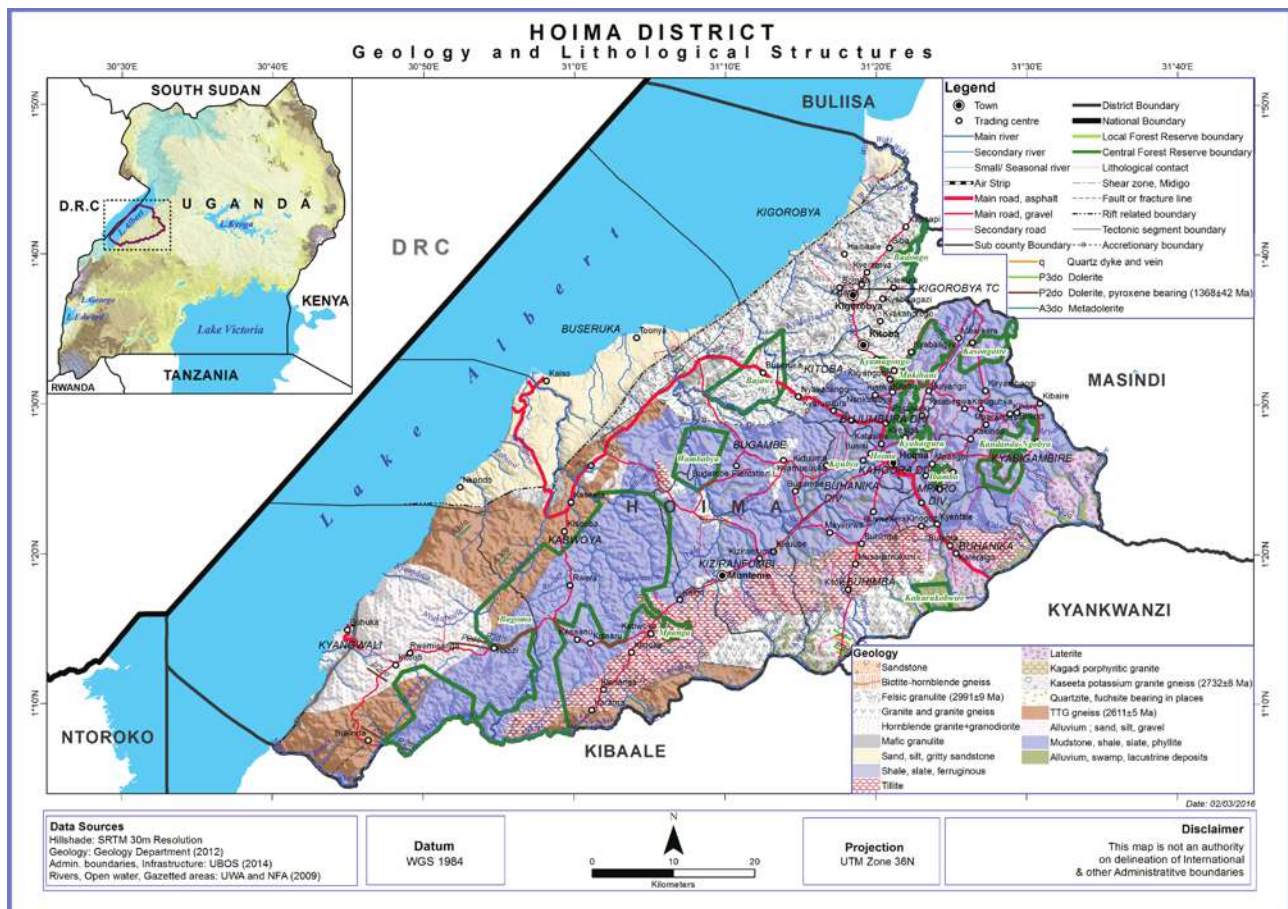


Figure 3: Geology and Lithological Structures

2.1.4 Vegetation and Land use Stratification

The vegetation of the district can be broadly classified into forest, savannah, grassland and swamps (Figure 4). Human activities have had a great influence on the natural vegetation in the district, such as deforestation, wetland degradation, river pollution and many others.

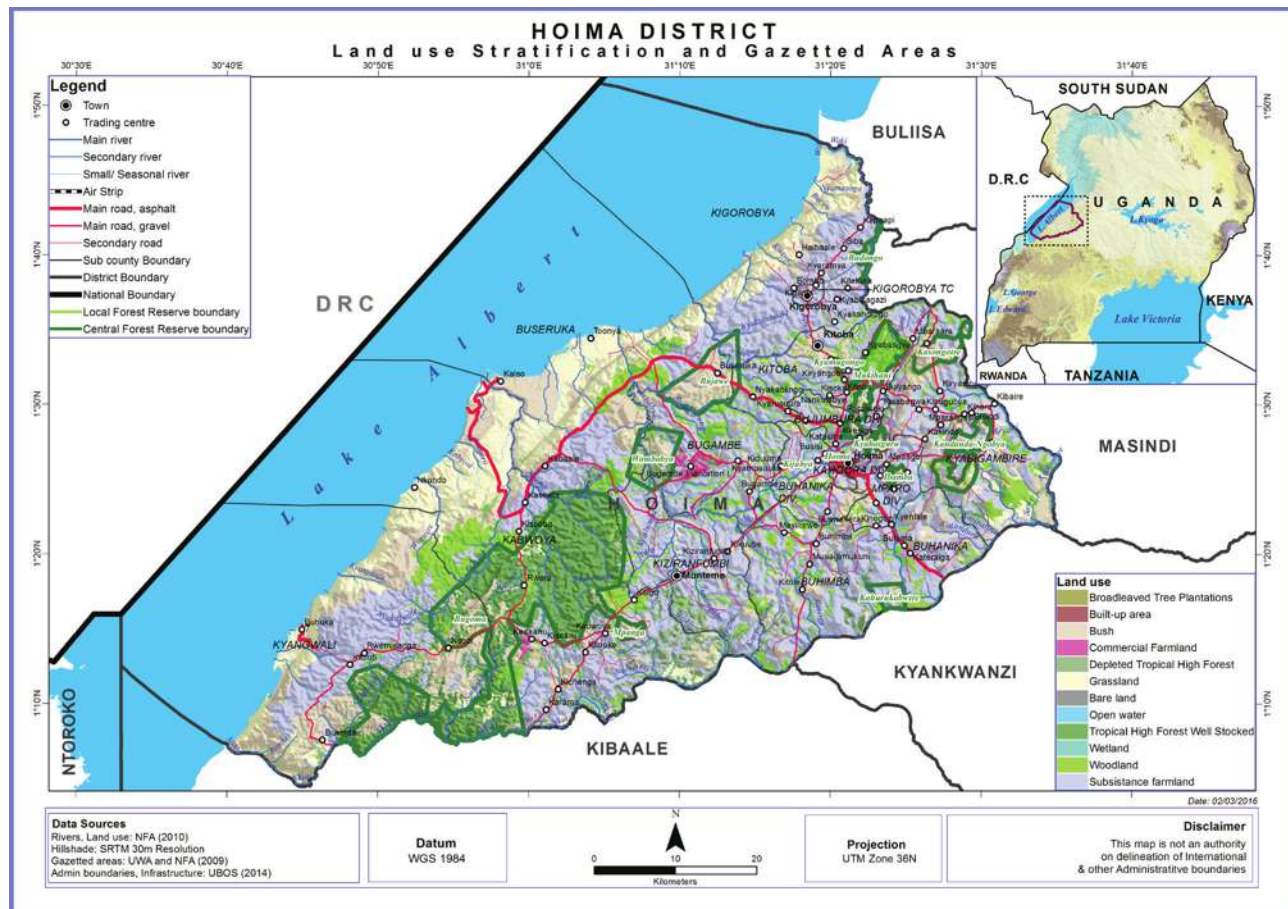


Figure 4: Land use Stratification, Hoima District

2.1.5 Temperature and Humidity

Temperatures are moderate averaging 18 - 30°C with the hottest spot of the district lying in the Rift Valley to the West. Although this is a dry belt area it has potential for livestock keeping and Lake Fishery. Climate change and variability are the important factors impacting on the district's agriculture and environmental sustainability.

2.1.6 Wind

The long-term wind speed records from the East African Meteorological Department (1975) indicate average annual wind speeds of 3 knots and 5 knots at 0600 hours and 1200 hours, for Hoima. The wind speed values indicated, therefore, represent conditions of moderate to strong or turbulent conditions. The average number of calms experienced in the area, are indicated to be experienced for 99 days at 0600 hours, and 27 days at 1200 hours, respectively, at Hoima. The general conclusion from these climatic figures is that for most of the year, Hoima district experiences moderate to strong and gusty winds, increasing in the afternoon.

2.1.7 Rainfall

Hoima District receives a total rainfall of about 700 to 1500 mm per annum. Wetter months are April-May and September-October, with two dry spells in June-July and December-January. Western areas bordering the rift valley are the driest and hottest (Figure 5).

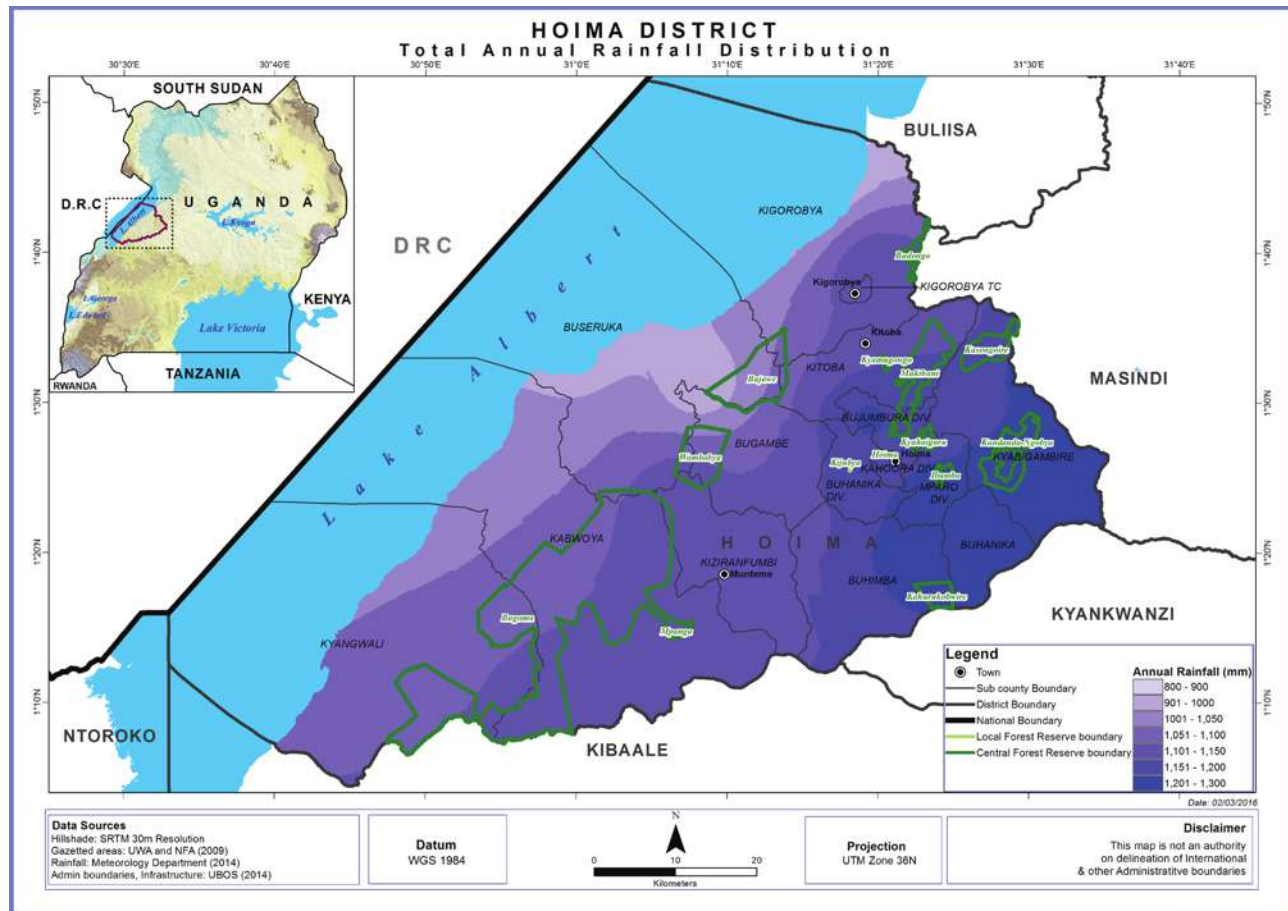


Figure 5: Annual Rainfall, Hoima District

2.1.8 Hydrology

Hoima district is endowed with watercourses. Watercourses include Lake Albert which covers about 2268.6 sq. km (38%) of the district and a number of wetlands, the most prominent ones being Kafu, Wambabya, Waki, and Kabale. Rivers in the district include Waki, Hoima, Wambabya, Biganjuka, Nguse and Kafu.

2.1.9 Population

According to the National Population and Housing Census (2014) results, Hoima District had a total population of 573,903 people. Results also showed that most of the people in Hoima District reside in rural areas (467,411 (81.4%) compared to (106,492 (18.6%) who reside in urban centers. The gender distribution was reported to be males: 286,705 (49.96%) and females: 287,198 (50.04%). About 98.5% (565,189) of the population form the household population and only 1.5% (8,714) is Non-household. Kyangwali sub-county had the highest population of 97,366 people while Kigorobyia town council had the least population of 5,867 people (Figure 6). Table 1 shows the population distribution per sub-county for the different gender.

Table 1: Population Distribution in Hoima District

<i>Sub-County</i>	HOUSEHOLDS		POPULATION		
	<i>Number</i>	<i>Average Size</i>	<i>Males</i>	<i>Females</i>	<i>Total</i>
Buhanika	3332	4.2	7338	6961	14299
Buseruka	8896	4.6	22105	20913	43018
Kigorobyia	12889	5.3	33772	34630	68402
Kigorobyia Town Council	1285	4.4	2732	3135	5867
Kitoba	7476	4.7	17646	17694	35340
Kyabigambire	8908	4.6	20972	20152	41124
Bugambe	6827	4.4	15284	14831	30115
Buhimba	8729	4.4	19635	19404	39039
Kabwoya	13761	4.6	32239	30879	63118
Kiziranfumbi	7563	4.7	17832	17758	35590
Kyangwali	20911	4.6	49598	47768	97366
Bujumbura Division	5295	4.2	10850	11954	22804
Busiisi Division	4469	4.3	9511	9750	19261
Kahoorra Division	9871	3.4	15824	19244	35068
Mparo Division	5695	3.9	11367	12125	23492

Source: UBOS Census 2014

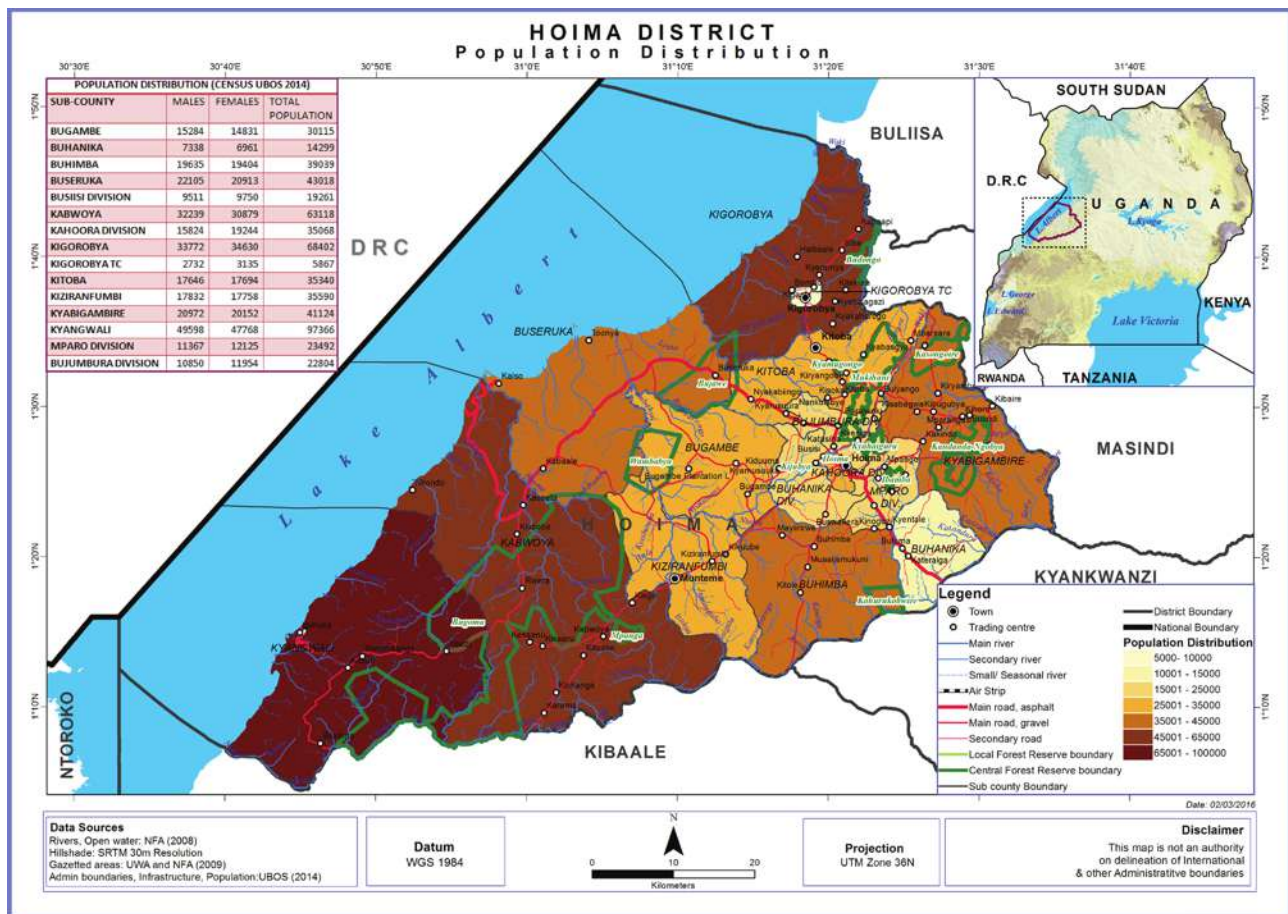


Figure 6: Population Distribution, Hoima District

2.1.10 Economic activities

Majority of the population in Hoima District (75 – 78%) engages in subsistence agriculture where cultivation of crops such as bananas, maize, beans, soya beans, cocoa, coffee, sim sim, cassava, groundnuts and sweet potatoes is dominant. However, crops such as cotton, tea, tobacco, sugarcane and rice are grown on a large scale for commercial purposes. A considerable number of the households practice livestock production and the animals reared are cattle, goats, sheep, pigs and chicken.

METHODOLOGY

3.1 Collection and analysis of field data using GIS

3.1.1 Preliminary spatial analysis

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

3.1.2 Stakeholder engagements

Stakeholder engagements were carried out in close collaboration with OPM's DRM team and the district disaster management focal persons with the aim of identifying the various hazards ranging from drought, to floods, landslides, human and animal disease, pests, animal attacks, earthquakes, fires, conflicts etc. Stakeholder engagements were done through Focus Group Discussions (FGDs) and key informant interviews guided by checklist tools (Appendix I). At district level, One Key Informant Interview comprising of two respondents (District Natural Resources Officer and District Environment Office) was held at Hoima District Headquarters (UTM Zone 36N: 314508E; 155276N). At sub-county level Key informants included: Sub-county and parish chiefs, community Development mobilizers and health workers.

FGDs were carried out in four purposively selected sub-counties that were ranked with highest vulnerability. FGDs comprising of an average of 12 respondents (crop farmers, local leaders, nursing officers, police officers and cattle keepers) were conducted at Kyabigambire Sub-county (UTM Zone 36N: 328056E;163565N), Buseruka Sub-county (UTM Zone 36N: 300685E;169775N), Kabwoya Sub-county (UTM Zone 36N: 286595E;137985N) and Buhimba sub-county (UTM Zone 36N: 312404E;148946N). Each Parish of the selected Sub-counties was represented by at least one participant and the selection of participants was engendered. FGDs were conducted with utmost consideration to the various gender categories (women, men) with respect to age groups since hazards affect both men and women though in different perspectives irrespective of age. This allowed for comprehensive representation as well as provision of detailed and verifiable information.

Focus Group discussions and Key Informant Interviews were transcribed in the field for purposes of input into the NVIVO software for qualitative data analysis. Case stories and photographs were documented and captured respectfully. In order to produce age and sex disaggregated data, results from FGDs and KIIs were integrated with the district population census data. This was also input in the multi-hazard, risk and vulnerability profile maps.

3.1.3 Participatory GIS

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

3.1.4 Geo-referencing and ground-truthing

The identified hazard hotspots in the community profile maps were ground-truthed and geo-referenced using a handheld Spectra precision Global Positioning System (GPS) unit, model: Mobile Mapper 20 set in WGS 1984 Datum. The entities captured included: hazard location, (Sub-county and parish), extent of the hazard, height above sea level, slope position, topography, neighboring land use among others (Appendix I). Hazard hot spots, potential and susceptible areas will be classified using a participatory approach on a scale of “not reported/ not prone”, “low”, “medium” and “high”. This information generated through a participatory and transect approach was used to validate modelled hazard, risk and vulnerability status of the district. The spatial extent of a hazard event was established through modelling and a participatory validation undertaken.

3.2 Develop District Specific Multi-hazard Risk and Vulnerability Profiles

3.2.1 Data analysis and integration

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

3.2.2 Data verification and validation

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

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

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

RESULTS FROM MULTI-HAZARD RISK, VULNERABILITY MAPPING

4. Multi-hazards

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

In the case of Hoima 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 are not a serious problem in Hoima district. However, soil erosion and rock falls mainly occur during rainy seasons in Tonya parish (Hoimo and Fofo villages) down the escarpment in Buseruka sub-county. Participants observed that run off from up the escarpment comes along with rocks thereby blocking roads. Deep gullies are also created in the process. In November 2015, several gardens in Hoimo village were swept by soil erosion. The most affected sub-counties include Buseruka, Kabwoya, Kigorobya and Kyangwali. The rest of the sub-counties in the district are seriously affected by soil erosion. This information was integrated with the spatial modelling using socio-ecological spatial data i.e. Soil texture (data for National Agricultural Research Laboratories – Kawanda (NARL) 2014, Rainfall (Meteorology Department 2014), Digital Elevation Model (DEM), SLOPE, ASPECT (30m resolution data from SRTM Shuttle Radar Topography Mission (SRTM) to generate Land slide, rock falls and soil erosion vulnerability map (Figure 7).

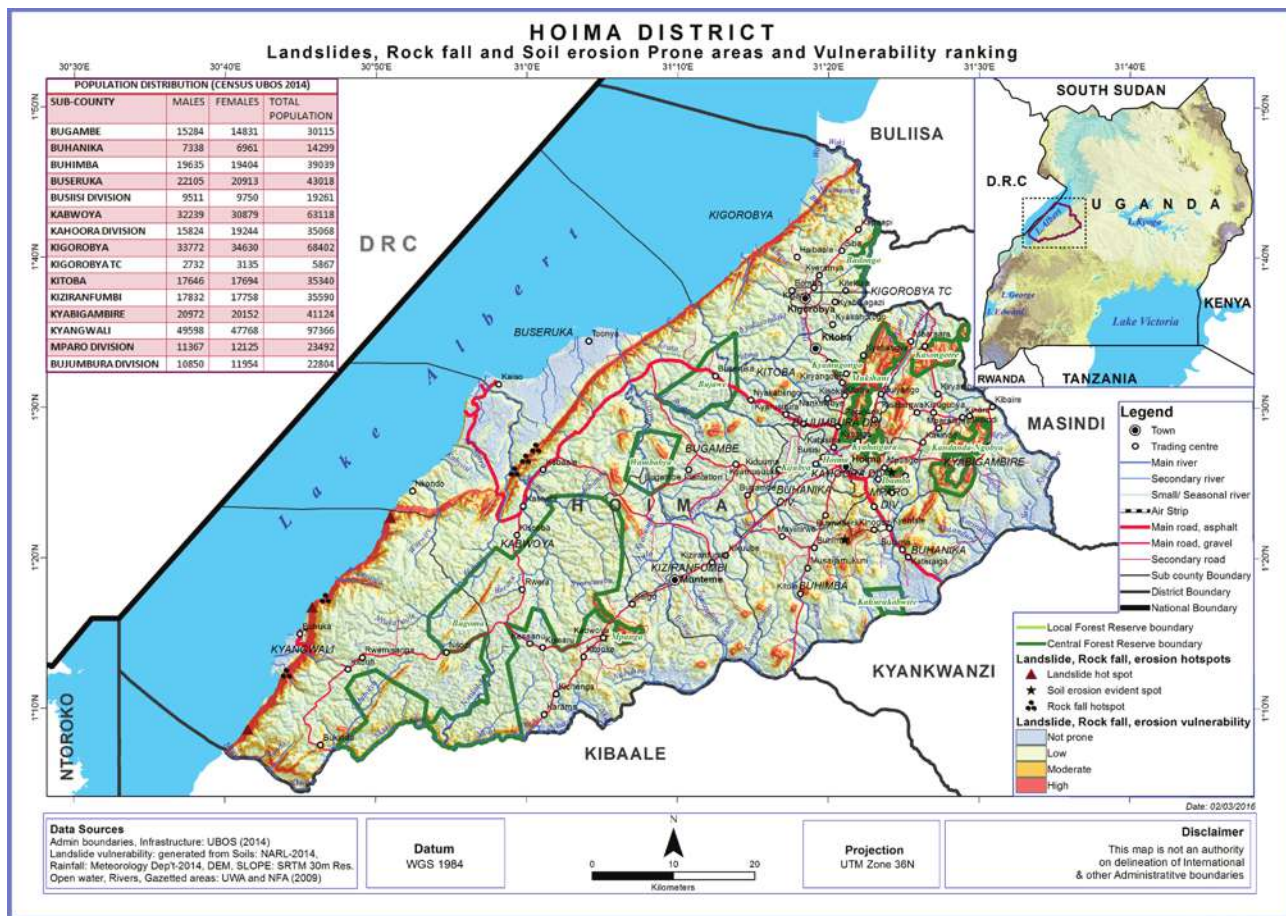


Figure 7: Landslides, rock falls and soil erosion, Hoima District

4.1.2 Earthquakes and faults

Results from the participatory assessments revealed that Hoima district experiences minor earthquakes. Participants observed that the rocks and soil masses in the escarpment that goes through Kyangwali, Kabwoya, Buseruka and Kigorobyia sub-counties have fault lines which are a potential threat as they are susceptible to rock falls and landslides (Figure 8).

4.1.3 Meromicticism of Lake Albert

A meromictic lake has layers of water that do not intermix. The lack of mixing between layers creates radically different environments for organisms to live in: among the consequences of this stratification, lake waters at the bottom layer receive little oxygen from the atmosphere, and hence becomes depleted of oxygen. A meromictic lake may form when its basin is unusually deep and steep-sided compared to the lake's surface area and; the lower layer of the lake is highly saline and denser than the upper layers of water.

When the layers do mix for whatever reason, the consequences can be devastating for organisms that normally live in the top layer. This layer is usually much smaller in volume than the bottom layer; therefore, when the layers mix, the oxygen concentration at the surface will decrease dramatically. This can result in the death of many organisms, such as fish, that require oxygen.

Participants observed that Lake Albert occasionally experiences meromicticism (Nyamuraro) which causes death of big fish species such as Nile perch due to suffocation. The landing sites at Kaiso, Tonya and Hoimo in Buseruka sub-county, are the most affected.

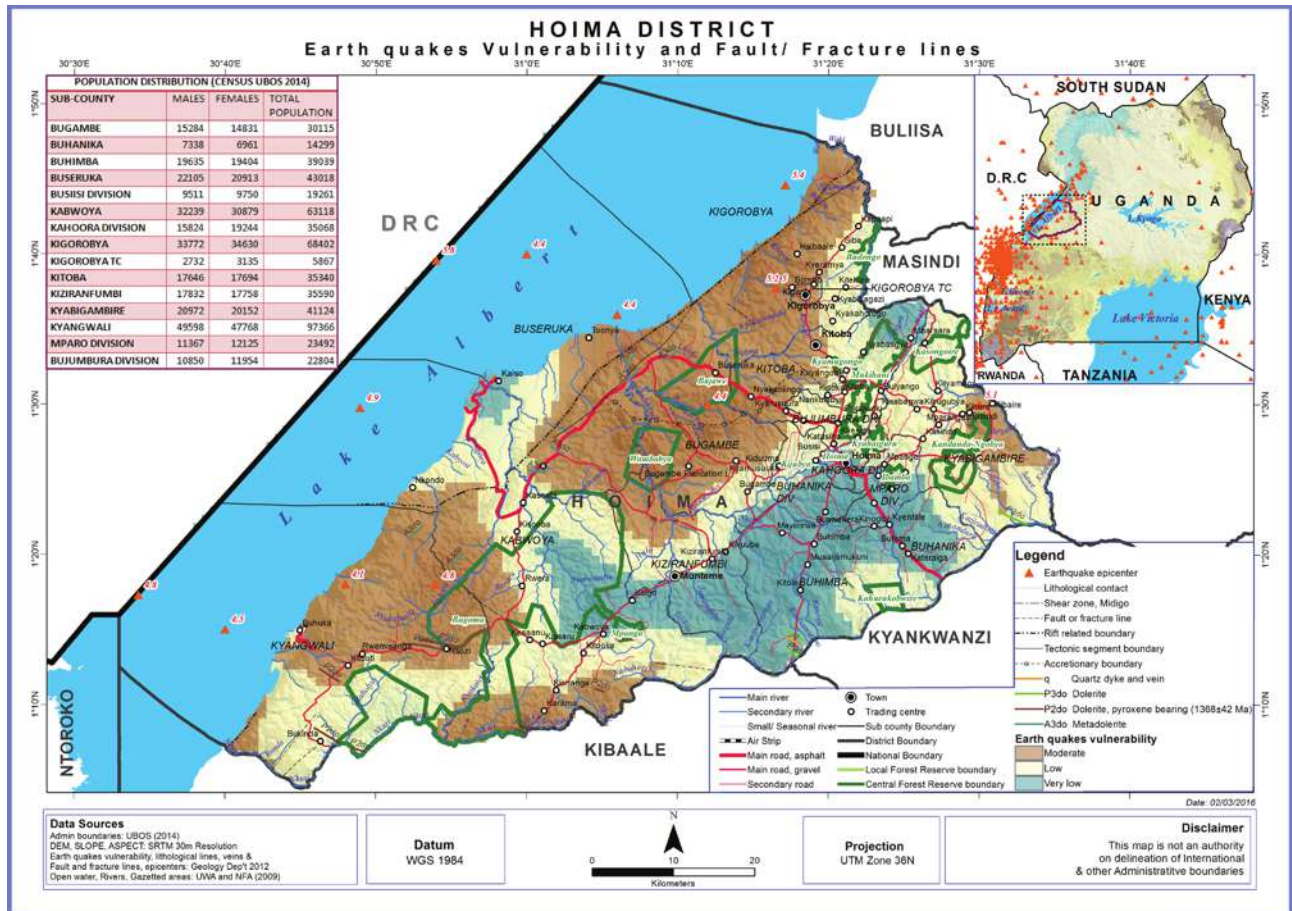


Figure 8: Earth quakes Vulnerability and Fault lines, Hoima District

4.2 Climatological and Meteorological Hazards

4.2.1 Floods

Results from the focus group discussions revealed that floods usually occur along Rivers Wambabya, Kafu, Kabaale and Biganjuka in Hoima district. Participants reported that the most recent incident happened in November 2015 when Rivers Nkusi and Kafu burst their banks causing flooding in the sub-counties of Kabwoya, Buhimba and Buhanika. Another serious flood occurred in Buhuka parish, Kyangwali sub-county which later combined with thunderstorms that washed away one landing site in the area. The Kampala – Hoima highway was also temporarily closed because of this incident. The other affected areas include parts of Bugambe sub-county along Wambabya River. This information was integrated with the spatial modelling using socio-ecological spatial data i.e. Soil texture (data for National Agricultural Research Laboratories – Kawanda (NARL) 2014, Rainfall (Meteorology Department 2014), Digital Elevation Model (DEM), SLOPE, ASPECT (30m resolution data from SRTM Shuttle Radar Topography Mission (SRTM) to generate flood susceptibility map (Figure 9).



Plate 1: Flooding within Hoima Municipality after heavy rains



Plate 2: Flooding at River Kafu in 2015

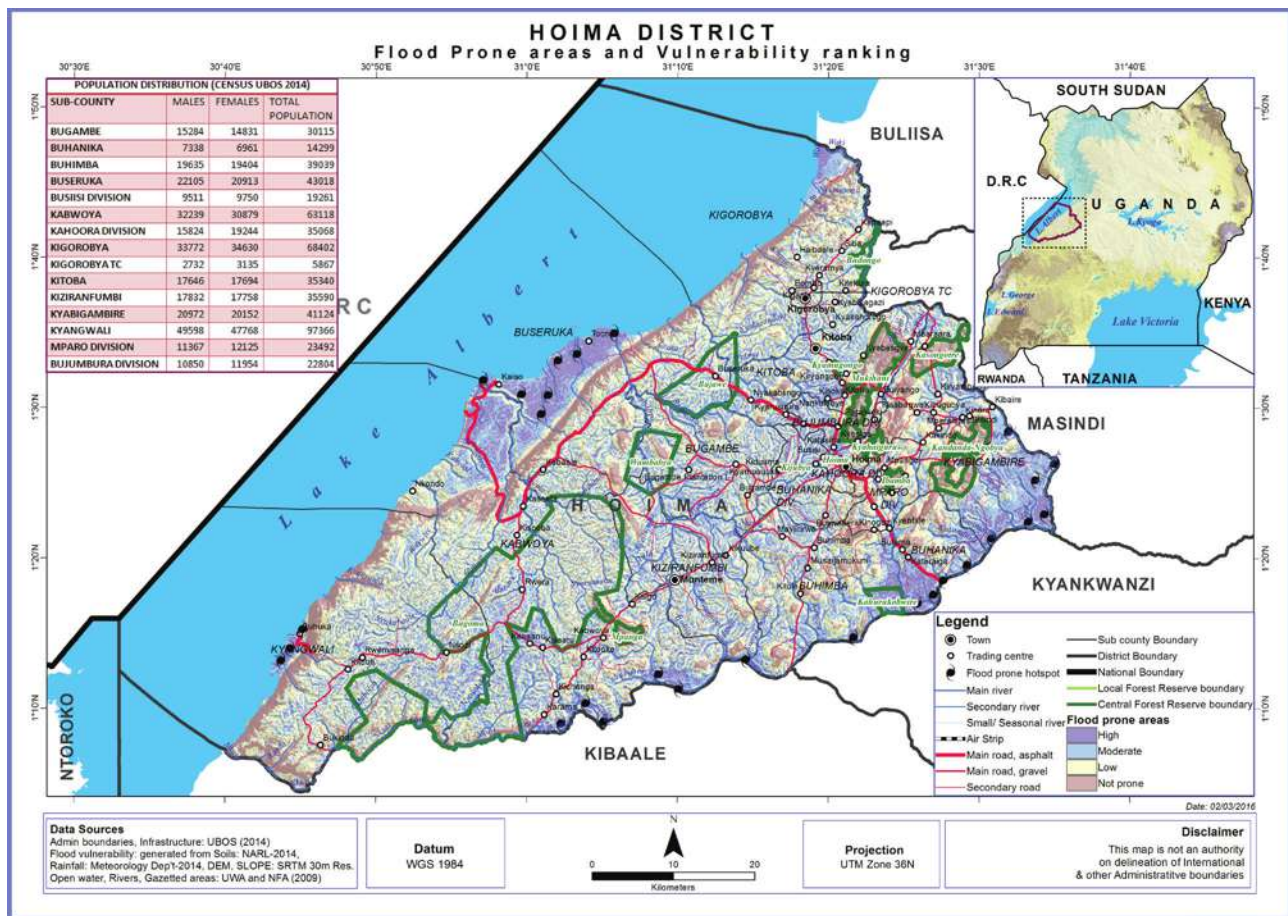


Figure 9: Flood Prone Areas and Vulnerability Ranking, Hoima District

4.2.2 Drought

Participatory assessments through the focus group discussions indicated that droughts in Hoima district are experienced in the form of long dry spells without rainfall. Participants revealed that dry spells normally occur in the dry season and as a result cause crop failures, water scarcity, shortage of pastures and increased incidences of pests and diseases. During the dry spell that hit Buseruka sub-county in 2011, very many animals died due to lack of water and forage. Consequently, many cattle keepers were forced to sell off some of the remaining animals at very low prices in order to hire grazing grounds. The most affected sub-counties include; Kyangwali, Kabwoya, Buseruka and Kigoroby. Others are Kyabigambire, Bugambe and Buhimba. This information was integrated with spatial modelling using socio-ecological spatial data i.e. Rainfall and Temperature (Uganda National Meteorological Authority, 2014) using the Standardized Precipitation Index (SPI) to generate drought vulnerability map (Figure 10).

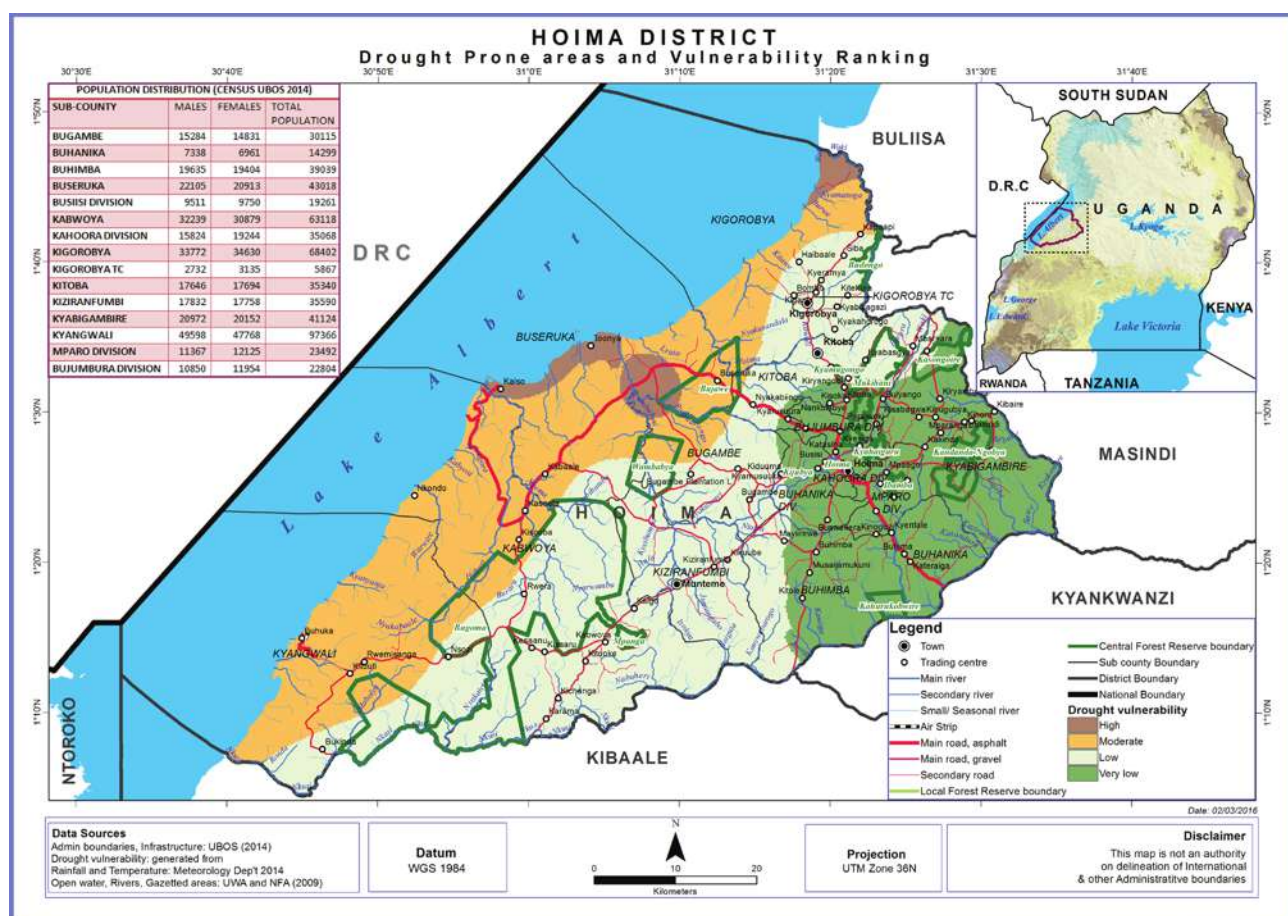


Figure 10: Drought Prone Areas and Vulnerability Ranking, Hoima District

4.2.3 Hailstorms

Results from the participatory assessments showed that Buhimba, Kyangwali, Kiziranfumbi, Kabwoya and Buhanka, Bugambe, Kyabigambire and part of Kitoba are the most affected by hailstorms in Hoima District. Some of the effects of hailstorms mentioned by the participants included: loss of crops especially bananas, maize, millet, beans, rice, cassava and sweet potatoes, tobacco; loss of small size animals (pigs, chicken, young goats), damage to roofs (iron sheets). This as a result caused considerable economic losses (Figure 11).

4.2.4 Strong winds

Results from the Participatory assessments indicated that strong winds are experienced during the rainy season. It was reported that strong winds blow off roof tops of households and schools, church institutions, uproot banana plantations and trees. Areas along the shores of Lake Albert in Buseruka, Kigoroby, Kabwoya and Kyangwali and Bugambe, Kyabigambire and Kitoba are the most affected by strong winds.

4.2.5 Lightning

Lightning is a sudden high-voltage discharge of electricity that occurs within a cloud, between clouds, or between a cloud and the ground. The distribution of lightning on Earth is far from uniform. The ideal conditions for producing lightning and associated thunderstorms occur where warm, moist air rises and mixes with cold air above. Results from the participatory assessments showed that there have been increased incidences of lightning over the past 10 years in Hoima District during rainy seasons. It was reported that in 2007, Lightning killed 7 pupils of Bujugu primary school in Bugambe sub-county. The entire district is prone to Lightning. Lightning which has caused number human and animal deaths has affected homesteads, institutions, etc in all sub-counties including the Municipal Council divisions. Most schools in Hoima district are at risk of being struck by lightning because they lack Lightning conductors.

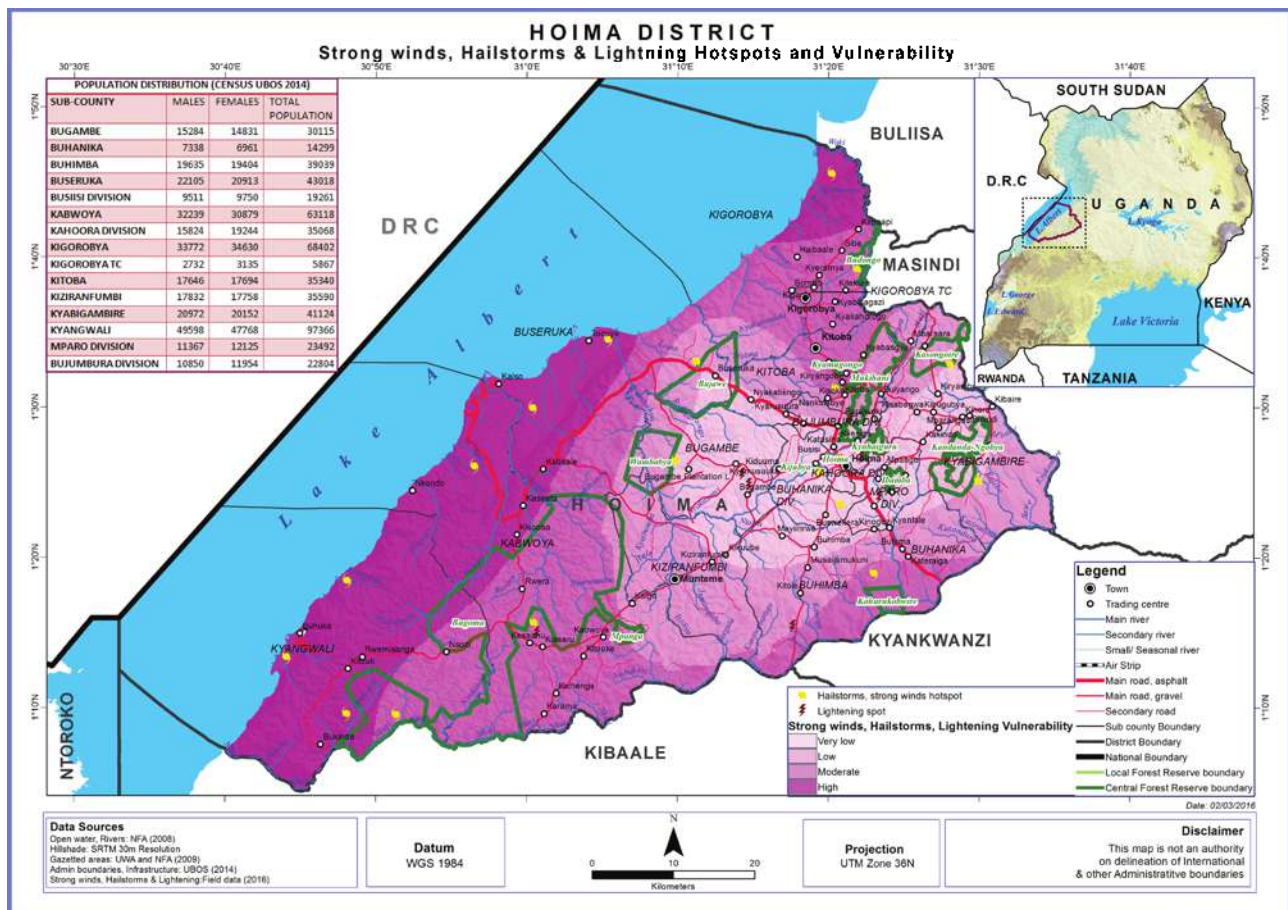


Figure 11: Strong winds, Hailstorms and Lightning Hotspots and Vulnerability, Hoima District

4.3 Ecological and Biological Hazards

4.3.1 Crop Pests and Diseases

Results from participatory assessments revealed that crop farmers in Hoima District as a whole are vulnerable to crop pests and diseases. The most reported crop diseases included; banana bacterial wilt, cassava mosaic, cassava brown streak disease, Coffee Twig Borer, and coffee wilt disease while the most reported pests were caterpillars, aphids and fruit flies. Kyabigambire, Kitoba, Buhimba, Bugambe, Kiziranfumbi and Buhanika were most affected by crop diseases and pests (Figure 12).



Plate 3: Coffee wilt disease, Kyabigambire Sub-county

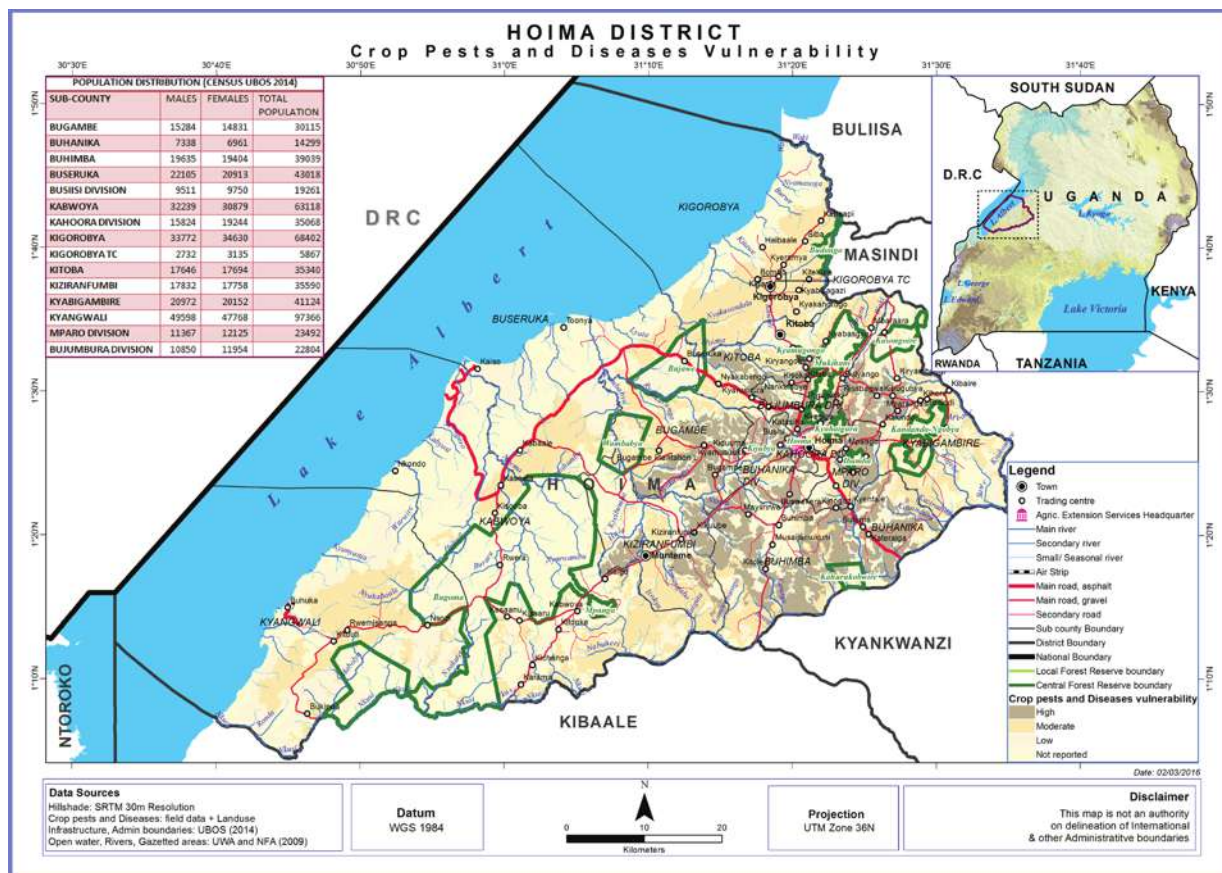


Figure 12: Crop Pests and Diseases Vulnerability, Hoima District

4.3.2 Livestock Pests and Diseases

Participants in the focus group discussions indicated that livestock pests and diseases were a serious problem in Hoima district. The most mentioned diseases included; foot and mouth disease (FMD), contagious bovine pleuropneumonia (CBPP), east coast fever, foot rot, African swine fever in pigs and Newcastle Disease, Gumboro, fowl typhoid, fowl pox and Coccidiosis in poultry. For the livestock pests, ticks were the most common in cattle. Participants reported that there have been cases of foot and mouth disease in areas of Kapaapi in Kigorobya sub-county and Kitoonya in Buhanika sub-county. Most of these livestock diseases are common in the sub-counties of Buseruka, Kigorobya, Kyangwali, Buhanika and Kabwoya (Figure 13).

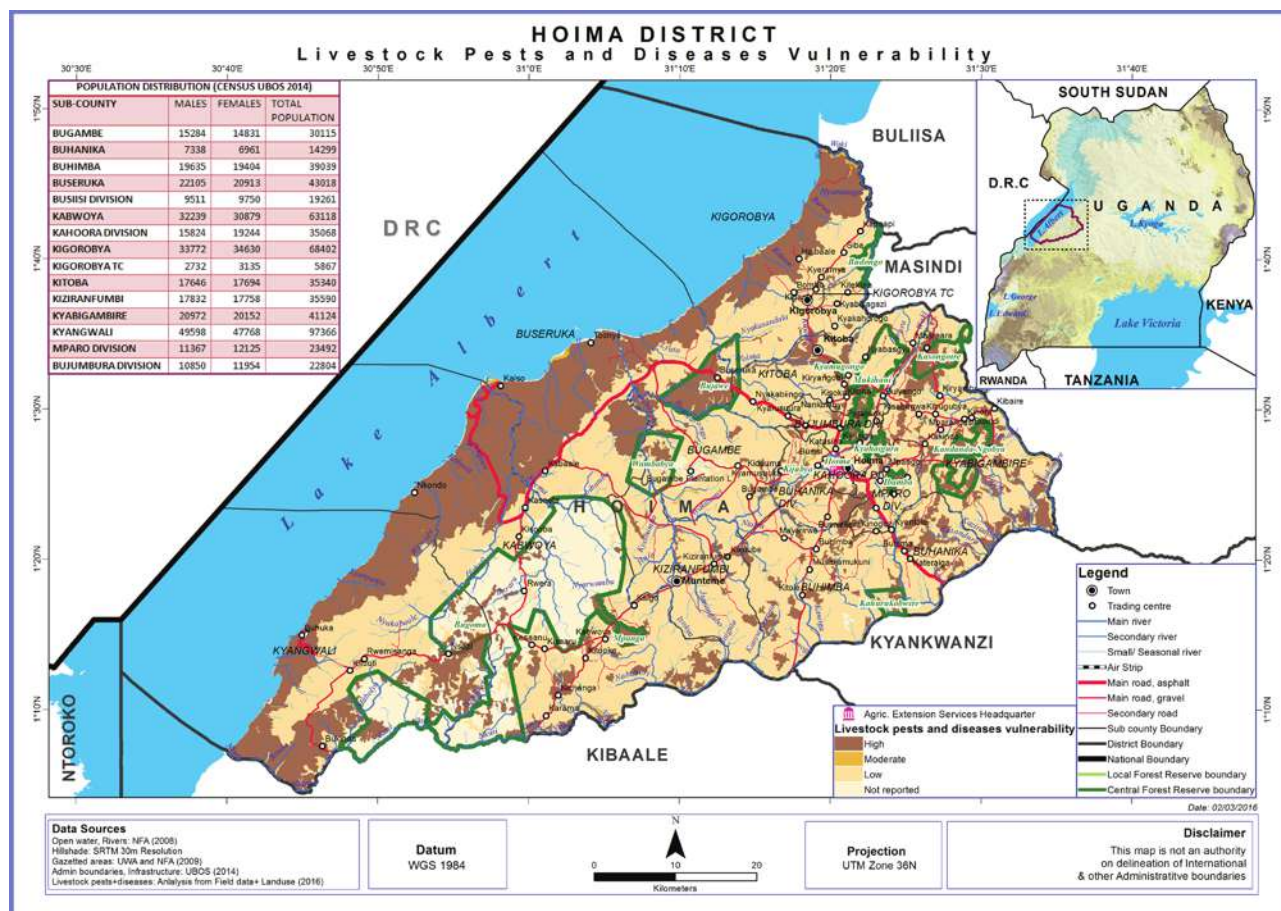


Figure 13: Livestock Pests and Diseases Vulnerability, Hoima District

4.3.3 Human Diseases outbreaks

The most reported human disease outbreaks included; River blindness (Onchocerciasis), bilharzia (schistosomiasis), cholera, dysentery, typhoid and malaria. Kyabigambire sub-county is the most affected by River blindness. Participants indicated that this disease is caused by a black fly and is common in areas along the fast flowing rivers of Waki and Wambabya. The landing sites on Lake Albert in the sub-counties of Kyangwali, Buseruka, Kabwoya and Kigorobya were prone to cholera, typhoid (wet seasons) and HIV/AIDS. There are also zoonotic diseases especially brucellosis, rabies, leptospirosis and worms which have caused negative impacts to productivity of the population or communities. Such cases of zoonotic diseases are prevalent in Kyangwali, Kabwoya, Kigorobya, Kyabigambire and Buhimba (Figure 17).

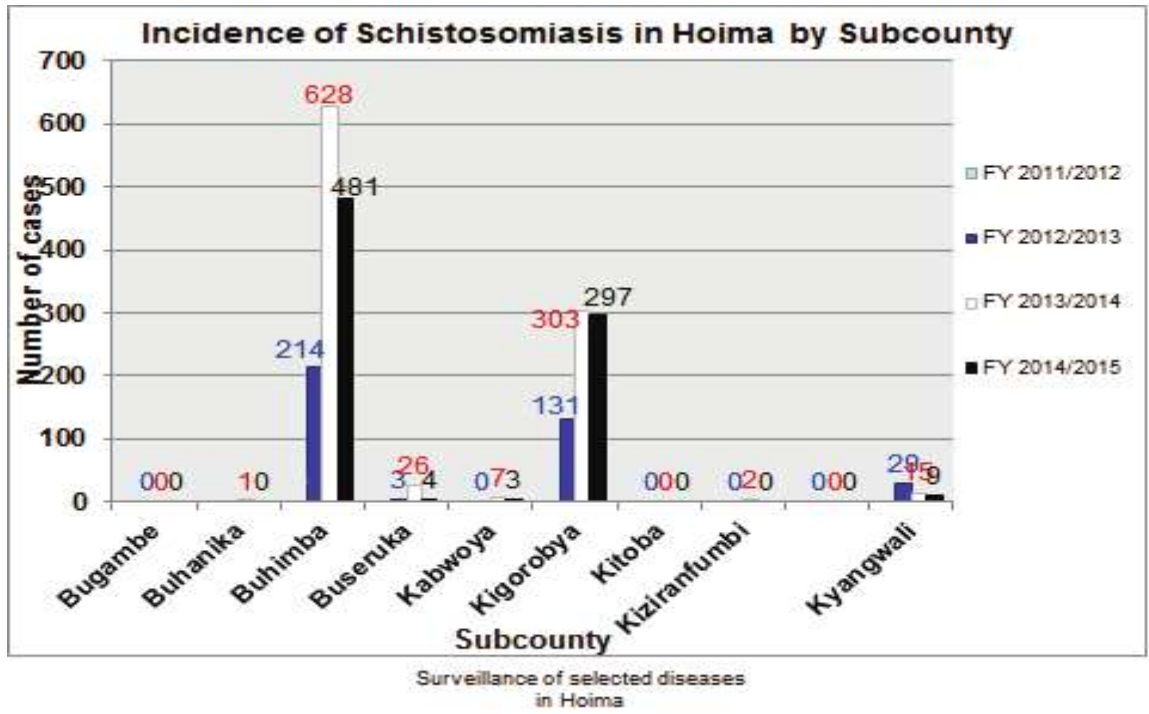


Figure 14: Incidence of Schistosomiasis in Hoima District

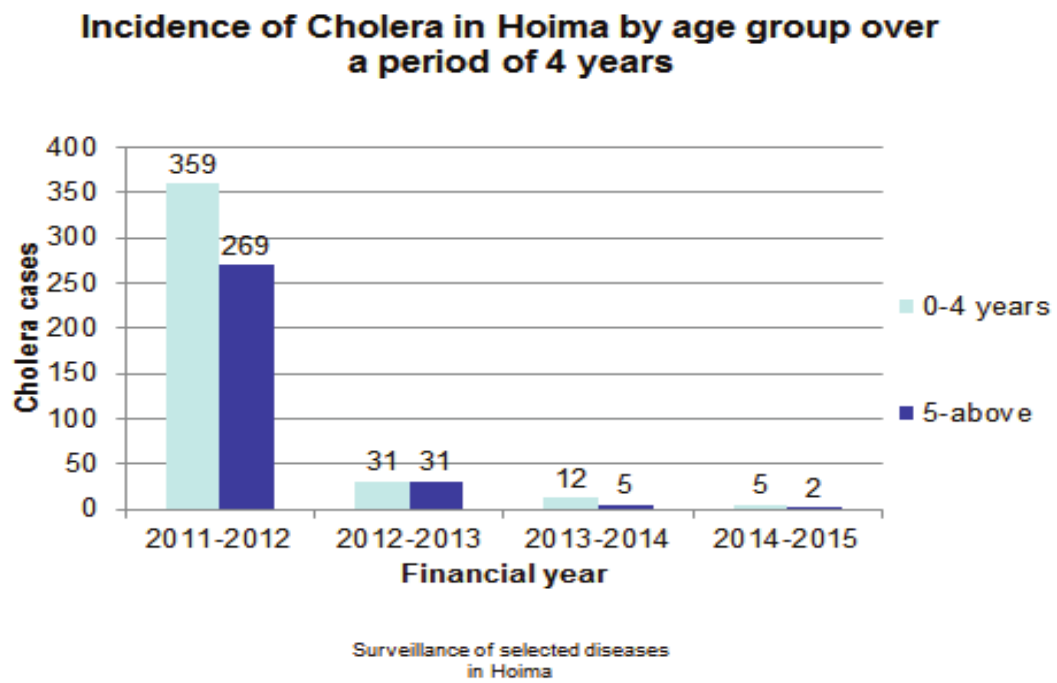


Figure 15: Incidence of Cholera in Hoima District

Trends in reported cases of 3 selected diseases in Hoima; Jan 2011 – Dec 2014

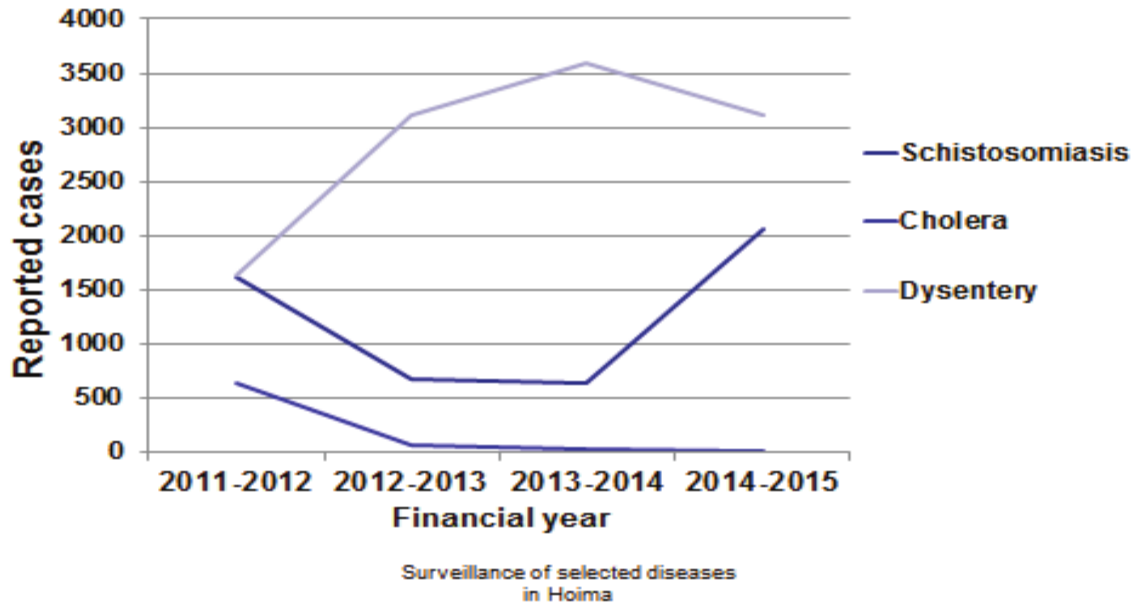


Figure 16: Trends in reported cases of 3 selected diseases in Hoima District

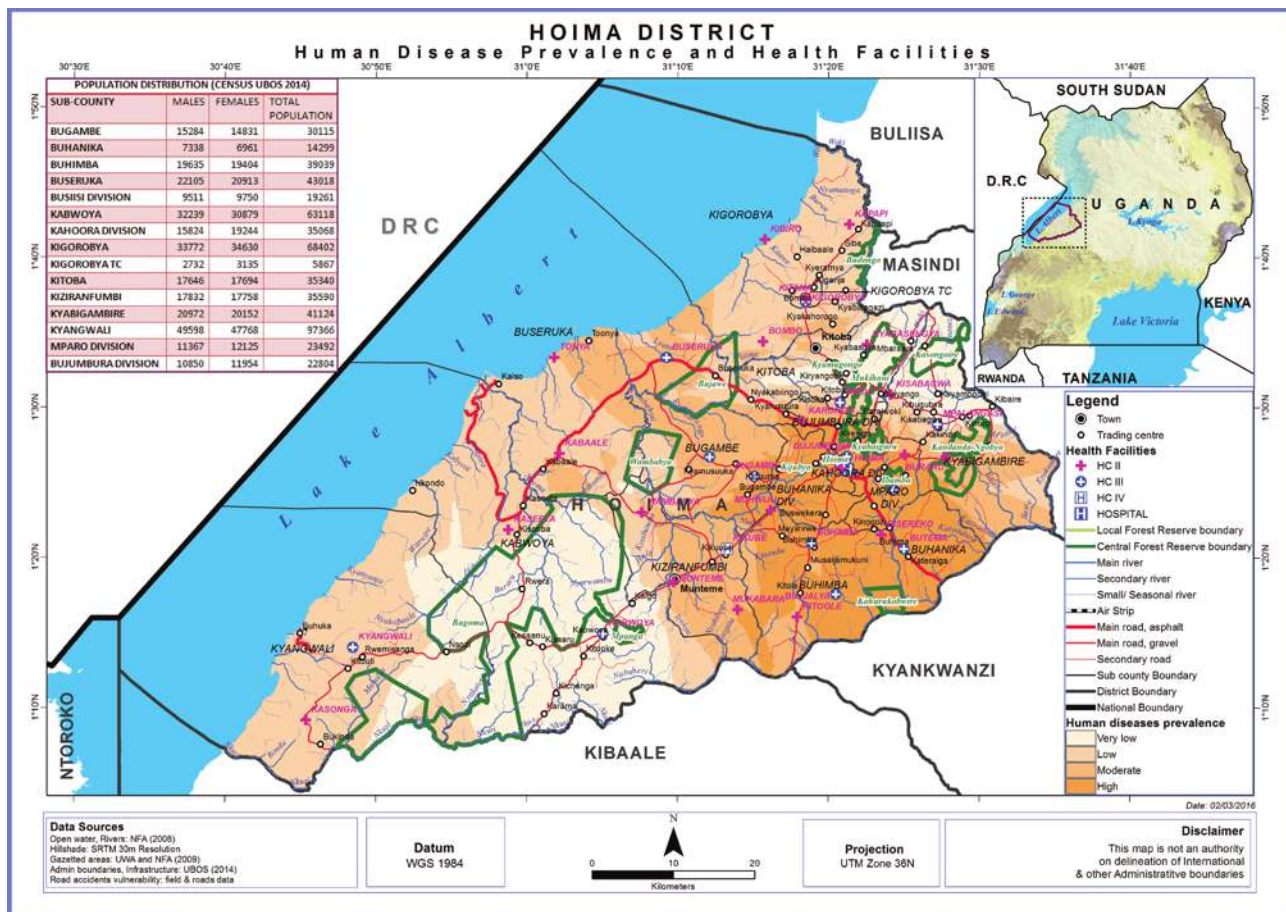


Figure 17: Human Disease Prevalence and Health Facilities, Hoima District

4.3.4 Vermin and Wild-life Animal Attacks

Participatory assessments through focus group discussions indicated that there are incidences of vermin and wildlife animal attacks in the areas adjacent to Budongo forest reserve and the Kaiso-Toonya Wildlife Conservation Area (TWCA). Vermin such as wild pigs, porcupines, monkeys, birds, rats and squirrels usually destroy a variety of crops including maize, rice, beans, millet, cassava and sweet potatoes. The most affected sub-counties include; Kabwoya, Kyangwali and Kiziranfumbi, Buseruka and Bugambe. Cases of problem animals have been reported in several sub counties. For instance, a hippopotamus attacked a certain man to death in Buseruka sub-county; a crocodile attacked someone on Lake Albert shores in Kabwoya sub-county; one lion strayed out of the wild and caused acrimony in Bugambe sub-county. Some cases of attacks by chimpanzees (including abduction of a child), have been reported in Kyabigambire and Hoima Municipality (Figure 18).

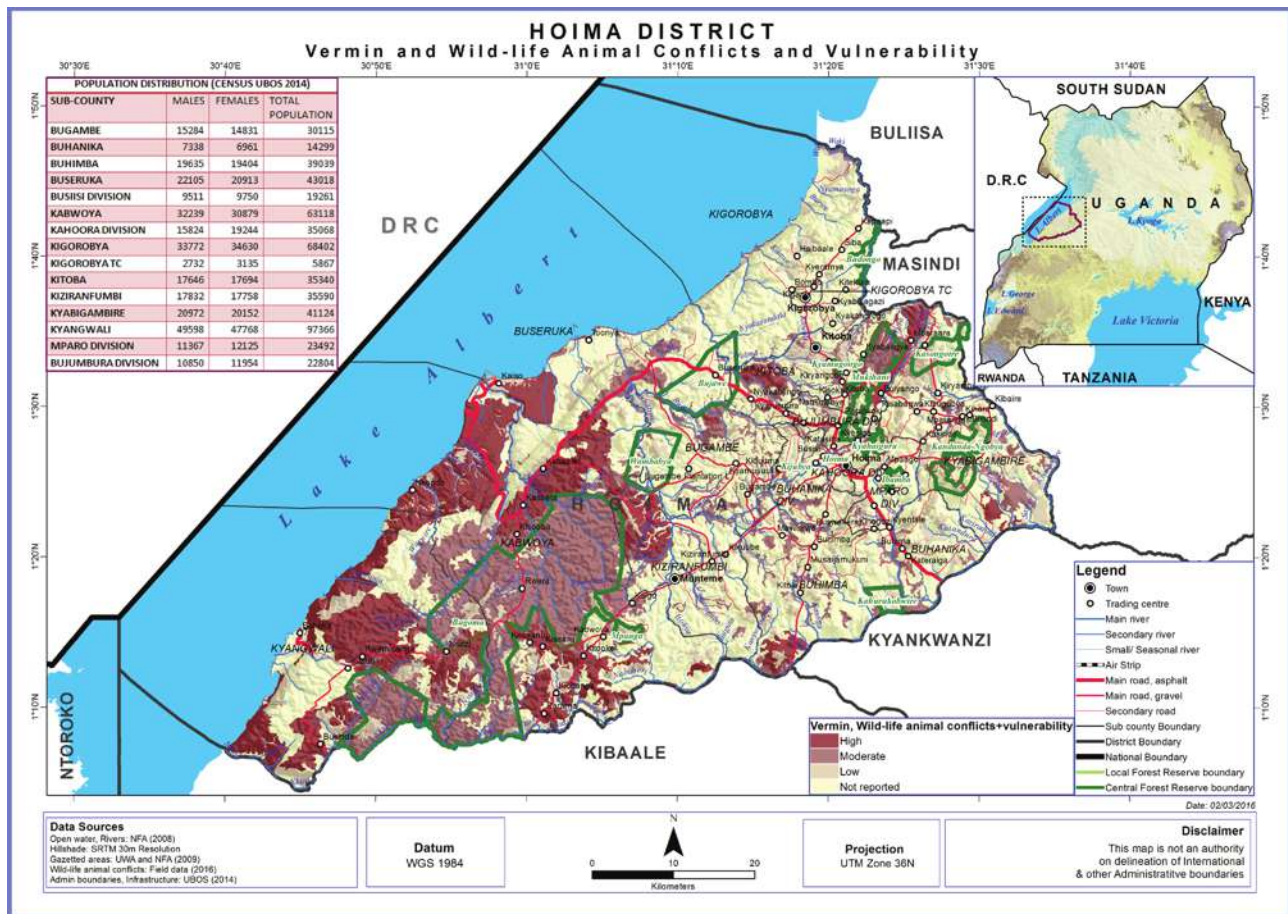


Figure 18: Vermin and Wildlife Animal Conflicts Vulnerability, Hoima District

4.3.5 Invasive species

Results from the discussions showed that *Lantana camara*, *Eichhornia crassipes* (Water hyacinth), *Salvinia molesta* (Nankabirwa weed) and *Oxalis latifolia* were the most reported invasive species in Hoima District. Participants reported that the entire district is affected by *Lantana camara* and *Oxalis latifolia*. Parts of Buseruka and Kabwoya sub-counties on Lake Albert are dominated by *Eichhornia crassipes* (Water hyacinth) and *Salvinia molesta* (Nankabirwa weed). *Lantana camara* destroys pastures that would have been palatable to cattle in grazing lands. The recent reports on the invasive weed called *Striga* in Kitoba and Kigorobya sub-counties has caused fears in reducing productivity of cereal enterprises in the area. The neighbouring sub-counties of Kyabigambire, Buseruka and Bugambe may be equally vulnerable. Generally, invasive species are widely spread in all sub counties (Figure 19).



Plate 4: *Lantana camara* in Kabwoya Sub-county

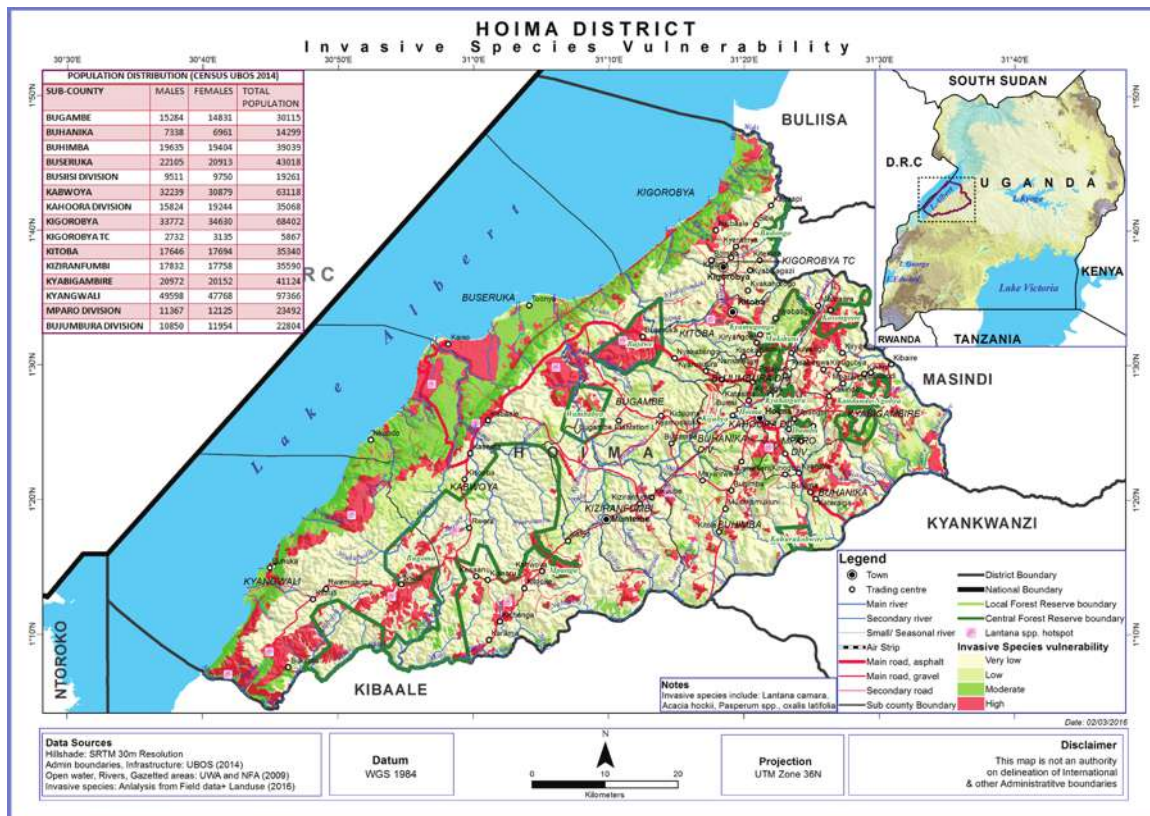


Figure 19: Invasive species vulnerability, Hoima District

4.4 Human Induced and Technological Hazards

4.4.1 Bush fires

During the focus group discussions, participants indicated that bush burning was a serious problem in Hoima district. It was reported that most of these fires are set by cattle keepers who often burn old grass to allow regeneration of fresh pastures for their cattle. Most of these fires are not controlled and end up destroying crops and wood lots of pine and eucalyptus. In a recent incident that happened in February 2016, a pine plantation was burnt along the Hoima – Kaiso toonya road in Buseruka sub-county. The other most affected sub-counties include; Kitoba and Kyabigambire. Generally, the bush fires occur in all sub-counties (Figure 20).



Plate 5: Burnt pine plantation at Bujawe, Buseruka sub-county



Plate 6: Bush burning in Kabwoya Sub-county

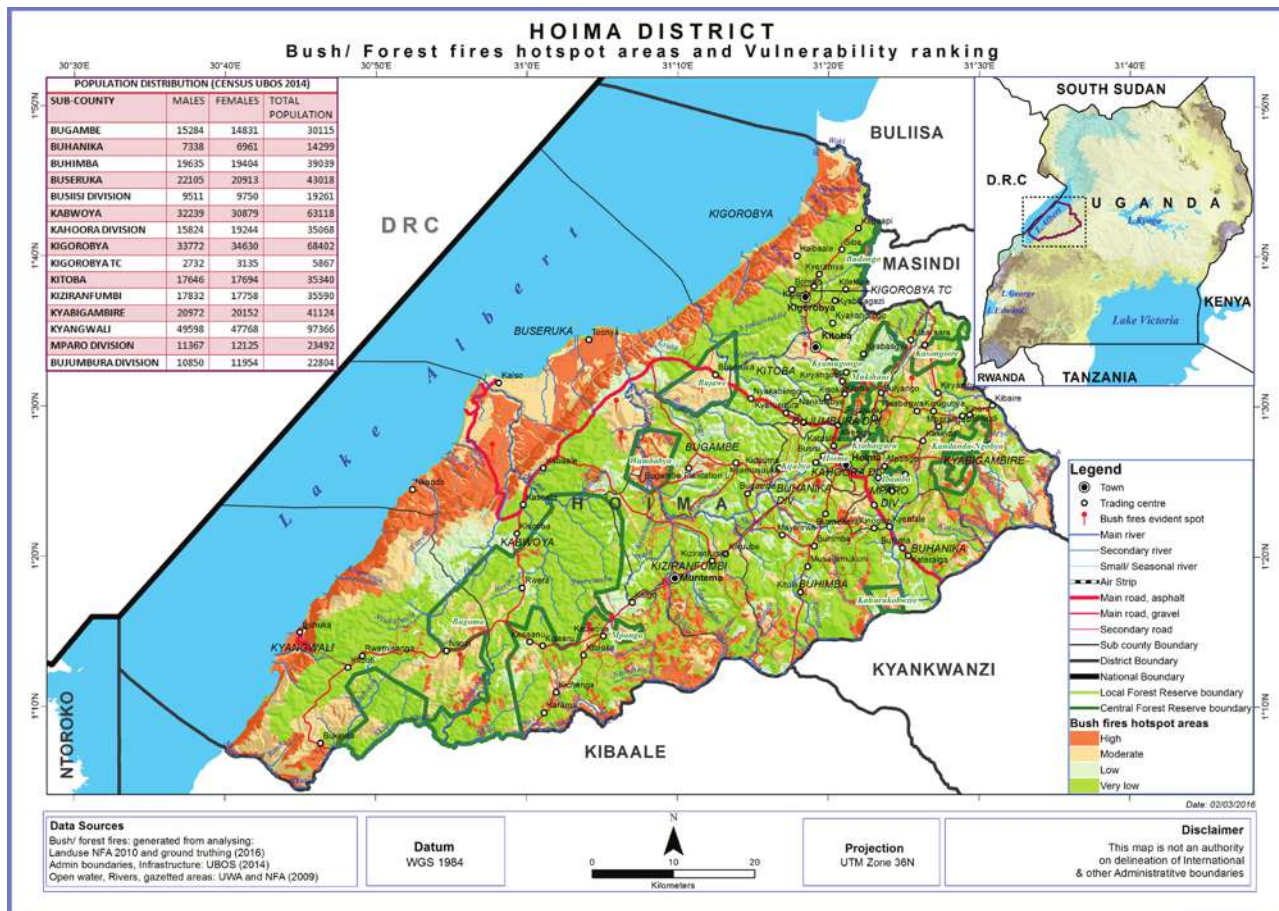


Figure 20: Bush/Forest fires Hotspot Areas and Vulnerability Ranking, Hoima District

4.4.2 Land conflicts

Participants indicated that incidences of land conflicts have escalated in Hoima district. It was observed that these conflicts range from ownership and boundary user rights. It was reported that many people have been evicted from their customary land without compensation in what is increasingly becoming oil-influenced land grabbing. This is partly due to keeping the land idle. Over 50% of the land holding in Hoima is not under productive use (it is idle) (Figure 22).

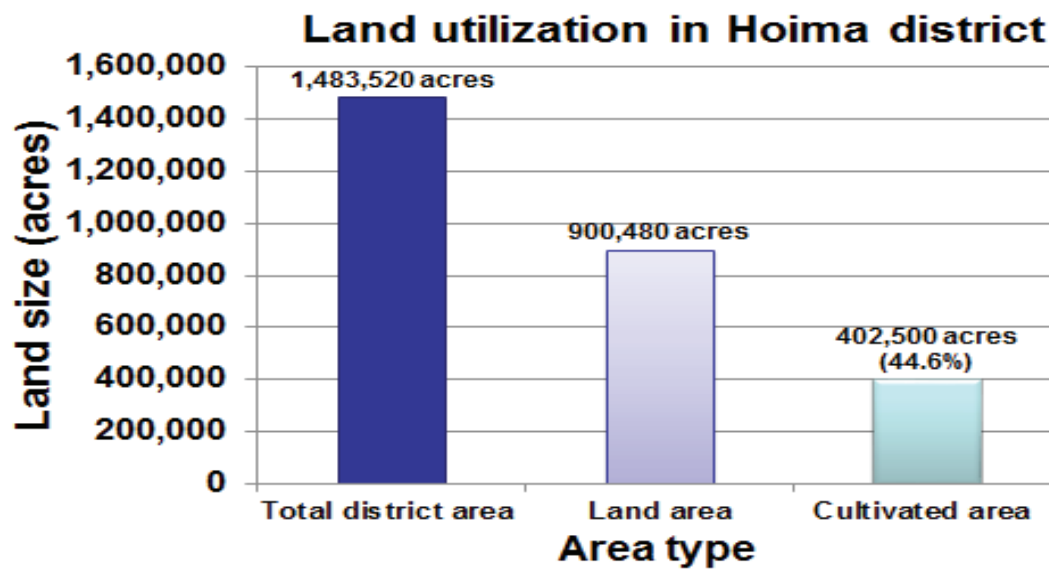


Figure 21: Land utilization in Hoima district

There is also emigration into the area by many other people that encroach on land that has been sparsely populated. In 2014, it was reported that 70 families were displaced from their land in Rwengabi village, Kabwoya sub-county. The other most affected sub-counties include; Kigorobya, Bugambe, Buseruka, Kiziranfumbi and Kyangwali where cases of land evictions, land wrangles, death due to wrangling etc have been reported.



Plate 7: Some of the affected members in Rwengabi community (Kabwoya) due to land conflicts

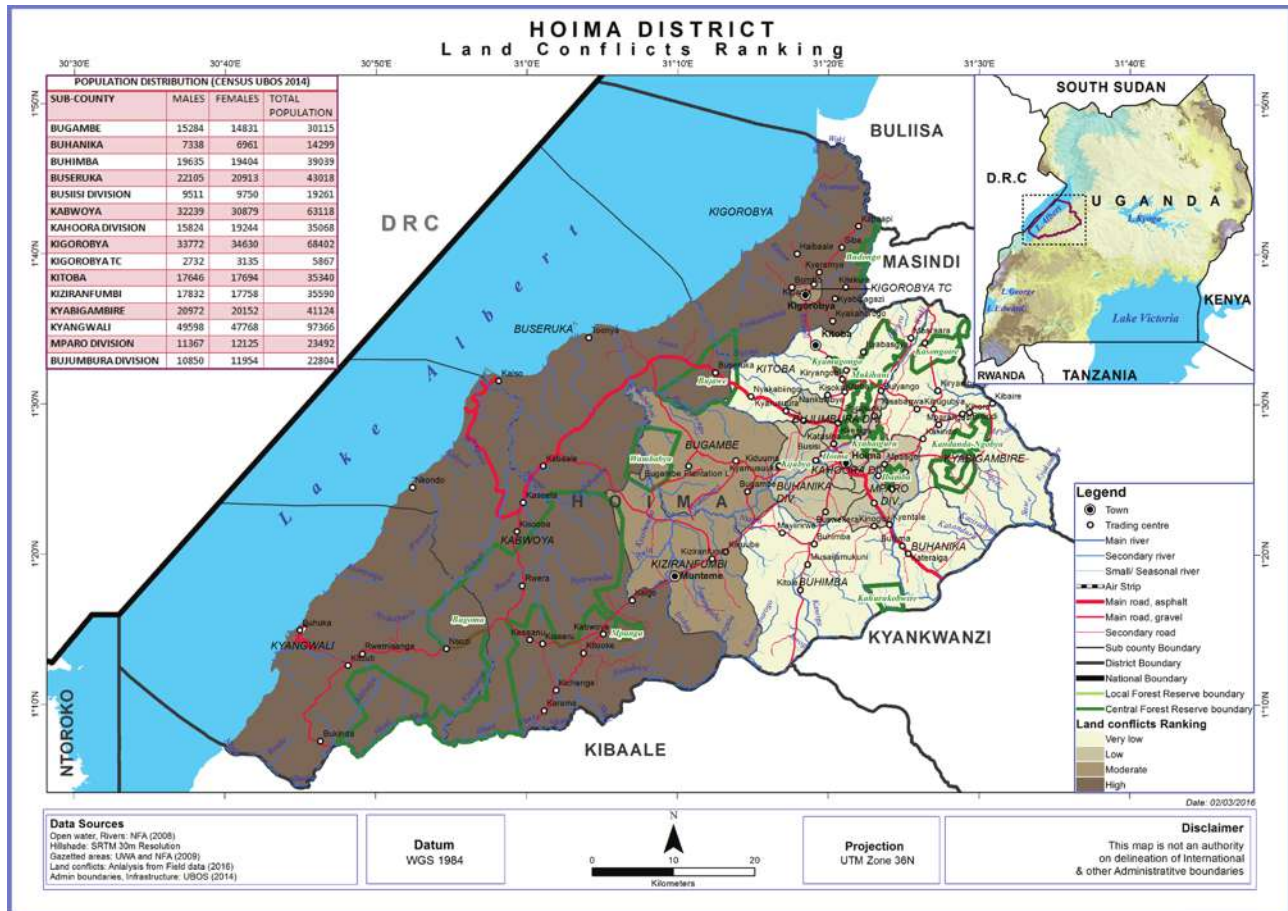


Figure 22: Land Conflicts Ranking, Hoima District



4.4.3 Environmental Degradation

Results from the participatory assessments indicated that the most reported forms of environmental degradation in Hoima district were; wetland reclamation, massive deforestation for agriculture, sand mining, stone quarrying, cutting down trees for timber, fire wood and charcoal burning and establishment of car washing bays (in Hoima Municipality) in wetlands and rivers. The most affected sub-county is Kyabigambire which is a major producer of charcoal, Kitoba, Hoima Municipality. It is also a hub for the brewing of alcohol using sugar molasses that takes place in major swamps. There are potential hazards as a result of oil/gas exploration, production and development (activities) such as blow out of oil wells, oil spills from pine lines, accumulated oil wastes that lead to pollution (Figure 23).



Plate 8: Car washing along a stream in Hoima Municipality

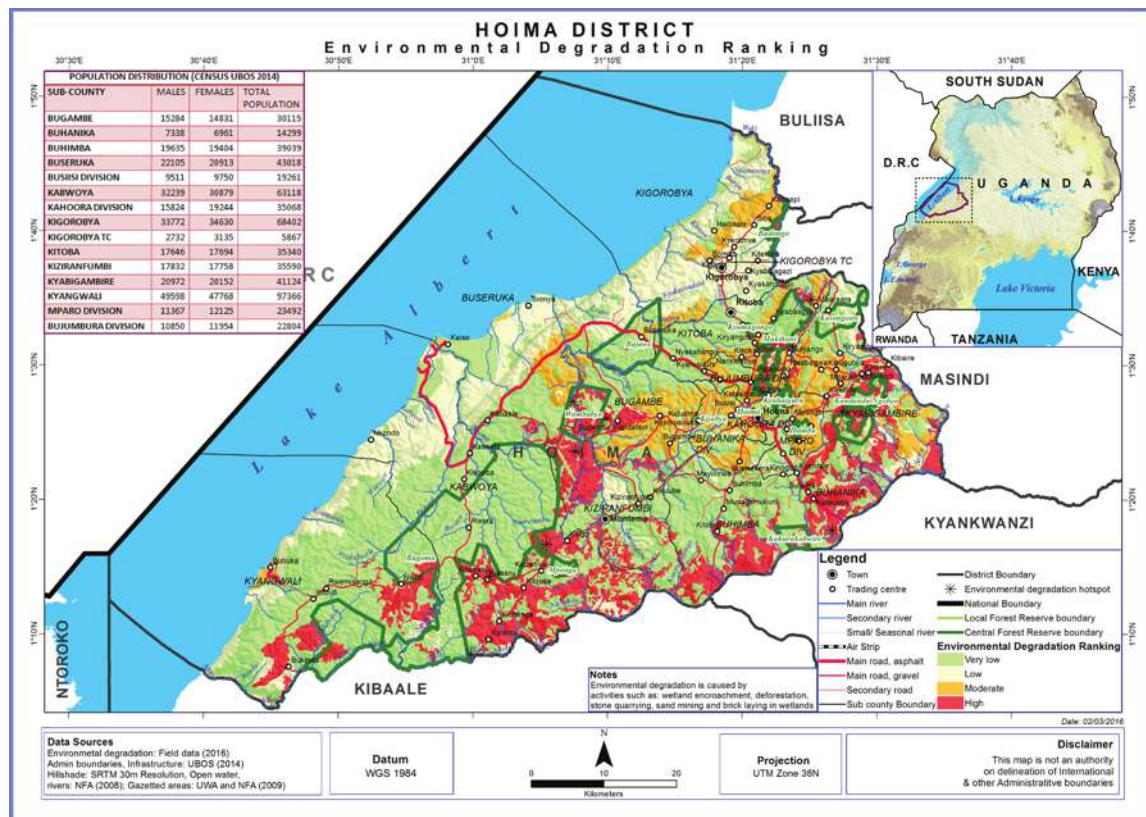


Figure 23: Environmental Degradation Ranking, Hoima District

4.4.4 Road and Water Accidents

Road accidents were mainly reported along the new Hoima – Kaiso Tonya road and Kampala – Hoima highway due to over speeding and over loading. The sharp and steep corners popularly known as black spots which were maintained during construction along the road aggravate the problem of accidents on the road. Such spots in Hoima include points at Mukati (within Kahoora Division) and River Kiribanywa (towards Butema). Another potential hotspot for road accident is at Ikamiro – Kyangwali road.

Water accidents are common on Lake Albert. The recent cases are those of refugees from Kyangwali sub-county who were returning to DRC. Some pupils from Primary schools have also been reportedly drowned in Kibiro, Kigorobya sub-county (Figure 24).

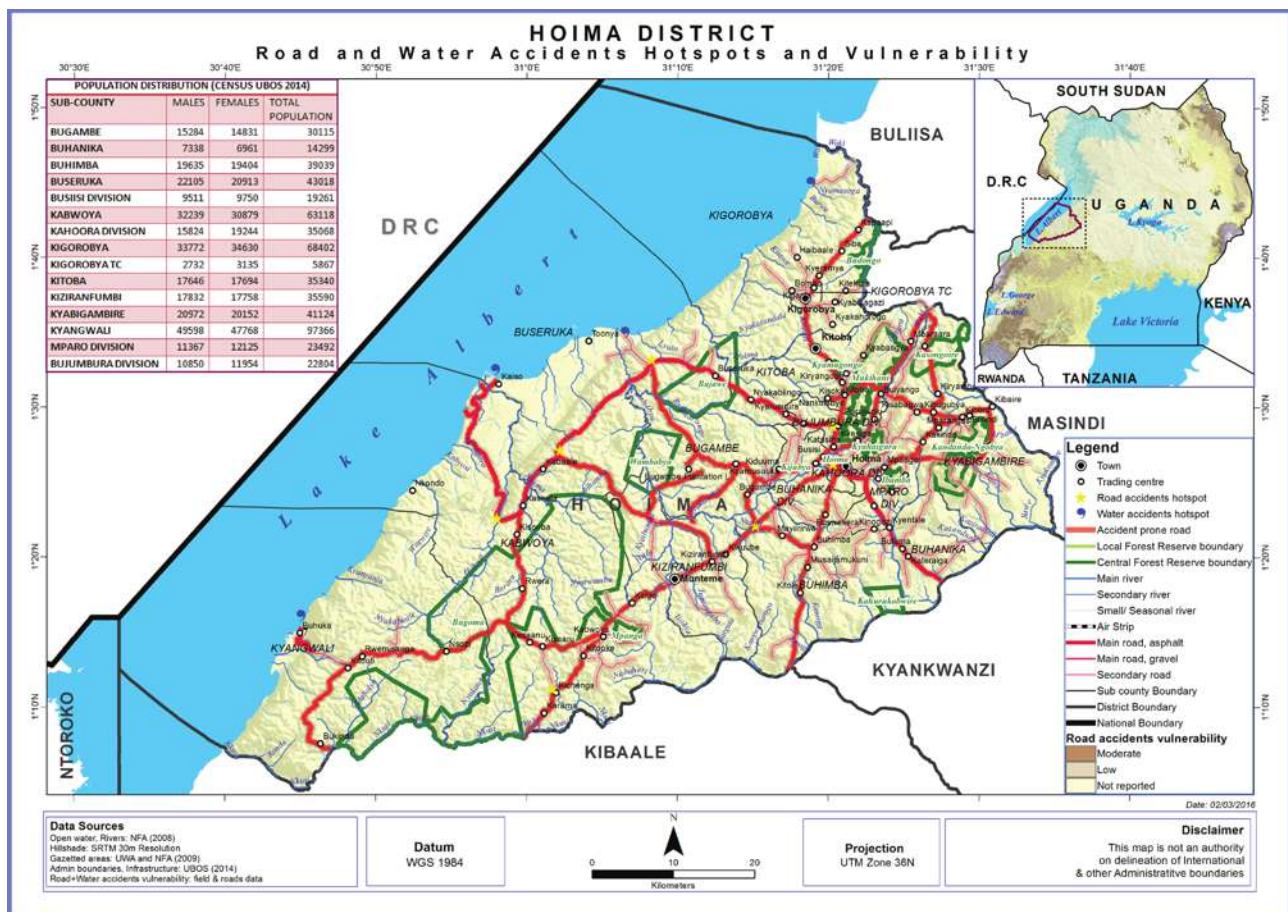


Figure 24: Road and Water Accidents Hotspots and Vulnerability, Hoima District

4.4.5 Oil and gas related hazards

Hoima District is endowed with Oil and Gas as the most potential natural resource. The extent of Oil and gas resources in terms of acreage in Hoima District is estimated at approximately 714 sq. Km.

Main oil fields include:

- Under Tullow: Mpuuta, Nzizi and Waraga (Kaiso-Tonya discovery area, 370 sq.km)
- Under CNOOC: Well pad I, Well pad II and Well pad III (Kingfisher discovery area, 344 sq. km)

Expected Infrastructure Developments

Expected infrastructure that may impact on Biodiversity and local communities include:

- Proposed CPF, central processing facility in Kyangwali
- Proposed Pipelines (Nile crossing)
- Proposed Housing and camp sites
- Proposed oil refinery in Kabaale parish, Buseruka Sub-county

The above oil and gas development are greatly associated with potential hazards ranging from;

- Oil spills
- Associated oil waste generation
- Ground water contamination
- Accidents like blow ups on site, on road (road kills), fires, occupational hazards,
- Environmental degradation e.g. quarrying, barrow pits, vegetation clearance, soil and land degradation,
- Land take and property destructions in various dimensions
- Pollution e.g. air, sound, light, surface water
- Traffic volumes amidst the existing road infrastructure
- Influx of oil workers amidst inadequate resources
- Land conflicts

However, the following are the positive impacts of the oil and gas developments:

- Limiting the footprint when drilling pads
- Access roads and camp sites
- Sensitivity atlas developed by National Environment Management Authority and World Conservation Society
- Strategic Environment Assessment developed by National Environment Management Authority and WWF
- Monitoring biodiversity in liaison with the Wildlife Authority and other stakeholders
- Restoration and decommissioning of sites
- Development of infrastructure like Kaiso-Tonya (Buseruka) and Ikamiro (kyangwali) roads
- CSR's schools and health units
- Establishment of waste treatment facilities in Nyamasoga (Enviroserve) and White Nile and waste consolidated areas in Kisinja and proposed Central Processing Facility (CPF) in Kyangwali Sub-county
- Employment in different oil and gas activities.

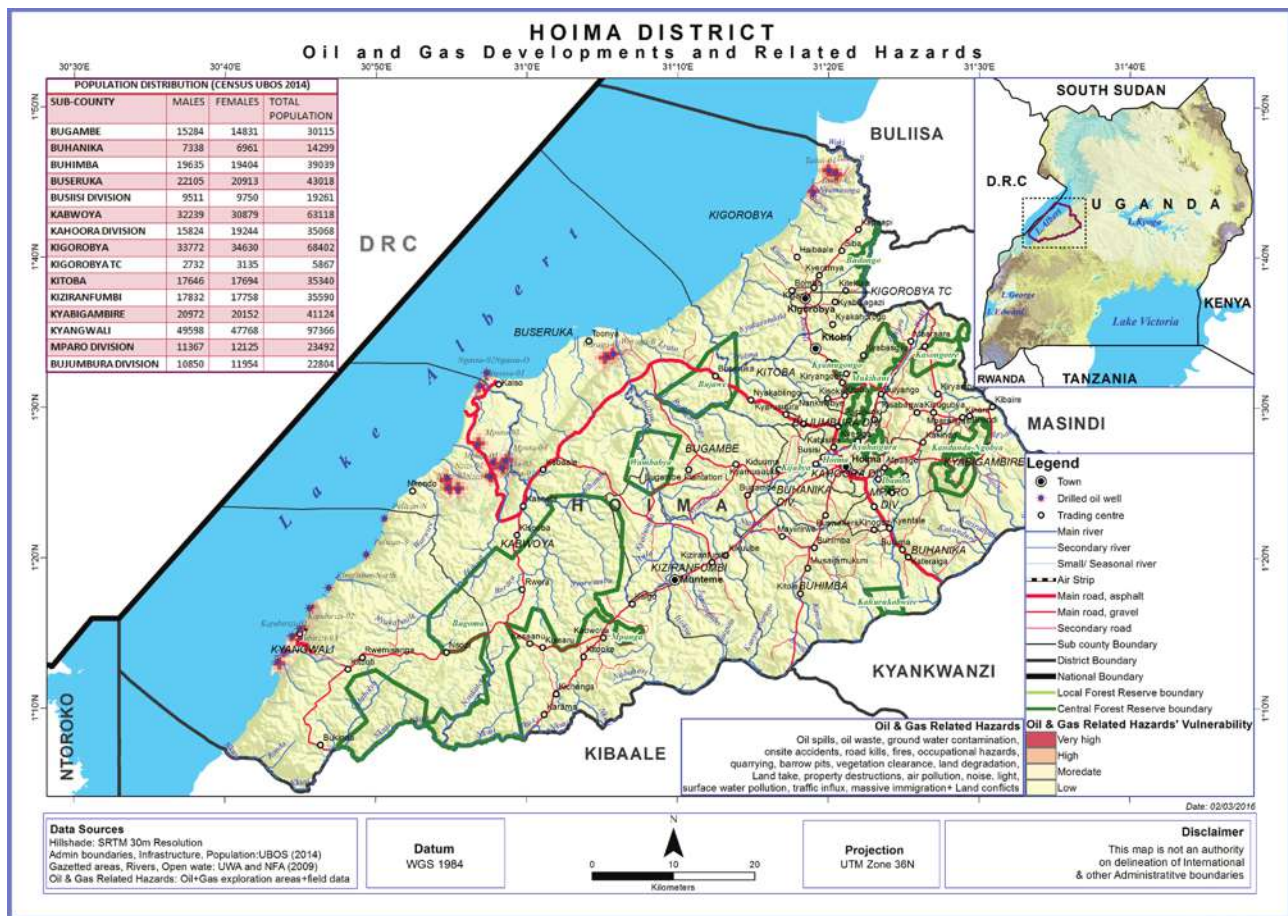


Figure 25: Oil and Gas Developments and Related Hazards, Hoima District

Table 2: Components of Vulnerability in Hoima 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	<ul style="list-style-type: none"> - Human and livestock adjacent to hill slopes - Crops on hill slopes - Infrastructure e.g. houses, schools, roads adjacent to hill slopes 	Parish, District	<ul style="list-style-type: none"> - Loss of lives - Complete crop failure - Destruction of infrastructure e.g. homes, and schools 	Parish	<ul style="list-style-type: none"> -Migration -Sensitization by both governmental and non-governmental agencies -Adoption of soil/water conservation practices 	Parish Village	
	Earth quakes	<ul style="list-style-type: none"> - Infrastructure e.g. houses, schools 	District	<ul style="list-style-type: none"> - Loss of lives - Destruction of infrastructure e.g. houses, schools 	District	-No much measure so far	District	
	Floods	<ul style="list-style-type: none"> - Livestock adjacent to flood plain - Crops on flood plain - Infrastructure e.g. houses, schools, roads adjacent to flood plain 	Parish	<ul style="list-style-type: none"> - Livestock loss - Destruction of crops - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain 	Parish	<ul style="list-style-type: none"> -Migration -Sensitization on wetland conservation -Dig trenches 	Parish	
	Drought	<ul style="list-style-type: none"> - Livestock - Crops - Human population 	Village	<ul style="list-style-type: none"> - Hunger & poverty - Livestock loss - Crop failure - Shortage of pasture - Shortage of water 	Village	<ul style="list-style-type: none"> -Migration -Sensitization on tree planting -Buy food from elsewhere 	Village	
	Hailstorms, strong winds and Lightning	<ul style="list-style-type: none"> - Human and livestock populations - Crops - Infrastructure e.g. houses, schools, health centres 	Parish	<ul style="list-style-type: none"> - Loss of lives - Destruction of crops - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain 	Parish		Parish	
	Crop Pests and Diseases	<ul style="list-style-type: none"> -Crops 	District	<ul style="list-style-type: none"> - Complete crop failure 	District	<ul style="list-style-type: none"> - Spraying - Cut and burry affected crops -Sensitization on crop disease management 	District	
	Livestock Pests and Diseases	<ul style="list-style-type: none"> -Livestock (cattle, goats etc.) 	District	<ul style="list-style-type: none"> - Loss of livestock - Reduced livestock productivity 	District	<ul style="list-style-type: none"> - Vaccination - Burry and burn animals that have died from infection - Quarantine 	District	
	Human Disease outbreaks	<ul style="list-style-type: none"> - Human Population 	District	<ul style="list-style-type: none"> - Loss of lives 	District	<ul style="list-style-type: none"> - Mass Immunization - Use of mosquito nets 	District	

Invasive species	-indigenous species -Animals	District	- Outcompete the indigenous spp., suppress growth of indigenous spp. - Loss of indigenous spp. - Complete crop Failure - suppress growth of pasture	District	- Cut and burn -Sensitization on Invasive species management	District
Bush fires	- Livestock - Crops - Infrastructure e.g. houses, schools	Sub-county	- Loss of livestock - Shortage of pasture - Destruction of crops - Destruction of infrastructure e.g. houses, schools	Sub-county	-Sensitization	Sub-county
Road and water accidents	- Human population - Infrastructure adjacent to accident black spots e.g. houses, schools etc.	Sub-county	- Loss of lives - Destruction of vehicles - Destruction of Infrastructure adjacent to accident black spots e.g. houses, schools etc.	Sub-county	-Humps on roads -Signage on speed limits -Sensitization on traffic rules	Sub-county
Land conflicts	- Human population	Village	-Loss of lives -Family violence and break outs	Village	- Community dialogue - District court in charge of land issues	Village
Vermin and Wildlife animal attacks	- Human population - Livestock - Crops	Parish	-Loss of lives -Livestock loss -Crop destruction	Parish	- Report to UWA - Guard gardens -Poison -Hunt and kill -Fence water collection points with Wildlife animals	Village
Environmental degradation	- Human and livestock populations - Crops - Natural vegetation	Sub-county	-Crop failure -Shortage of pasture -Shortage of water -Decline of water quality	Sub-county	-Sensitization on wetland conservation -Sensitization on tree planting -Setting bi-laws	Sub-county
Landslides, Rock falls and Soil erosion	- Human and livestock adjacent to hill slopes - Crops on hill slopes - Infrastructure e.g. houses, schools, roads adjacent to hill slopes	Parish	- Loss of lives - Complete crop failure - Destruction of infrastructure e.g. homes, and schools	Parish	-Migration -Sensitization by both government and non- governmental agencies	
Earth quakes	- Infrastructure e.g. houses, schools	District	- Loss of lives - Destruction of Infrastructure e.g. houses, schools	District	-No much measure so far	



Floods	<ul style="list-style-type: none"> - Livestock adjacent to flood plain - Crops on flood plain - Infrastructure e.g. houses, schools, roads adjacent to flood plain 	Parish	<ul style="list-style-type: none"> - Livestock loss - Destruction of crops - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain 	Parish	<ul style="list-style-type: none"> -Migration -Sensitization on wetland conservation -Dig trenches
Drought	<ul style="list-style-type: none"> - Livestock - Crops - Human population 	Village	<ul style="list-style-type: none"> - Hunger & poverty - Livestock loss - Crop failure - Shortage of pasture - Shortage of water 	Village	<ul style="list-style-type: none"> -Migration -Sensitization on tree planting -Buy food from elsewhere
Hailstorms, strong winds and Lightning	<ul style="list-style-type: none"> - Human and livestock populations - Crops - Infrastructure e.g. houses, schools, health centres 	Parish	<ul style="list-style-type: none"> - Loss of lives - Destruction of crops - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain 	Parish	
Crop Pests and Diseases	<ul style="list-style-type: none"> - Crops 	District	<ul style="list-style-type: none"> - Complete crop failure 	District	<ul style="list-style-type: none"> - Spraying - Cut and bury affected crops -Sensitization on crop disease management
Livestock Pests and Diseases	<ul style="list-style-type: none"> -Livestock (cattle, goats etc.) 	District	<ul style="list-style-type: none"> - Loss of livestock - Reduced livestock productivity 	District	<ul style="list-style-type: none"> - Vaccination - Bury and burn animals that have died from infection - Quarantine
Human Disease outbreaks	<ul style="list-style-type: none"> - Human Population 	District	<ul style="list-style-type: none"> - Loss of lives 	District	<ul style="list-style-type: none"> - Mass Immunization - Use of mosquito nets
Invasive species	<ul style="list-style-type: none"> -indigenous species -Animals 	District	<ul style="list-style-type: none"> - Outcompete the indigenous spp., suppress growth of indigenous spp - Loss of indigenous spp. - Complete crop Failure - suppress growth of pasture 	District	<ul style="list-style-type: none"> - Cut and burn -Sensitization on Invasive species management
Bush fires	<ul style="list-style-type: none"> - Livestock - Crops - Infrastructure e.g. houses, schools 	Sub-county	<ul style="list-style-type: none"> - Loss of livestock - Shortage of pasture - Destruction of crops - Destruction of infrastructure e.g. houses, schools 	Sub-county	<ul style="list-style-type: none"> -Sensitization
Road accidents	<ul style="list-style-type: none"> - Human population - Infrastructure adjacent to accident black spots e.g. houses, schools etc. 	Sub-county	<ul style="list-style-type: none"> - Loss of lives - Destruction of vehicles - Destruction of Infrastructure adjacent to accident black spots e.g. houses, schools etc. 	Sub-county	<ul style="list-style-type: none"> -Humps on roads -Signage on speed limits -Sensitization on traffic rules

Environmental component



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



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

Vulnerability was assessed basing on two broad criteria i.e. socio-economic and environmental components of vulnerability. Participatory approach was employed to assess these vulnerability components by characterizing the exposure agents, including hazards, elements at risk and their spatial dimension. Participants also characterized the susceptibility of the district including identification of the potential impacts, the spatial disposition and the coping mechanisms. Participants also identified the resilience dimension at different spatial scales (Table 2).

Table 3 (Vulnerability Profile) shows the relation between hazard intensity (probability) and degree of damage (magnitude of impacts) depicted in the form of hazard intensity classes, and for each class the corresponding degree of damage (severity of impact) is given. It reveals that climatological and meteorological hazards in form of drought and hailstorms predispose the community to high vulnerability state. The occurrence of pests and diseases and Lightning, also create a moderate vulnerability profile in the community (Table 3). Table 4 shows Hazard assessment for Hoima District.

Table 3: Vulnerability Profile for Hoima District

	PROBABILITY	SEVERITY OF IMPACTS	RELATIVE RISK	VULNERABLE SUB COUNTIES
	<i>Relative likelihood this will occur</i>	<i>Overall Impact (Average)</i>	<i>Probability x Impact Severity</i>	
Hazards	1 = Not occur 2 = Doubtful 3 = Possible 4 = Probable 5 = Inevitable	1 = No impact 2 = Low 3 = medium 4 = High	0-1 = Not Occur 2-10 = Low 11-15 = Medium 16-20 = High	
Floods	5	4	20	The most affected sub-counties: Buhimba, Buhanika and Bugambe. All lakeshore sub-counties. Municipal divisions
Droughts	5	4	20	The most affected sub-counties: Kyangwali, Kabwoya, Buseruka, Kigoroby
Soil erosion, rock falls and landslides	4	4	16	The most affected sub-counties: Buseruka, Kabwoya, Kigoroby, Kyangwali. All sub counties
Hail storms, Lightning and strong winds	4	4	16	The most affected sub-counties: Buhimba, Kiziranfumbi, Kyangwali, Buhanika, Kabwoya, Buseruka, Bugambe
Bush fires	4	3	12	The most affected sub-counties: Kitoba, Buseruka Kyabigambire; but occur in all sub-counties.
Crop pests and diseases	4	3	12	The most affected sub-counties: Kitoba, Kyabigambire, Buhimba, Kiziranfumbi, Kyangwali, Buhanika, Bugambe; but generally in all sub-counties.
Livestock pests and diseases	4	3	12	The most affected sub-counties: Buseruka, Kigoroby, Buhanika, Kyangwali, Kabwoya; but generally in all sub-counties.
Human Diseases outbreaks	5	2	10	The most affected sub-counties: Kyabigambire, Kyangwali, Buseruka, Kabwoya, Kigoroby
Land conflicts	4	4	16	The most affected sub-counties: Kigoroby, Buseruka, Kabwoya, Kiziranfumbi, Kyangwali. But generally occur in all sub-counties.
Vermin and Wild-life animal attacks	5	4	20	The most affected sub-counties: Kabwoya, Kyangwali, Kiziranfumbi, Kitoba, Kyabigambire, Buseruka, Hoima MC.
Earthquakes and faults	3	1	3	The most affected sub-counties: Buseruka, Kigoroby, Buhanika, Kyangwali, Kabwoya
Road and water accidents	4	2	8	The most affected sub-counties: Kyangwali, Kabwoya, Kigoroby, Buseruka and Hoima Municipality, Buhanika
Environmental degradation	4	4	16	All sub-counties

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 4: Hazard Risk Assessment

Hazard	Buhanika	Buseruka	Kigorobya	Kigorobya T.C	Kitoba	Kyabigambire	Bugambe	Buhimba	Kabwoya	Kizirantumbi	Kyangwali	Bujumbura Division	Busisi Division	Kahoorra Division	Mparo Division
Floods	H	H	M	L	M	M	H	H	H	L	H	M	M	M	M
Drought	M	H	H	M	M	M	M	M	H	M	H	L	L	L	L
Landslides, Rock falls	M	H	H	L	L	L	L	L	H	L	H	L			
Soil Erosion	M	H	H	M	M	M	M	M	H	M	H	M	M	M	M
Strong winds, Hailstorms & Lightning	H	H	H	M	M	M	H	H	H	H	H	M	M	M	M
Crop pests and Diseases	H	M	M	M	H	H	H	H	M	H	M	M	M	M	M
Livestock pests and Diseases	H	H	H	M	M	M	M	M	H	M	H	M	M	M	M
Human disease outbreaks	M	H	H	M	M	H	M	M	H	M	H	M	M	M	M
Vermin +Wildlife animal attacks	L	H	M		H	H	M	M	H	H	H	M	L	L	L
Land conflicts	H	H	H	M	H	H	M	H	H	H	H	M	M	M	M
Bush fires	L	H	M	L	H	H	L	L	H	M	M	L	L	L	L
Environmental degradation	M	H	H	L	H	H	H	M	H	H	H	M	M	M	M
Earthquakes and faults	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Road accidents	M	M	L	M	L	L	L	L	L	L	L	M	M	M	M
Water accidents		M	M						M		M				
Invasive species	L	H	L	L	L	L	L	L	H	L	H	L	L	L	L
Meromicticism		L	L						L		L				

Key

H	High
M	Moderate
L	Low
	Not reported/ Not prone

4.5.1 Gender and Age groups mostly affected by Hazards

Table 5: Gender and age groups mostly affected by hazards

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

4.5.2 Coping Strategies

In response to the various hazards, participants identified a range of coping strategies that the community employs to adjust to, and build resilience towards the challenges. The range of coping strategies are broad and interactive often tackling more than one hazard at a time and the focus of the communities leans towards adaptation actions and processes including social and economic frameworks within which livelihood and mitigation strategies take place; ensuring extremes are buffered irrespective of the direction of climate change and better positioning themselves to better face the adverse impacts and associated effects of climate induced and technological hazards (Table 5).

Table 6: Coping strategies to the Multi-hazards in Hoima District

No	Multi-Hazards	Coping strategies
1	Geomorphological or Geological	Landslides, Rock falls and Erosion <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 • Plant early maturing crops varieties • Plant drought tolerant/resistant varieties • Adopt climate smart agriculture – (Micro) Irrigation, SWC practices, etc.
5		Strong winds, Hailstorms and Lightning <ul style="list-style-type: none"> • 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

No	Multi-Hazards	Coping strategies
6	Ecological or Biological	Crop pests and Diseases <ul style="list-style-type: none"> • Spraying pests • Cutting and burying BBW affected crops • Burning of affected crops • Vigilance • Use disease tolerant/resistant varieties • Use recommended practices (crop rotations, etc)
7		Livestock pests and Diseases <ul style="list-style-type: none"> • Spraying pests • Vaccinations • Burying animals that have died from infection • Quarantine • Enforce proper management practices
8		Human epidemic Diseases <ul style="list-style-type: none"> • Mass immunisation • Visiting health centres • Use of mosquito nets • Improving water & sanitation coverage at household level. • Enforce hygiene standards
9		Vermin and Wild-life animal attacks <ul style="list-style-type: none"> • 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 control guards (VCGs)
10		Invasive species <ul style="list-style-type: none"> • 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 • Proper management practices

No	Multi-Hazards	Coping strategies
11	Human induced or technological	Land conflicts <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • Leave wetlands as water catchments • Plant appropriate tree species as climate modifiers • Sensitization • Bye-laws and Ordinance • Enforcement of bye-laws & Ordinance • Gazette 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 Hoima district has over the past two decades increasingly experienced hazards including; rock falls, soil erosion, floods, drought, hailstorms, strong winds, Lightning, crop pests and diseases, livestock pests and diseases, human disease outbreaks, vermin, wildlife animal attacks, invasive species, bush fires and land conflicts putting livelihoods at increased risk. Generally drought and flooding were identified as most serious problem in Hoima 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 Hoima district increase their vulnerability to hazard exposure necessitating urgent external support.

Hazards experienced in Hoima district can be classified as:

- i. Geomorphological or Geological hazards including; landslides, rock falls, soil erosion and earth quakes.
- ii. Climatological or Meteorological hazards including; floods, drought, hailstorms, strong winds and Lightning.
- iii. Ecological or Biological hazards including; crop pests and diseases, livestock pests and diseases, human disease outbreaks, vermin and wildlife animal attacks and invasive species.
- iv. Human induced or Technological hazards including; bush fires, road accidents land conflicts.

However, reducing vulnerability at community, local government and national levels should be a threefold effort hinged on:

- i. Reducing the impact of the hazard where possible through mitigation, prediction, early warning and preparedness.
- ii. Building capacities to withstand and cope with the hazards and risks (adaptation and resilience).
- 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 should undertake to institutionalize, promote and fast-track implementation of One Health Approach (OHA) which integrates control and management of disasters especially pests and diseases in the local governments.
- iii. The government through MAAIF should review the animal diseases control act because of low penalties given to defaulters.
- iv. The government should establish systems to motivate support of political leaders toward government initiatives and programmes aimed at disaster risk reduction.
- v. The government should increase awareness campaigns aimed at sensitizing farmers/communities on disaster risk reduction initiatives and practices.
- vi. The government should revive disaster committees at district level and ensure funding of disaster and environmental related activities. In this regard, a vote should be created by the Ministry of Finance under the current OBT system to cater for Disaster budget in the Local government. Alternatively, a contingency fund (like 5%) should be put aside for disaster related interventions in the Local Governments.
- vii. The government through UNRA and the District Authority should fund periodic maintenance of feeder roads to reduce on traffic accidents.
- viii. The government through MAAIF and the District Production office in the local governments should promote drought and disease tolerant/resistant crop species and livestock breeds.
- ix. The government through LGs and the relevant Ministries of Education and Sports and MWE, OPM (coordination) and Meteorology Authority, UNBS should mandatorily promote the use of Lightning arresters/conductors through increase importation and reduction of taxes on the importation.
- x. The government through OPM and Meteorology department should support establishment of disaster early warning systems in Local Governments.
- xi. The government through MWE increase funding and staff to monitor wetland degradation and non-genuine agro-inputs.
- xii. The government through OPM should improve communication between the disaster department and local communities.
- xiii. The government through MWE should promote Tree planting along road reserves.
- xiv. The government through MAAIF should fund and recruit extension works at sub-county level.
- xv. Government should support Local Governments in systematic land demarcation including the use of natural boundaries made of live fences.

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APPENDIX I: DATA COLLECTION TOOLS



Key informant interview at Hoima District Headquarters



Focus group discussion at Kabwoya Sub-county Headquarters

FOCUS GROUP DISCUSSION GUIDE FOR DISTRICT DISASTER RISK MANAGEMENT FOCAL PERSONS

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

No.	Name of Participants	Designation	Contact	Signature

Introduction

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

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

1. Which crops are majorly grown in your area of jurisdiction?
2. Which domestic animals are dominant in your area of jurisdiction?
3. What challenges are faced by farmers in your area of jurisdiction?
4. Have you experienced landslides and rock falls in the past 10 years in your area of jurisdiction?
5. Which villages, parishes or sub-counties have been most affected by landslide and rock falls?

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

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

21. Have you experienced floods in the past 10 years in your area of jurisdiction?
22. Which villages, parishes or sub-counties have been most affected by floods?
23. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
24. Which crops are majorly affected by floods in your area of jurisdiction?

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

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

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

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

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

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

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

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

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

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

87. What impacts have been caused by environmental degradation?

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

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

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

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

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

93. What impacts have been caused by land conflicts?

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

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

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

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

98. Which roads have experienced Road accidents?

99. What impacts have been caused by Road accidents?

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

101. Which conflict resolution measures have been adopted local communities in a bid to mitigate the above challenges?
102. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
103. Have you experienced any serious bush and or forest fires in the past 10 years in your area of jurisdiction?
104. Which particular villages, parishes or sub-counties have been majorly affected by bush and or forest fires in your area of jurisdiction?
105. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
106. What impacts have been caused by serious bush and or forest fires?
107. To what extent have the serious bush and or forest fires affected livelihoods of the local communities in your area of jurisdiction?
108. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?
109. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

FOCUS GROUP DISCUSSION GUIDE FOR LOCAL COMMUNITIES

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

No.	Name of Participants	Village/ Parish	Contact	Signature

Introduction

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

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

1. Which crops are majorly grown in your community?
2. Which domestic animals are dominant in your community?
3. What challenges are faced by farmers in your community?

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

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

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

38. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?
39. Have you experienced hailstorms or Lightning in the past 10 years in your community?
40. Which villages and parishes have been most affected by hailstorms or Lightning?
41. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?
42. What impacts have been caused by hailstorms or Lightning?
43. To what extent have the hailstorms or Lightning affected livelihoods of the local communities in your community?
44. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?
45. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

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

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

53. What are the relevant government's interventions focusing at helping farmers mitigate the epidemic animal disease outbreaks mentioned?
54. Have you experienced any crop pests and disease outbreaks in the past 10 years in your community?
55. Which villages and parishes have been most affected by epidemic animal disease outbreaks?
56. As a way of ranking from Low, Medium, High and Very high, rank the villages and parishes that have been most affected?
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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?
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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?
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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?
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Section D: Human induced or Technological hazards (Land conflicts, bush and forest fires, road accidents, water accidents, environmental degradation, oil and gas hazards)

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?
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87. What impacts have been caused by environmental degradation?
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89. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
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102. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
103. Have you experienced any serious bush and or forest fires in the past 10 years in your community?
104. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
105. What impacts have been caused by serious bush and or forest fires?
106. To what extent have the serious bush and or forest fires affected livelihoods of the local communities in your community?
107. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?
108. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

FOCUS GROUP ATTENDANCE LIST FOR DISTRICT DISASTER RISK MANAGEMENT FOCAL PERSONS

Name of Participant	Designation	Contact
1. Nyangoma Joseline	Senior District Environment Officer	0772628153
2. Nsita Getrude	District Environment Officer	0782294921

FOCUS GROUP DISCUSSION ATTENDANCE LIST FOR LOCAL COMMUNITIES

Name of Participant	Village/Parish	Contact
1. Barugahara Geoffrey	Kyakamese	0774744229
2. Zozimu Kasangaki	Kyakamese	-
3. Evas Kasangaki	Kyakamese	-
4. Atugonza John	Kyakamese	-
5. Tibakunirwa Monica	Kyakamese	0781355763
6. Kabahaguzi Annet	Kyabigambire	0772621385
7. Musinguzi Moses	Buseruka	0772471395
8. Atugonza Esther	Buseruka	0782379046
9. Kyahurwa Simon	Toonya	0789141838
10. Magambo Fred	Bigando	0782166746
11. Isingoma Jeotham	Toonya	0782808356
12. Irumba Zubairi	Buseruka	0782381943
13. Jilly Ntamara	Nyakabingo	0773289025
14. Tinkamanyire Ali	Nyakabingo	0772410677
15. Kabatalya Joyce	Buseruka	0772694135
16. Pacutho Justine	Buseruka	0777358666
17. Wobusobozi Micheal	Buseruka	0776253954
18. Kasanga Lomeo	Kyabatalya	0772350737
19. Kiiza Nicholas	Kyabatalya	0775612653
20. Babiiha Francis	Kibingo/Musaija Mukuru East	0773269972
21. Atugonza Peter	Kyabatalya	0702979291
22. Wabyona Henry	Kyabatalya	0777221392

Name of Participant	Village/Parish	Contact
23. Ahumuza Brenda	Kyabatalya	-
24. Bingi Leonard	Musaija Mukuru West	0773482983
25. Kiiza Milly	Kyabatalya	-
26. Muhumuza Edward	Musaija Mukuru East	0779297589
27. Topista Bikara	Kyabatalya	-
28. Mbabazi Alice	Kyabatalya	-
29. Ayebale Darlson	Kyabatalya	-
30. Ntegeka Joyce	Kyabatalya	-

31. Kyaligonza Stephen	Kihooko-Bubogo	0782897403
32. Asiimwe Milton	Kinkonda II	0782586435
33. Kwizera Deo	Kiburara	0774792605
34. Mpabaisi Sam	Bwijangoro	0773232383
35. Tumwesigye Paatu	Maaya B	0776809115
36. Kiirya Joseph	Maaya B	0775286696
37. Kasigwa Rasito	Igwanjura	0777120135
38. Mwongezi Vitus	Bubogo	0752819359
39. Bazaara Godfrey	Kyamugoba	0782093877
40. Kamara Jovan	Kaabira-Bubogo	0774744416

SPATIAL DATA COLLECTION SHEET FOR HAZARD VULNERABILITY AND RISK MAPPING

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