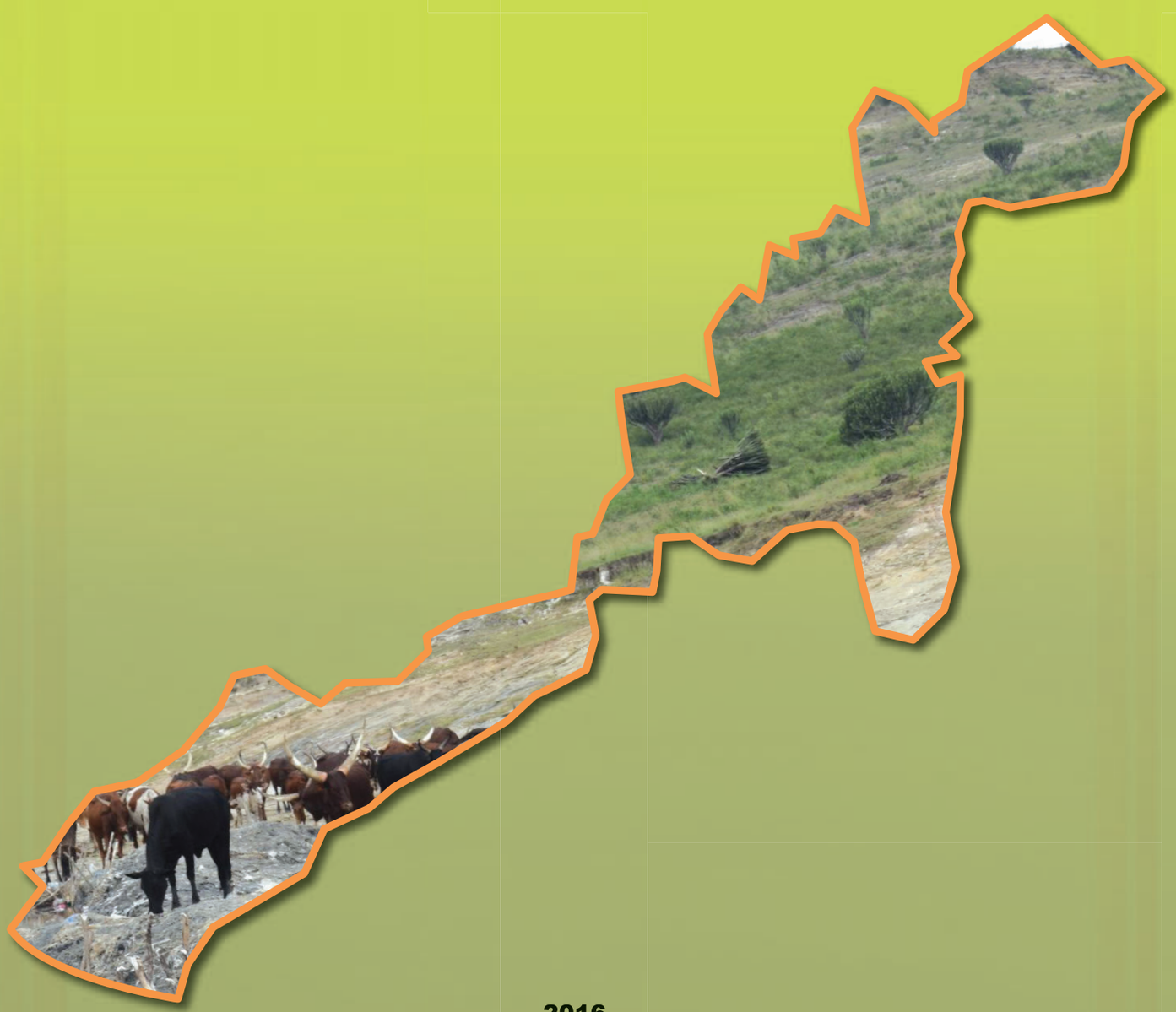
THE REPUBLIC OF UGANDA

Butambala District

Hazard, Risk and Vulnerability Profile



2016

ACKNOWLEDGEMENT

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

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My appreciation also goes to Butambala District Team:

1. Mr. Mugolo Richard – Chief Administrative Officer
2. Mr. Mubiru Farouk Mugambe- Ag. District Natural Resources Officer
3. Mr. Kabogoza John –Agriculture Officer
4. Mr. Mukalazi Kizito - Driver

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

Vulnerability assessment, hazard and risk mapping is an important exercise carried out by OPM in response to The National Policy for Disaster Preparedness and Management (Section 4.1.1) and also targeting to counteract vulnerability at community and Local Government levels by reducing the impact of the hazards where possible through mitigation, prediction, warning and preparedness.

This report has been prepared in close collaboration and coordination with OPM and other stakeholders. The report is presented in 3 chapters with chapter one detailing the background of the report which comprises of the Government of Uganda shifting the disaster management paradigm from the traditional emergency response focus toward one of prevention and preparedness. Here the report highlights the objectives of the exercise as to Collect and analyze the field data using GIS and Develop specific multi-hazard, risk and vulnerability profiles using a standard methodology.

Chapter two highlights the overview of the District and its location where the District curved out from Mpigi District and started operating in July 2010. The district lies in the central region and borders with Mpigi in the East and South, Mityana in the North East; Gomba to the West and North West and Kalungu in the South West. The district has two main rainfall seasons in a year that is March to May and September to November with an average of 1320mm. The remaining months are generally dry. The district lies in the central plateau of Uganda, which comprises of undulating hills with deeply incised valleys. The hill summits lie between 1,182 and 1,341 meters above sea level. The soils are mainly of the Buganda catena and are combinations of clay and sandy loams resulting in sandy clay loams. The vegetation in Butambala district is very varied just as in Mpigi. It ranges from medium ever green forests through medium moist semi-deciduous forests, savanna and swamps.

Chapter three clearly explains the materials and methods applied in conducting the assessment and here a multidisciplinary approach was adopted for the assessment of multi-hazard, risk and vulnerability profiles production. The approach included; an investigation of socio-economic parameters, biophysical characteristics and spatial analysis of hazards in the district.

Chapter four has findings that encompass multi hazard, risk and vulnerability status of the district. It has been noted that Butambala District has continuously experienced multi-hazards for over 30 years. The multi-hazards that are experienced in the District can be classified as:

i. Geomorphological and geological hazards including soil erosion

ii. Climatological or hydro-meteorological including hailstorms, lightning, drought and strong winds

iii. Ecological or biological hazards including crop pests/animal parasites and diseases and invasive species

iv. Technological hazards including road and water accidents

v. Environmental hazards including wetland degradation, deforestation and land conflicts

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

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

b) Building capacities to withstand and cope with the hazards and risks;

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

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DLG	:	District Local Government
DPP	:	District Development Plan
DWRM	:	District Water Resources Management
GIS	:	Geographical Information Systems
HRV	:	Multi hazard, Risk and Vulnerability
MWE	:	Ministry of Water and Environment
NARO	:	National Agricultural Research Organisation
NEMA	:	National Environmental Management Authority
NFA	:	National Forestry Authority
OPM	:	Office of the Prime Minister
SC	:	Sub County
SRTM	:	Shuttle Radar Topography Mission
TC	:	Town Council
ToR	:	Terms of Reference
UBOS	:	Uganda Bureau of Statistics
UNDP	:	United Nations Development Programme
UNRA	:	Uganda National Roads Authority

DEFINITION OF KEY TERMS

Hazard is a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation

Risk is a probability of a hazard occurring or threatening to occur

Vulnerability refers to the propensity of exposed elements such as human beings, their livelihoods, and assets to suffer adverse effects when impacted by hazard events

Climate variability refers to the climatic parameter of a region varying from its long-term mean. Every year in a specific time period, the climate of a location is different. Some years have below average rainfall, some have average or above average rainfall

Disaster is a progressive or sudden widespread or localized, natural or human caused occurrence which causes or threatens to cause death or injury, damage to property, infrastructure or environment, disruption of life of a community and its magnitude exceeds the ability of those affected to cope using only their own resources

Disaster management is a continuous and integrated multi-sectoral and multidisciplinary process of planning and implementation of measures aimed at disaster prevention, mitigation, preparedness, response, recovery and rehabilitation

Mitigation means structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards

Preparedness means activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary evacuation of people and property from threatened locations

Response means measures taken during or immediately after an incident or a disaster in order to bring relief to affected communities or individuals

Adaptation means the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities

CHAPTER ONE

1.1 Background

Uganda has over the past years experienced frequent disasters that ranges from drought, to floods, landslides, human and animal diseases, pests, animal attacks, earthquakes, fires, conflicts and other hazards which in many instances resulted in death, property damage and loss of livelihood. With the increasing negative effects of hazards that accompany population growth, development and climate change, public awareness and proactive engagement of the whole spectrum of stakeholders in disaster risk reduction, are becoming critical. The Government of Uganda is shifting the disaster management paradigm from the traditional emergency response focus toward one of prevention and preparedness. Contributing to the evidence base for the 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 engage mainstreaming of disaster and 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 sub-regions of Rwenzori, Karamoja, Teso, Lango, Acholi, West Nile, Central and South western sub regions. During the exercise, local government officials and community members actively participated in the data collection and analysis through focus groups discussions and the key informant interviews. The data collected was used to generate hazard, risk and vulnerability maps and profiles for each district. Validation workshops were held in close collaboration with the District Local Government (DLG) technocrats, Development Partners, Agencies and academic/research institutions. The developed maps show the local geographical distribution of hazards and vulnerabilities up to sub county level of the District.

1.2 Justification

The National Policy for Disaster Preparedness and Management (Section 4.1.1) requires the Office of the Prime Minister to “Carryout vulnerability assessment, hazard and risk mapping of the whole Country and update the data annually”. UNDP’s DRM project 2016 Annual Work Plan; Activity 4.1 is “conduct national hazard, risk and vulnerability (HRV) assessment including sex and age disaggregated data preparation of District profiles.”

1.3 Objectives

The objectives of the assignment were to:

1) Collect and analyze field data using GIS in close collaboration and coordination with OPM in Butambala District

2) Develop District specific multi-hazard, risk and vulnerability profiles using a standard

methodology.

3) Preserve the spatial data to enable use of the maps for future information.

4) Produce age and sex disaggregated data in HRV maps

1.4 Scope

This assignment was carried out by a team of consultants under the overall technical supervision by the Office of the Prime Minister and UNDP, Uganda. The assignment was conducted in the month of May, 2016.

CHAPTER TWO

2.1 Overview of Butambala District

Butambala is a newly created district curved out from Mpigi District and started operating in July 2010. The District lies in the central region and borders with Mpigi in the East and South, Mityana in the North East; Gomba to the West and North West and Kalungu in the South West. The District lies on the shores of Lake Victoria, the largest fresh water lake on the African continent. The district headquarters are about 75 Km from Kampala, the Capital City of Uganda. The District has 5 Sub counties and 1 Town Council and these include Kalamba, Kibibi, Budde, Ngando, Bulo and Gombe Town Council.

The district has two main rainfall seasons in a year that is March to May and September to November with an average of 1320mm. The remaining months are generally dry.

The District lies in the central plateau of Uganda, which comprises of undulating hills with deeply incised valleys. The hill summits lie between 1,182 and 1,341 meters above sea level. Seasonal and permanent systems drain much of the low-lying areas. The underlying rocks mainly comprise rocks of Precambrian age that are heavily weathered. The most dominant rocks are of the Buganda-Toro system. The soils are mainly of the Buganda catena and are combination s of clay and sandy loams resulting in sandy clay loams. The vegetation in Butambala District is very varied just as in Mpigi. It ranges from medium ever green forests through medium moist semi-deciduous forests, savanna and swamps. The forests decrease as one goes further from the East to the West of District. Medium moist evergreen forests occur at altitude of between 1,128 and 1,280m along the North-west shores of Lake Victoria. It is differentiated from true lowland tropical rain forests on account of its greater altitude, lower rainfall.

The majority of the working population is engaged in agriculture as their main occupation, with 77% of the working population being subsistence agricultural workers. The professionals and administrators collectively constitute 6%of the total working population, while the sales and service workers are 11.9%of the total working population.

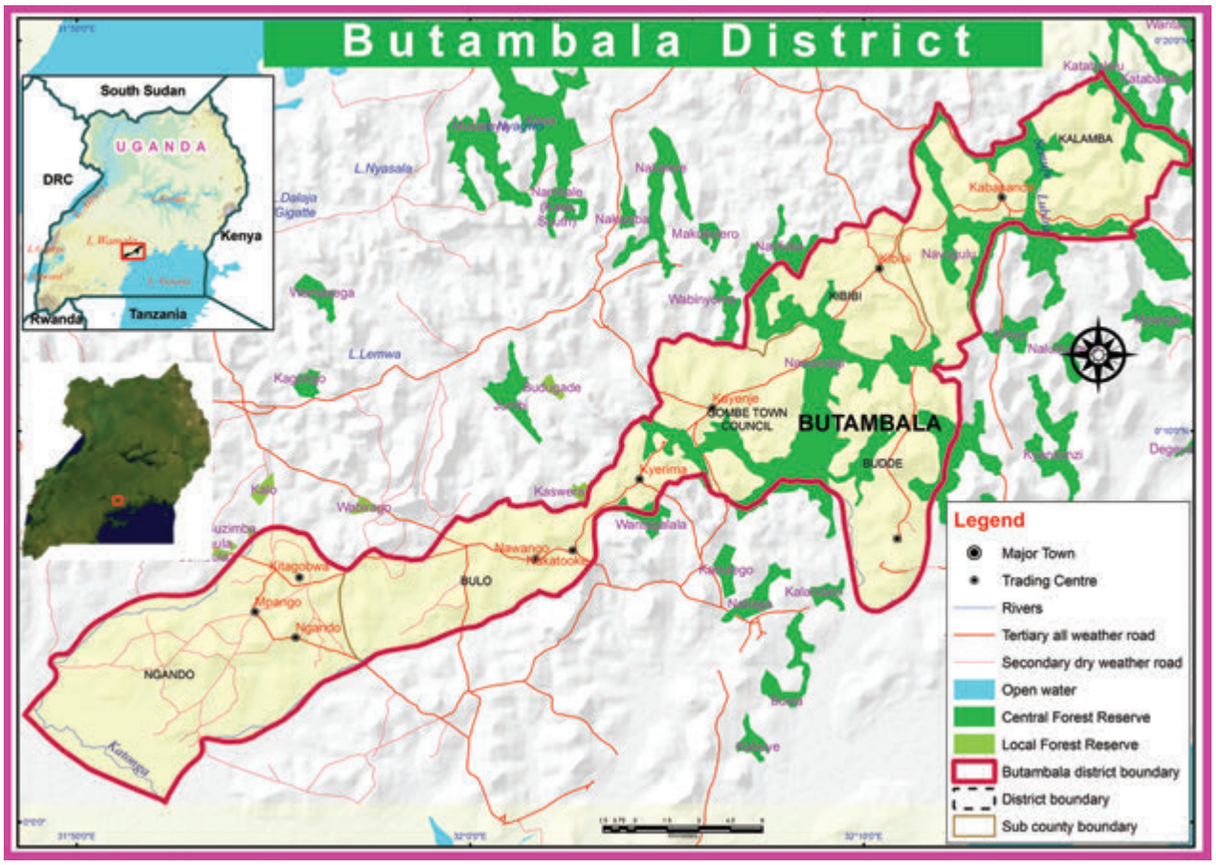

Figure 1: Butambala District map

CHAPTER THREE

3.1 Materials and methods

3.1.1 Multi-hazard, risk and vulnerability profile assessment

3.1.1.1 Approach

A multidisciplinary approach was adopted for the assessment of multi-hazard, risk and vulnerability profiles production. The approach included; the investigation of socio-economic parameters, biophysical characteristics and spatial analysis of hazards in the District.

3.1.1.2 Data collection

3.1.1.3 Socio economic investigation

The socio economic assessment of hazards, risks and vulnerability was threefold: the consultations, key informant interviews and Focus Group Discussion. The consultations were conducted at the district level and this included Government officials who were selected on the advice of the Chief Administrative Officer and assessment team. The issues and concerns discussed were the causes, effects, adaptive responses, risks and vulnerability of multi-hazards experienced in the District. The question and answer session was selected purely because the officials were knowledgeable and had vast experience in the occurrence, severity and frequency of hazards in the District.

In addition to consultations, the key informant interviews were also carried out on the sub county officials for evidence based discovery. A total of two focus group discussions were also conducted in the Sub-counties: Kibibi and Ngando. The groups on average comprised 10-15 members who were randomly selected by the Sub-county focal persons from the different Parishes. The risk and vulnerability factors were determined through ranking and weighting procedures. The discussions helped to identify the most prone areas that were later visited for more site risk and vulnerability study. Four broad vulnerability areas were participatory identified in the District, these being social, economic, environmental and physical components. In each of these vulnerability components, participants characterised the exposure agents, including multi-hazards, elements at risk and their spatial dimension.

3.1.1.4 Spatial analysis

A series of spatial datasets were collected, pre-processed and processed to extract information on the magnitude and distribution of hazards, risks and vulnerability. The primary and secondary datasets were collected and collated prior to information extraction. The primary dataset included GPS coordinates while the secondary datasets were satellite images, land use/cover maps, digital elevation model, population and hydrological maps..

The utilised datasets used to create multi-hazards, risks and vulnerability maps are here indicated below:

Table 1: Sources of spatial datasets obtained and utilized in the study

No	Datasets	Sources	Period
1	Population	UBOS	2014
2	Roads	UNRA	2009
3	Land use/cover	NFA	2010
4	Hydrography	MWE	2010
5	Wetlands	MWE	2009
6	Protected areas	NFA	1990
7	Soil	NARO	2013
8	Trading centres	NFA	2014
9	Digital Elevation Model (30m)	SRTM	2014

The identified multi-hazards were mapped following standards procedures and methods for acceptability and reasonable output. Some of the analytical procedures are stated here below:

Table 2: Multi-hazard analytical detailed description of procedures

No	Multi hazards	Procedures
1	Flood inundation	Yang et al. (2006)
2	Soil erosion	Fistikoglu & Harmancioglu (2002)
3	Land conflicts	Homer-Dixon (1994)
4	Strong winds	Bunting & Smith (1993)
5	Invasive species	Venette et al. (2010)
6	Road accidents	Kamijo et al. (2000)
7	Lightning	Yokoyama (2002)

The frequency and severity of multi-hazards, risks and vulnerability levels were catergorised based on key informant interviews and expertise as follows:

Table 3: Multi-hazard severity classes/levels

Classes	Ranges (%)
Extremely/very high	90-100
High	60-89
Moderate	30-59
Low	10-29
Very low	0-9

3.1.1.5 Validation

The hazard, risk and vulnerability prone areas were identified and studied in the field. The Spectra Precision handheld Global Positioning System (model: Mobile Mapper 20) units were used to map the hotspot and vulnerable areas. This profile was certified by the District Representative, Government officials in a validation workshop held in Jinja District from 27th June – 1st July, 2016.

3.2 Multi-hazard assessment

3.2.1 Introduction

The multi-hazards that are experienced in Butambala District can be classified as:

I. Geomorphological and geological hazards including soil erosion

II. Climatological or hydro-meteorological including hailstorms, lightning, drought and strong winds

III. Ecological or biological hazards including crop pests/animal parasites and diseases and invasive species

IV. Technological hazards including road and water accidents

V. Environmental hazards including wetland degradation, deforestation and land conflicts

The comprehensive information on the frequency, severity and distribution of multi-hazards is presented here below in a chronological episodes order.

3.2.2 Crop pests/animal parasites and diseases

The occurrence, severity, frequency and distribution of crop pests/animal parasites and diseases are high as compared to the last 30 years in the District. In crop production, the farmers are engaged in the growing of cassava, beans, groundnuts, rice, potatoes, millet maize and Bananas as food and cash crops, however, their production has drastically reduced over time due to increasing and emergence of new crop pests and diseases.

The high pre-and post-harvest pest and disease incidences in crops is mainly attributed to changes in weather patterns, deforestation, inadequate extension services, inadequate regulation and surveillance, trans-boundary movement, soil exhaustion, type of crop grown (cereals), poor farming methods, high costs of pesticides, substandard pesticides and poor storage facilities. The changes in weather patterns favours the life cycle of pests that continuously destroy crops resulting into famine and on the other hand poor farming methods are attributed to poverty, attitude, ignorance and poor mind-sets. The crop pests and diseases are associated with crop destruction, stunted growth, early rotting and farmer ignorance on better farming methods.

The factors that have contributed to the vulnerability of farmers include: poor seedlings, substandard pesticides and limited extension services. The adverse effects include low crop yields, low income levels, build-up of pests and soil degradation among others. Some of the notable pests and diseases are indicated here below (table 4). The effects of pests and diseases were evident in all the Sub-counties (figure 2).

Table 4: Major pests and diseases

No	Crops	Pests and diseases
1	Cassava	Cassava brown streak disease, cassava mosaic
2	Groundnuts	Groundnut rosette, Leaf miner
3	Maize	Stem borers, maize smurt, maize streak
4	Sorghum	Sorghum midge, stem borers, sorghum shoot fly
5	Cowpeas	Aphids
6	Soybean	Web worm, rust
9	Bananas	Banana Bacterial Wilt, banana weevils, sigatoka
10	Tomatoes	Tomato Blight
11	Rice	Stem borers, rice yellow mortal virus
12	Beans	Aphids
13	Citrus	Rot, fruit-fly, hard scab
14	Coffee	Coffee wilt disease, coffee twig borer

In livestock production, Butambala District lies in an endemic Tsetse and trypanosomiasis zone. The occurrences of parasites and diseases was basically caused by communal grazing, ignorance, poor on-farm management, deforestation, mixing of livestock due to limited pasture fields, wetland degradation, animal movement, grazing along road reserves and reduced surface water quality.

The parasites and diseases are associated with low milk yield, low meat products, slow growth in livestock and encroachment of marginal lands such as wetlands among others. The predictability of the parasites and diseases is on the increase of each year. The livestock keepers are apparently vulnerable due to sub-standard pesticides, unreliable weather patterns, limited extension services, water and pasture.

The adverse effects of livestock parasites and diseases include: loss of livestock, reduced household income levels, loss of revenue to the district, illness and human death. Some of the notable parasites and diseases included ticks, tsetse flies, worms, mites in poultry, New castle, Swine fever, Nagana, East Coast fever, foot and mouth disease among others. The livestock parasite and disease incidences are reported in all the Sub-counties

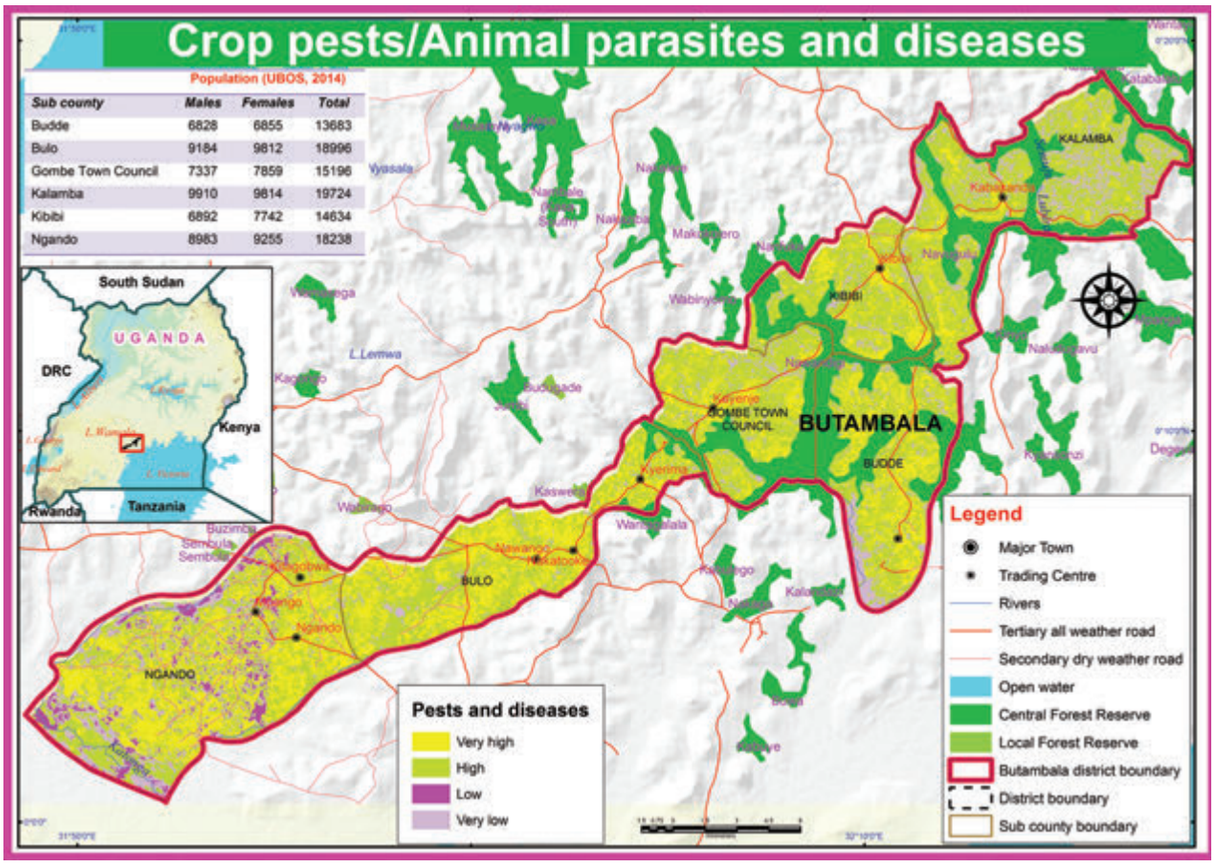

Figure 2: Distribution of pests, parasites and diseases

3.2.3 Drought

Butambala is one of the Districts found in the cattle corridor. The experienced drought events are manifested as prolonged dry spells that cause shifts in the onset of rainy seasons.

The frequency and severity of drought episodes are perceived to be caused by changes in the climate pattern, wetland degradation, location in the rain shadow, changes in land use, poor farming methods and deforestation. Drought occurrences are associated with deficit soil moisture, reduction of surface water sources, rotting of crops and reliance on imported foods. It is aggravated by low adaptive capacity of farmers and reduced soil fertility. Predictably, the most affected months are those from December – March and July – September of each seasonal calendar.

Notably, the most adverse effects of drought include reduced income levels for farmers and district revenue, reduced farm yields, reduced inputs and investment in the agricultural sector. In addition, drought increases prices of staple food, food insecurity, migration, theft of crops in gardens, wetland degradation, famine, illness and loss of livestock. The severity and distribution of drought affects all the Su-counties in particular Bulo and Ngando.

Plate 1: Wetland degradation (Crop growing & Eucalyptus plantation) in Gombe town council

3.2.4 Wetland degradation

The wetland types found in Butambala District are classified as thickets, bush lands, grasslands, (MWE, 2009). The wetland systems are under continual threats from the increasing rates of encroachment for wetland products and services. The wetlands are utilised as livestock grazing fields, extraction of building materials, crop growing, fishing and firewood among others. The major causes of wetland degradation include land shortage, drought, reduced soil fertility, political interference, soil erosion, drought, poor farming methods, assumed ownership, change in land use, ignorance, resource conflicts, brick making, sand mining, seasonal fires, over harvesting and invasion by invasive species (Plate 1).

The degradation is associated with silting of water bodies, reducing soil nutrients, lowering the water table, resource conflicts and over cultivation. The rates of wetland encroachments are high during the prolonged dry months characterised with low water availability and limited pastures. The factors that have increased the vulnerability of wetlands include limited enforcement mechanism and funds to demarcate the wetland boundaries.

The adverse effects of wetland degradation include subsequent occurrences of flash floods, erratic rains and drought, reduced water quality and quantity in water sources, loss of wetland biodiversity, drought, increased incidences of pests, parasites and diseases, loss of property, livestock and human life. The effects have been reported in Ngando, Bulo and Gombe Town Council Sub-counties found in the district (figure 3).

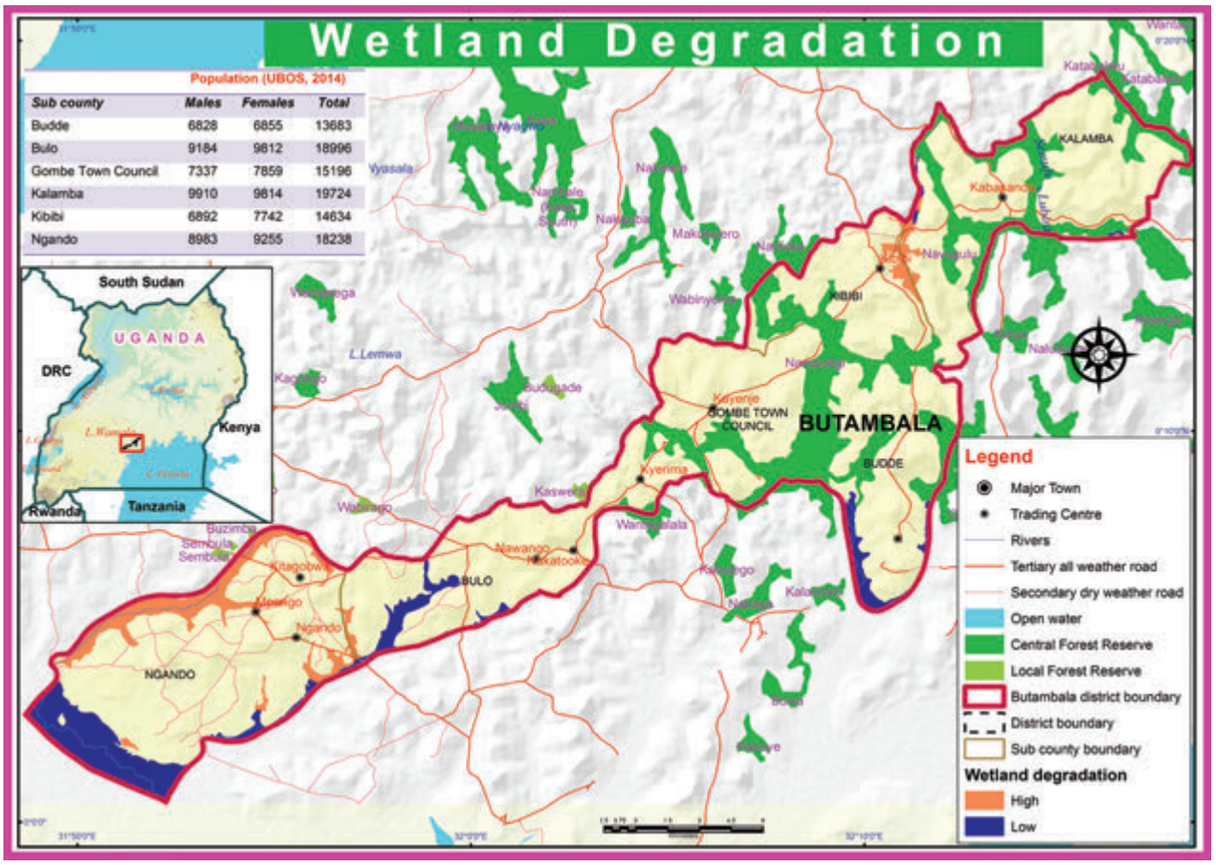

Figure 3: Levels of wetland degradation

3.2.5 Land conflicts

Land conflicts have now become rampant in the District for the last 5 years. Most of the land in the district is under unregistered customary ownership with an increasing number of leaseholds and freeholds. The conflicts are between the people and Government, communities and cultural institutions and vice versa.

The land conflicts in the District are fuelled by unclear ownership of wetlands, population pressure, customary land ownership, overlapping land policies, ignorance, unclear administrative and protected area boundaries, absent land lords, land grabbing, unequal distribution of land in families and untitled land. The conflicts are associated with prolonged court cases, displacement of people and low crop and livestock production among others. The land conflicts are more frequent in the populated Sub-counties in the District. The households are vulnerable to the frequent occurrence of land conflicts due to land ownership rights, land grabbers, unplanned settlements and lack of clear boundaries with the neighbours.

The conflicts have resulted into the migration of people to the neighbouring Sub-counties and other Districts, under development, loss of human life and livestock; and loss of property and income due to court cases. Furthermore, the tenure arrangements are associated with over exploitation by several implemented land use options such as overgrazing, bush burning and land fragmentation on the allocated piece of land. The eventualities are more severe in all the Sub-counties (figure 4).

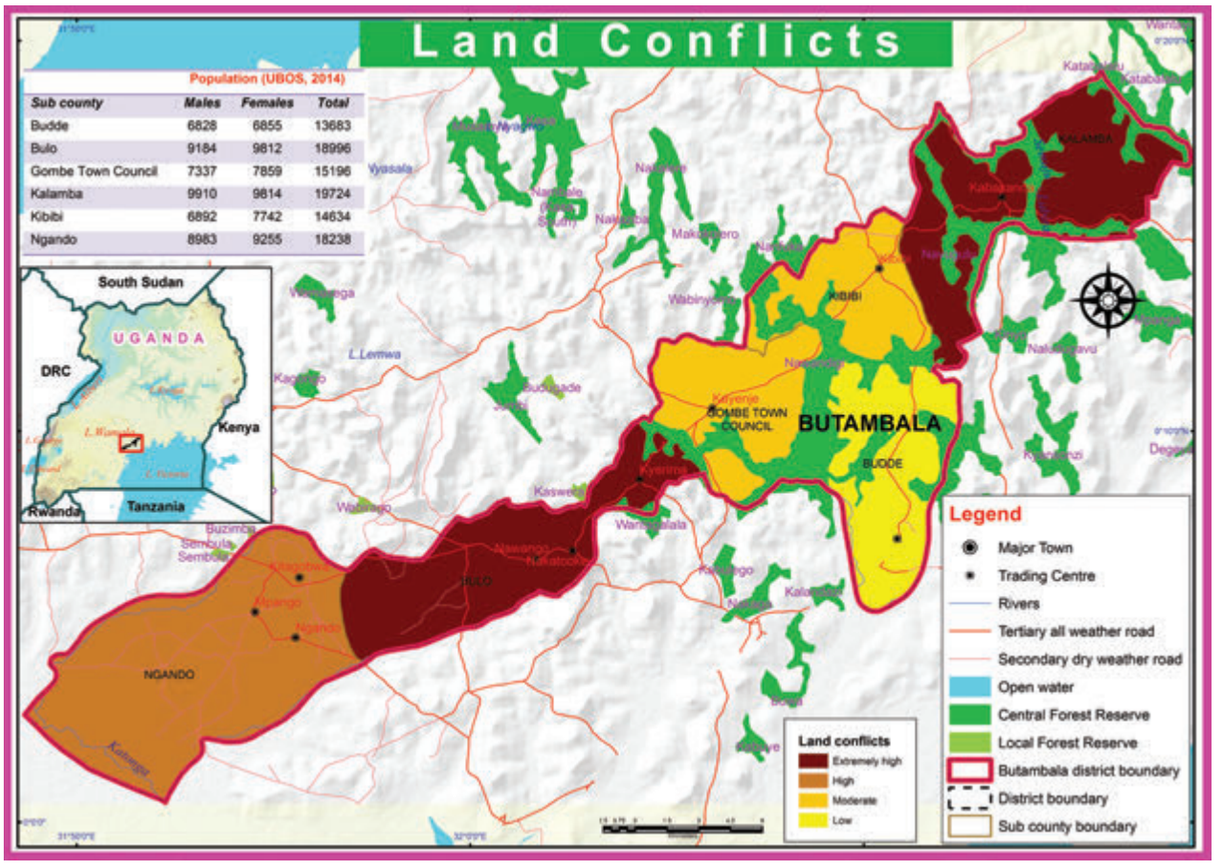

Figure 4: Severity of conflicts

3.2.6 Strong winds

The strong winds are normally experienced during the rainy season as compared to the dry season. The devastating winds occur during torrential rains and cause significant havoc in the social and economic wellbeing of the communities. The winds have become more rampant and severe simply because of high deforestation rates, presence of water bodies, wetland degradation, changes in the onset of rainy seasons and poor farming methods among others.

The occurrences and severity of strong winds are characterised with heavy showers, falling of crops, high rates of surface runoff, breakage of trees and destruction of houses. The winds are more common during the rainy season especially in the months of July, September, October, November and December of each seasonal year. The communities have become vulnerable due to lack of tree seedlings, unreliable seasonal weather forecasts and clearance of vegetation among others.

The strong winds have led to low crop yields, loss of life and property, increase in the occurrences of diseases, multiplication of invasive water weeds and low income levels etc. The most severe impacts have been reported in the sub counties of Kalamba, Kibibi, Budde and Gombe town council (figure 5).

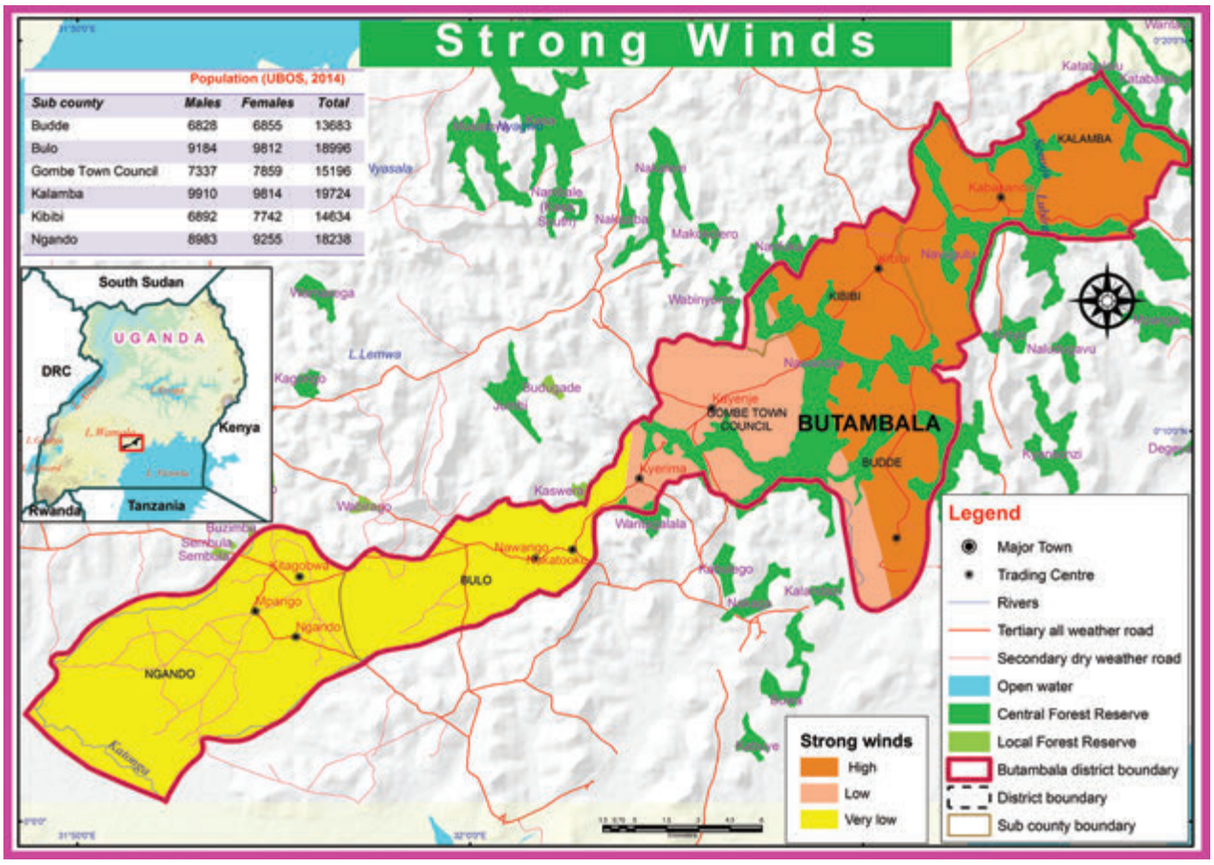

Figure 5: Strong winds

3.2.7 Soil erosion

The soil erosion has affected the integrity of farmlands, wetlands and water sources in the district. The main soil erosion types common in the district include rill, gulley and sheet erosion. Soil erosion is principally triggered by poor farming methods, over grazing, deforestation, poor land use planning, poor maintenance of roads and intensive rainfall events.

The occurrence of soil erosion is associated with the washing away of top soil, siltation of water sources and destruction of infrastructure including roads and bridges. The events are common and widespread during the rainy season. The famers are vulnerable to the severity of soil erosion due to poor farming methods, and land shortage which lead to low lying flood prone areas.

The adverse effects of soil erosion experienced in the district include: low crop yields, low income levels, land abandonment, reduction in the quality and quantity of surface water sources, high costs of transport, increased incidences of pests, parasites and diseases, loss of landscape beauty, land conflicts, introduction of new invasive species and famine. The occurrences and severity of soil erosion equally affects all the Sub-counties in the District (figure 6).

Plate 2: Soil erosion gulleys in Ngando sub county

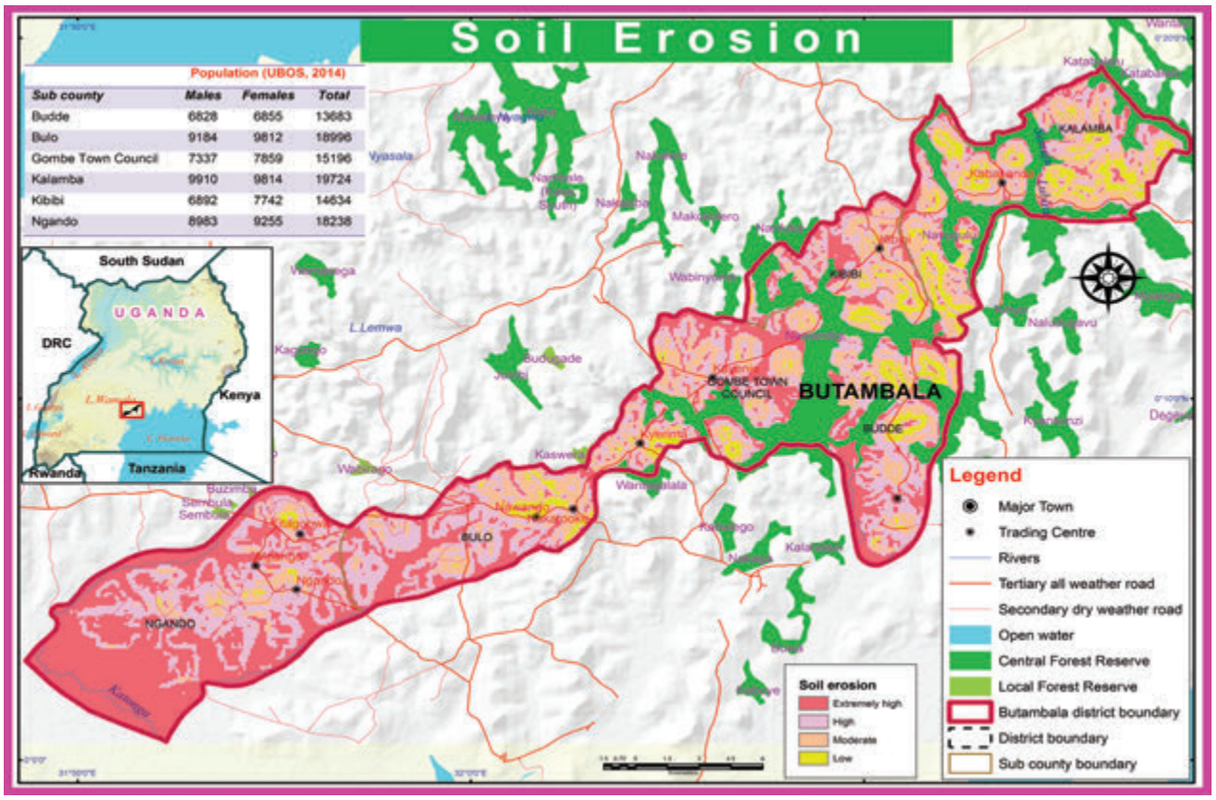

Figure 6: Soil erosion prone areas

3.2.8 Road and water accidents

Road and water accidents claim a number of lives in the district of recent than before. The prevalence of road accidents are attributed to the driving of cars in dangerous mechanical conditions, reckless driving, negligence, indiscipline, lack of road sign posts, bad weather, overloading, lack of driving documents, livestock grazing in the road reserves, narrow roads, incompetent drivers and over speeding. The road accidents mainly involve pedestrians, cars, bicycles, motorcycles and boats. The water accidents are largely caused by strong winds and flooding in the water bodies especially along River Katonga.

The road and water accidents are associated with injuries, disabilities and arrests among others. The incidences are more frequent during the festive seasons such as Christmas and Easter, election days and at the start and closure of schools. The factors that contributed to the vulnerability of households to road accidents are; weak enforcement of traffic laws, poor roads and establishment of road markets among others.

The notable effects of road and water accidents include: loss of human life and livestock, illness, disabilities, loss of property and documentation, reduction in crop and livestock production and loss of income in compensations. The accident incidents have been recorded in all the Sub-counties throughout the year (figure 7).

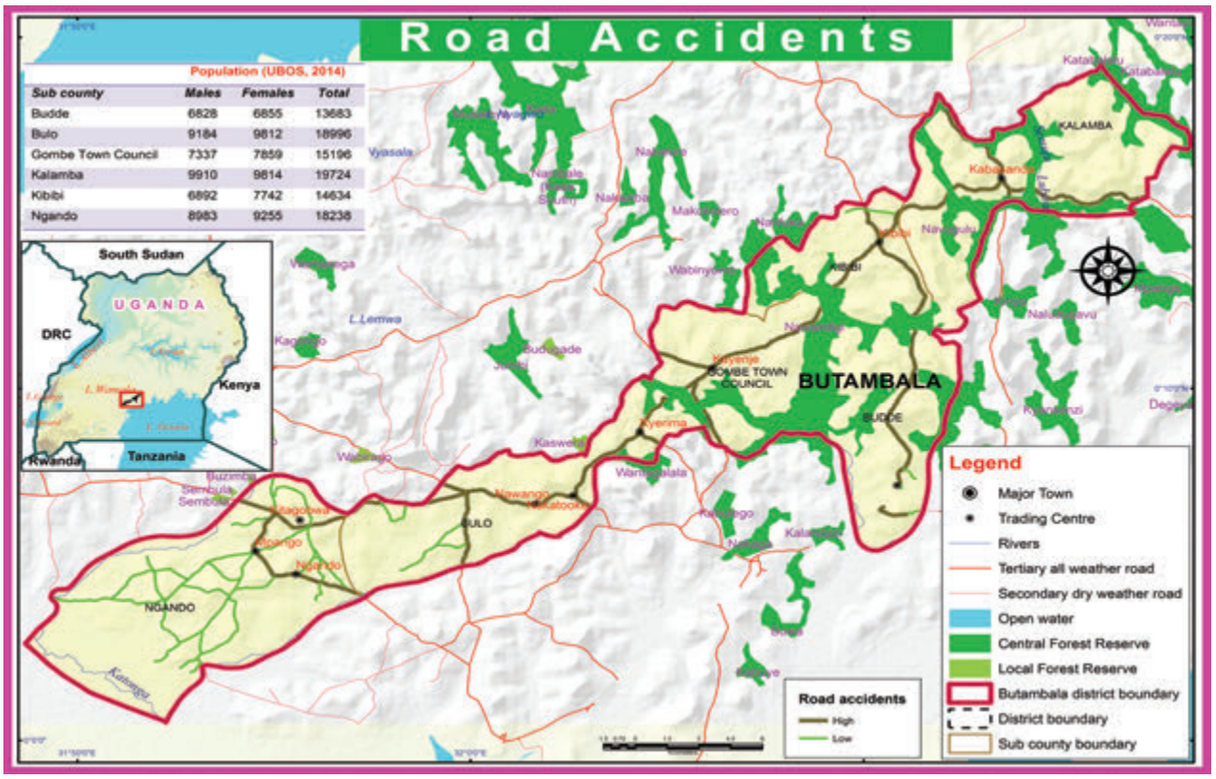

Figure 7: Road accidents distribution

3.2.9 Hailstorms

The occurrence and severity of hailstorms are a frequent phenomenon in Butambala District. The hailstones fall during heavy downpour and these take a period of about 10-30minutes. The frequency and distribution of hailstorms is primarily caused by changes in the onset of rainy seasons especially after prolonged dry spells, erratic rains and deforestation. Hailstorms are associated with vegetation, crop and property destructions. In addition to increasing surface rainfall runoff, they also clog water channels. The hailstorms are severely predicted to occur during the second rainy season. The deforestation activities have increased the magnitude of severity especially in farmlands and homesteads. The trees are cut down to acquire timber for brick making and construction.

The famers are vulnerable to the effects of hailstorms due to the massive clearance of trees, limited availability of tree seedlings, unreliable seasonal weather forecasts and limited agro input among others.

The adverse effects of hailstorms include destruction of property, low household income levels, loss of district revenue, food shortages, loss of human life and livestock. Severe episodes have been reported in Kalamba, Budde , Kibibi sub counties and Gombe Town Council (figure 8).

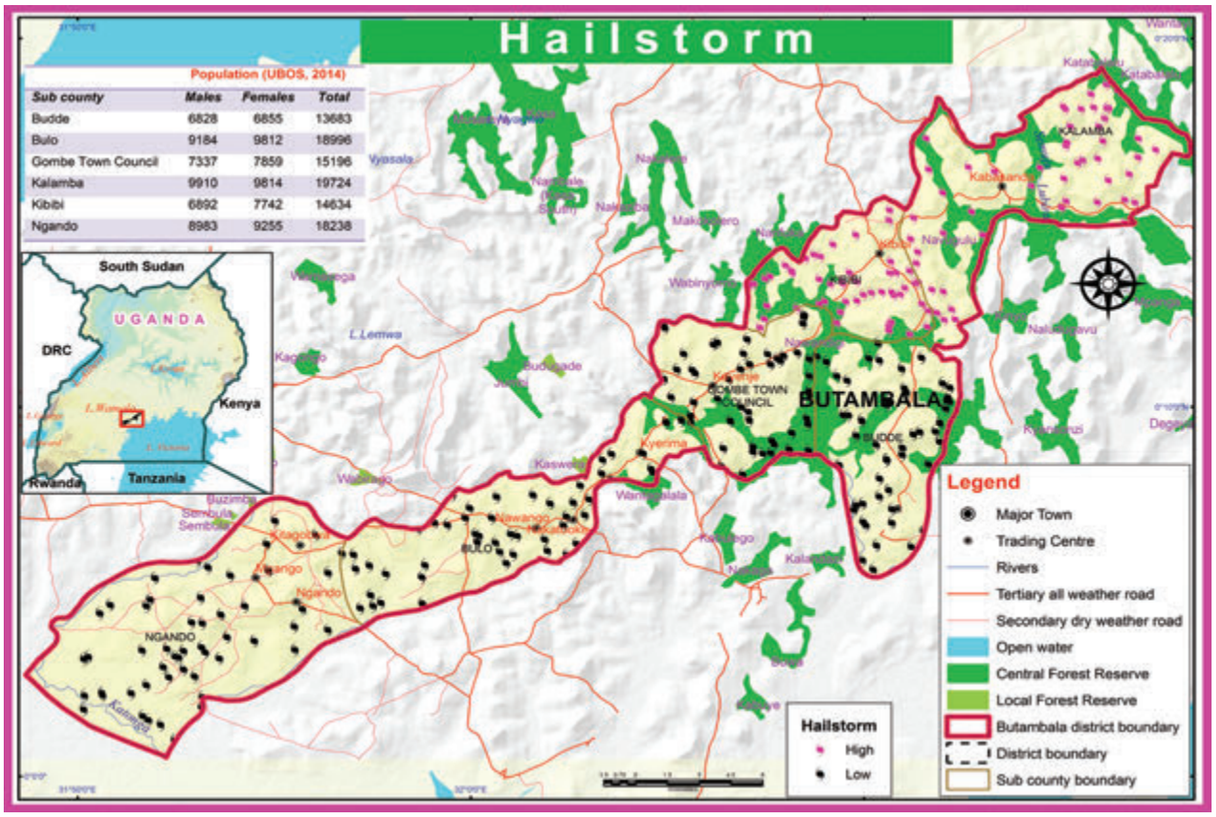

Figure 8: Distribution of Hailstorms severity

3.2.10 Invasive species

The occurrence of invasive species in the District is twofold: those that are land and water based. The invasions on land are mainly in farmlands while the water based can be seen on the lakes, ponds and wetlands. The frequency and severity of invasive species are sometimes determined by both natural and anthropogenic factors. In particular, the invasive species on land have evaded the District purely because of changes in weather patterns, reduced soil fertility, poor farming methods, soil erosion, animal movements, wetland degradation, high seed multiplication and dispersion by wind. Some of the notable species include striga "Kayongo", Lantana Camara, Congress weed (*Parthenium hysterophorus)* among others. On water, the species are spread by strong winds, boat movements, wetland degradation, fishing activities, high seed multiplication and siltation of River Katonga.

The occurrence of land based species is associated with stunted crop growth, crop failure, frequent weeding, poor yields and land abandonment. The water species are characterised with slow boat movement, migration of fish stocks, high transport costs and water pollution among others. The invasions are high during the rainy season due to the increase in the plant water content that facilitates their high growth.

The adverse effects of land based species include loss of biodiversity, loss of livestock, low income levels, poor crop yields and encroachment of public land among others. On the other hand in water, the species cause illness, loss of biodiversity, depletion of fish stocks, high transport costs and malnutrition among others. The invasion of both alien species is common in all the Sub-counties (figure 9).

Plate 3: Locally known as "setalla"-Gombe T/C

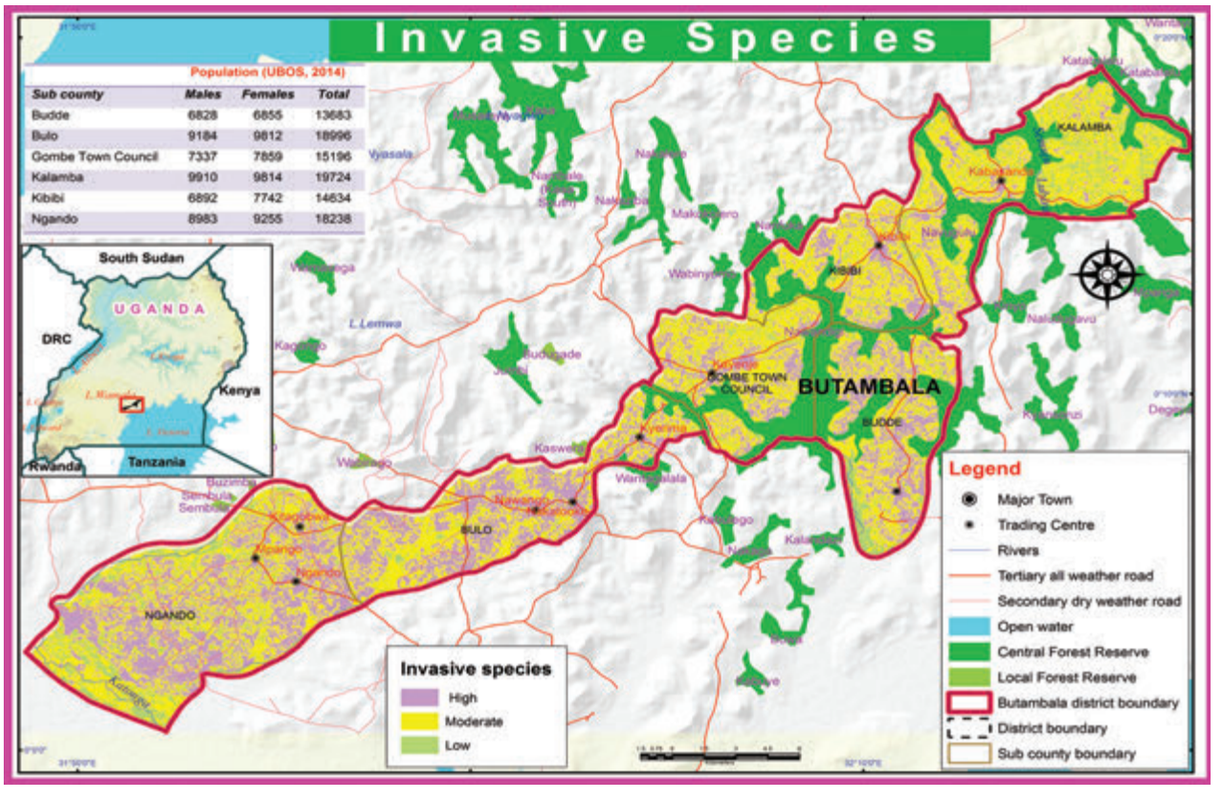

Figure 9: Distribution of Invasive species

3.2.11 Lightning

Uganda has one of the highest rates of lightning strike deaths in the world. The incidences are attributed to changes in climate and weather patterns, construction of houses on high grounds, and loss of natural tree cover due to deforestation activities. In particular, the lightning incidences are influenced by the unusual serge of the moist air from the Atlantic Ocean and Congo air-mass that occur during the rainy seasons.

The thunderbolt incidences are associated with the destruction of crops and vegetation, loss of life in human and livestock, heavy downpour and hailstorms. The incidences normally occur at the onset of the rainy season. These are frequent in the months of April-May and September-December of every year. The increase in vulnerability to lightning cases is attributed to deforestation, degradation of hills and shift in seasons.

The strikes have resulted into the loss of household income, loss of property and drought. Severe cases have been recorded in Kalamba, Kibibi and some parts of Ngando Budde Sub-counties and Gombe Town Council in the District.

Plate 4: Lightning strike

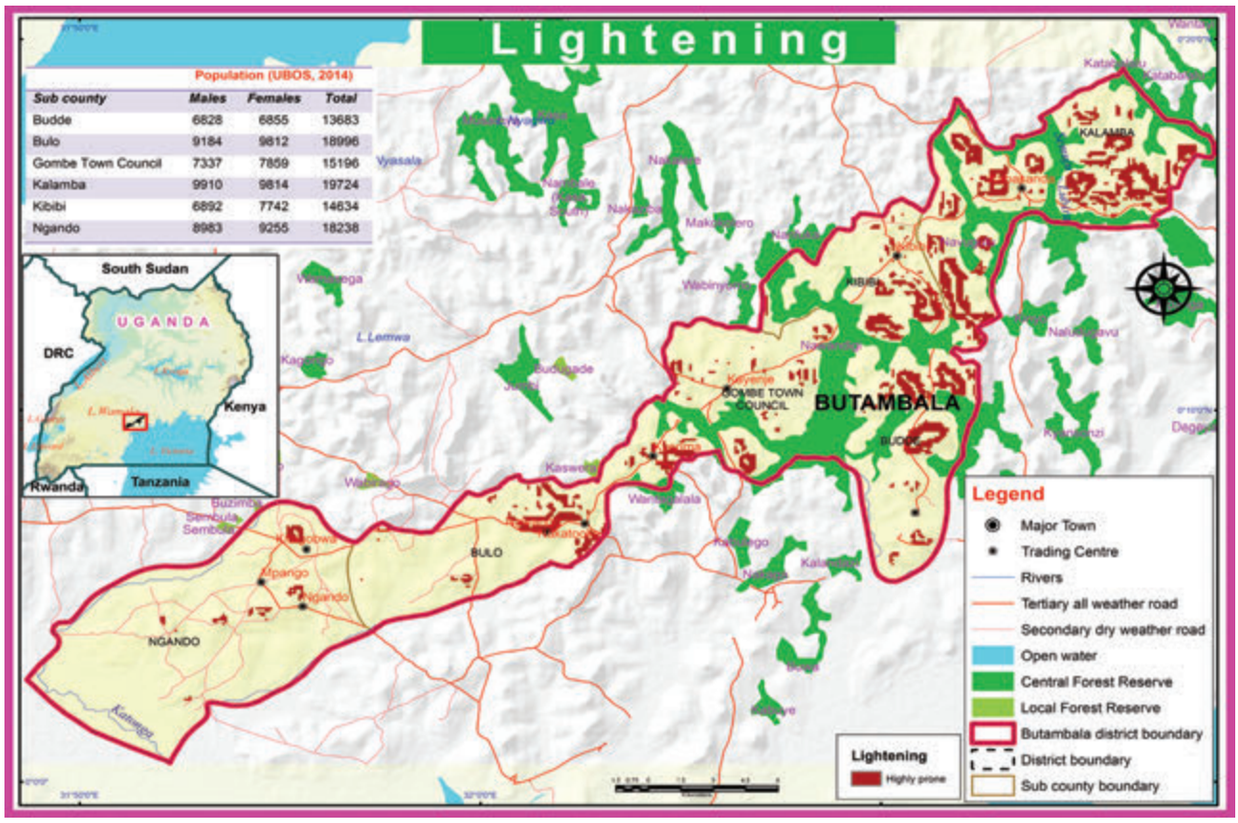

Figure 10: Lightning prone areas

3.2.12 Bush burning

The occurrence and frequency of fires is seasonal in the district. The fires are started majorly by the cattle keepers to break the cycle of parasites and facilitate pasture regeneration as perceived and farmers during opening of gardens. Some of the fires are attributed to poverty, charcoal burning,ignorance poor farming methods, hunting and land conflicts.

Bush burning is associated with the clearance of vegetation, conversion of wood into charcoal, destruction of crops and property. The bush fire incidences are rampant during the dry season (December-March and July-September). Vulnerability to the fires is due to the rampant land conflicts, drought, livestock production and inadequate enforcement of conservation policies

The secondary effects of unmonitored fires include loss of property, loss of human life and livestock, low crop yields, migration of animals, displacement of people, soil degradation and loss of biodiversity. Severe fire incidents have been recorded in Ngando Sub County and a few incidences have been reported in other Sub-counties.

3.2.13 Deforestation

Deforestation is perceived as the cutting of trees for wood and timber purposes. This has mainly affected Butambala District because most of the trees have been wiped away in search for land for settlement caused by the high birthrates and migration, charcoal and timber products, farm land since the soils have lost their fertility and commercialization of agriculture, corruption and weak laws that are not adhered to or enforced to protect forest reserves and forests.

The factors that contribute to the vulnerability include weak enforcement of forestry laws, high population growth rates, drought and reduced soil fertility among others in the District.

The resultant effects have led to increases in pests, parasites and diseases, destruction of habitats and drought. In addition to the loss of biodiversity, water resource conflicts and loss of water quality have been recorded in the District. The activities are prevalent in all the Sub- counties (figure 11).

Plate 5: Deforestation in Kizzikibi Central Forest Reserve –Gombe T/C

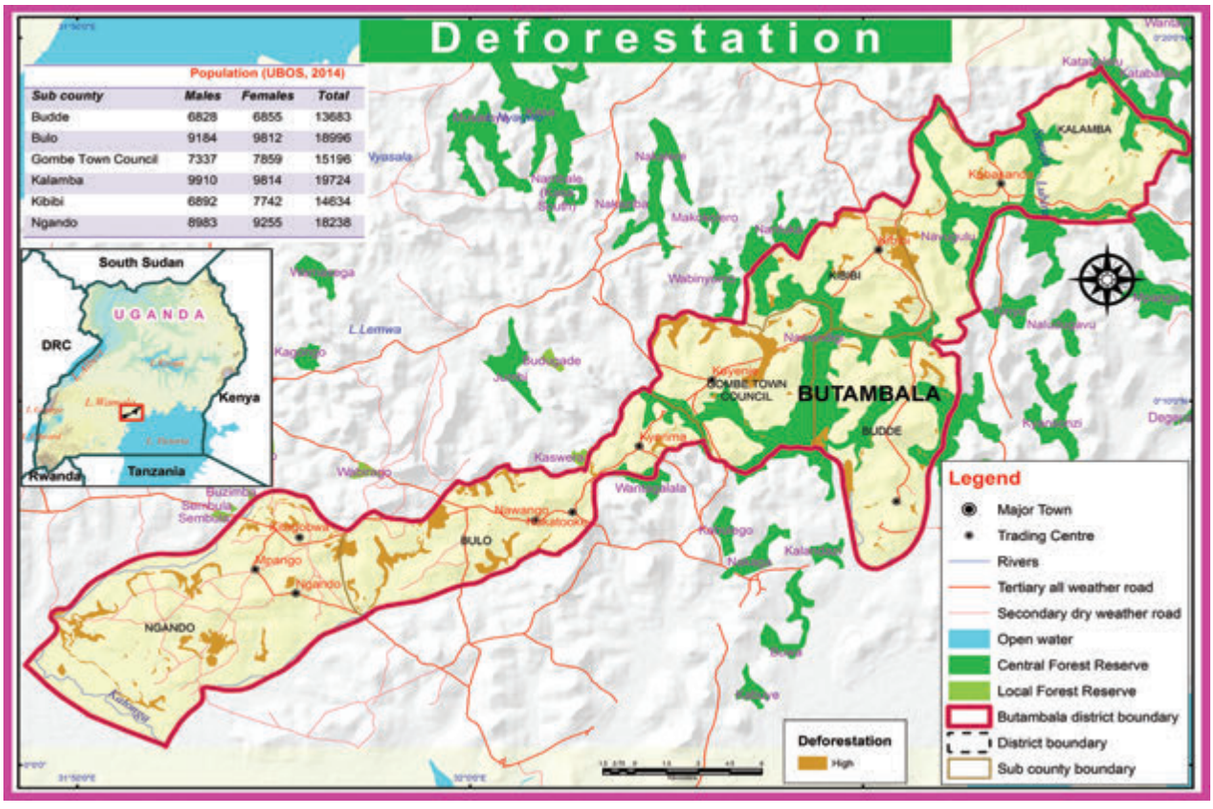

Figure 11: Deforested areas

3.3 Multi-hazard adaptation responses

According to the key informant interviews and FGDs, indicated here below are responses undertaken by the communities to adapt to the multi-hazards.

Table 5: Multi-Hazard adaptation responses

No	Multi-Hazards	Adaptation Reponses	Recommendations
1	Drought	• Crop irrigation • Tree planting • Planting drought resistant crops • Establishment of alternative income generating activities like business • Agro forestry • Food preservation and storage • Planting quick maturing seeds • Practicing conservation agriculture • Rain water harvesting	• Provision of tree seedlings and quick maturing seeds • Food relief • Extraction of underground water • Fund irrigation technologies • Diversify sources of livelihood • Construction of food storage facilities • Law enforcement on wetland degradation • Encourage hay and silage making • Promote the use of renewable energy • Subsidization of Hydro Electric Power.
2	Soil erosion	• Digging trenches and ridges • Mixed cropping • Tree planting • Crop spacing • Growing of cover crops • Sensitization (farmer visits) • Minimum tillage	• Sensitization of the farmers on proper farming methods • Agro-forestry • Provision of tree seedlings • Subsidize the costs of fertilizers • Funding the community outreach department • Encourage water harvesting • Adopting underground water tanks

No	Multi-Hazards	Adaptation Reponses	Recommendations
3	Pests/parasites and Diseases	• Crop rotation • Spraying • Vaccination of livestock • Treatment of animals • Use of disease resistant varieties • Destruction of infected crops or animals • Diversification of livelihood • Environmental sanitation	• Subsidizing pesticides and vaccines • Provide improved/resistant breeds • Fund the community outreach department • Strengthen pests, parasites and diseases surveillance • Integrated pest management • Strengthen and improve agricultural extension services • Review of the laws on agro-chemicals • Information systems on diseases on diseases outbreaks and control
4	Wetland degradation	• Sensitization on the dangers of encroaching wetlands • Tree planting • Practicing conservation agriculture • Prosecuting culprits to court • Evictions • Formation of community wetland management committees • Alternative livelihood	• Strengthen the wetland management committees • Strict enforcement of wetland laws • Demarcation of wetlands • Water harvesting for agriculture • Promote tourism • Increase funding for wetland conservation
5	Deforestation	• Use of improvised fuel like cow dung • Use of energy saving stoves • Tree planting • Biogas • Sensitization	• Massive tree planting • Encourage the use of energy saving stores • Adopt technologies that use less wood
7	Strong winds	• Tree planting • Planned constructions • Food relief	• Provision of tree seedlings • Sensitization of the community on a village level about tree planting • Construction of planned houses • Conservation agriculture, wood lot technology
8	Hailstorms	• Tree planting • Food relief • Temporal structures • Planting fast growing crops	• Food and seedlings provision on occurrence • Provision of tree seedlings • Provision of weekly weather forecasts

No	Multi-Hazards	Adaptation Reponses	Recommendations
9	Road and water accidents	• Law enforcement • Installation of road signs • Installation of humps • Community policing • Spot checks • Reflector jackets.	• Enforcement of traffic laws • Frequent maintenance of roads • Sensitization • Subsidization of reflector jackets • Road signs installation • Increase surveillance through installation of cameras • Routine inspection for road.
10	Invasive Species	• Mixed planting • Crop rotation • Uprooting • Planting resistant crops • Sensitization	• More research on invasive species • Planting resistant improved seeds • Legislation on the movement of seeds • Provision of improved seedlings • Provision of technical Personel.
11	Land Conflicts	• Law courts like Clan, LC's, magistrate courts • Demarcation of land • Acquisition of land titles • Sensitization • Documentation of the Land	• Subsidization of land registration • Sensitization of the community on land ownership • Popularize the land policy • Quick judgments of land cases • Gazetting and buffering the Public Land.
12	Lightning	• Planting of trees • Installation of lightning arrestors • Proper electrical installation	• Subsidization of lightning arrestors • Encourage tree planting • Law enforcement on the installations of arrestors • Early warning systems
13	Bush Fires	• Sensitization	• More Funds to Natural Resource Department • Strengthening extension services • More sensitization • By-laws

CHAPTER FOUR

4.1 Risk Assessment

This table presents relative risk for hazards to which the communities attached probability and severity scores.

Table 6: Risk assessment of multi-hazards for Butambala District

	PROBABILITY	SEVERITY OF IMPACTS	RELATIVE RISK	VULNERABLE SUB COUNTIES
	Relative likelihood this will occur	*Overall Impact (Average)*	*Probability x Impact Severity*	
Multi-hazard	*1 = Not occur 2 = Doubtful 3 = Possible 4 = Probable 5 = Inevitable*	*1 = Very Low 2= Low 3= Moderate 4 = High 5= Very High*	*1-10 = Low 11-20=Moderate 21-25= High*	
Floods/ Runoffs	3	2	1	Ngando, Bulo and Gombe Town Council.
Droughts	5	5	25	Ngando Sub County.
Hail storms	3	4	12	Kalamba, Budde , Kibibi Sub County and Gombe Town Council.
Man-made fires	2	5	10	Butambala –Gombe Town Council.
Lightning	2	4	8	Kalamba Sub County,Gombe Town Council, Kibibi and Budde Sub County.
Pests, parasites and diseases	5	5	25	District wide
Land conflicts	4	3	12	Bulo Sub County , Kalamba Sub County Kibibi Sub County. And Gombe TC
Strong winds	3	5	15	Kalamba ,Kibibi,Budde Sub Counties and Gombe Town Council.
Invasive species	3	4	12	Kalamba , Ngando Bulo ,Kibibi SC & Gombe Town Council.
Road, water accidents	3	5	15	Bulo SC, Gombe Town Council, Kibibi SC, Budde SC , Kalamba SC.
Soil erosion	5	5	25	Ngando SC
Human wild life conflicts	2	4	8	Kalamba Sub County
Bush fire	2	3	6	Ngando Sub County.
Earth quakes	1	5	5	
Wetland degradation	5	5	25	Gombe TC , KibibiSC and Bulo SC.
Deforestation	4	5	20	Gombe TC,Kibibi,Budde, Kalamba- and Bulo SC.

Key for Relative Risk

	High
	Moderate
	Low

4.2 Occurrence and frequency of multi-hazards

The table below shows the years in record and recurrence intervals of multi-hazards reported by the respondents in the District.

Table 7: Frequency of multi-hazards;

No	Multi-hazard	Number of Events (last 30 years)	No. years in record	Recurrence Interval per year (months/ seasons)	Hazard Frequency (%) Chance/year
1	Earth quakes	1	2012	2	200
2	Pests, parasites and diseases	30	1986-2016	12	40
4	Drought	30	1986-2016	2	6
5	Hailstorms	30	1986-2016	2	6
6	Bush fires	30	1986-2016	12	40
7	Invasive species	16	2010-2016	12	75
8	Human wildlife conflicts	4	2013-2016	12	300
9	Wetland degradation	9	2007-2016	12	133
10	Soil erosion	30	1986-2016	2	6
11	Strong winds	2	2008,2016	3	150
12	Land conflicts	16	2010-2016	12	75
15	Lightning	3	2010-13-14	2	66
16	Water, Road accidents	30		12	40
17	Deforestation	7	2009-2016	12	171

4.3 Elements at Risk and Vulnerability assessment

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 for Butambala district was assessed based on exposure, susceptibility and adaptive capacity at sub county and district levels highlighting their sensitivity to multi-hazards. 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.

The assessment reveals that geomorphological and geological hazards inform of soil erosion; climatological or hydro-meteorological in the form of hailstorms, drought, lightning and strong winds; ecological or biological hazards in the form of crop pests/animal parasites and diseases, and invasive species; technological hazards in the form of road and water accidents and environmental hazards in the form of wetland degradation, deforestation, bush burning and land conflicts predispose the community to high vulnerability state in the Butambala District (table 8).

Table 8: Components of vulnerability in Butambala District

Vulnerability Components	Exposure	-		Susceptibility	-	Resilience	
	Hazards	**Elements at risk**	**Geographical Scale**	**Potential impacts**	**Geographical Scale**	**Coping strategies**	**Geographical Scale**
Social components	Land conflicts	Human population Crops	Bulo, Kibibi, Kalamba Sub counties & Gombe TC	Loss of property Displacement of people Retards developments Poverty Low production Death	Sub county	Sensitise people on land developments and land use Clearly demarcating and defining land owner ship Court Acquiring land titles. Purchase land elsewhere.	District
	Invasive species	Crops Livestock	District	Interfere with water transport. Loss crop yields Loss of nutritive pastures. Alternative hosts of pests & diseases.	District	Destruction of weeds through uprooting, burning and slashing Use of herbicides.	District

	Soil erosion	Human population, Crops Livestock	Ngando,Kibibi & Kalamba Sub Counties.	Stunted crop growth Reduced yields Poor crop production Siltation of water bodies Decreased biodiversity Decrease in soil fertility Reduced water quality Destruction of property	Ngando,Kibibi & Kalamba Sub Counties.	Tree planting Sensitization Soil and water conservation i.e. bridges, trenches, mulching	District
	Pests, parasites and diseasesPests, parasites and diseases	Human and livestock populations Crops	District wide	Loss of livestock and humans Reduced livestock productivity Complete crop failure Stunted growth of crops Reduced crop yields & quality Reduced farmer profits	District wide	Vaccination Spraying Sensitization Crop rotation Planting disease resistant crops Quarantine Mosquito nets Abandoning farms e.g. coffee farms Destruction of effected crops& animals Alternative income sources	District
	Hail storms	Human and livestock populations Crops	Kalamba, Kibibi,Budde Sub Counties & Gombe TC	Complete crop failure Stunted growth of crops Destruction of houses Low crop yields & quality.	Kalamba, Kibibi,Budde Sub Counties & GombeTC	Agro-Forestry	District

	Wetland degradation	Lakes Crops Human population	District	Flooding Drying of water sources climatic change Diseases Loss of water quality and quantity Loss of grazing grounds Conflicts on waters.	District	Sensitisation through radios Enforcement of wetland laws Demarcation of wetlands Prosecuting culprits to Court Wetland management committee Eviction Modern methods of farming ie irrigation.	District
	Water, Road accidents	Human and livestock populations	District	Human deaths Disabilities after injuries	District	Regular guidance by traffic officers Construction of humps and road signs Reflector jackets, seat belts and helmets Spot checks for alcoholism Road spot improvement.	District

	Drought	Human and livestock populations Crops	Ngando Sub county	Reduced crop and animal production Theft of food Insecurity Death of livestock Famine Malnutrition	Ngando Sub county	Drought resistant crops Storage of food Sensitization Farming in wetlands Water harvesting Reduced food ratios, one meal per day Theft Transactional sex Labour for food Migration	District
	Human wild life conflicts	Crops Human and livestock population	Kalamba Sub county	Spread of diseases Tension Destruction of peoples crops Reduced crop yields & quality Affects children school attendance.	Kalamba Sub county	Trapping Hunting Gazetting natural resources Involving UWA Poisoning Scare crows Abandoning susceptible farms	District
	Deforestation	Human and livestock populations	District wide	Loss of water quality & quantity Loss of natural cover. Loss of fire wood Loss natural habitants Invasion of invasive species . Increased soil erosion	District wide	Tree planting Use alternative sources of fuel like bio gas Use of energy saving stoves Awareness Agro-Forestry Deep bore holes Water harvesting tanks Establishment of tree nursery bed.	District

	Lightning	Human and livestock populations Crops Infrastructure including homes, schools and hospitals Natural vegetation including trees	Kalamba ,Kibibi Sub counties & Gombe TC	Tension Death	Kalamba ,Kibibi Sub counties & Gombe TC.	Install lightning conductors Witch craft Planting specific tree species	District
	Bush fires	Crops	Ngando Sub county	Soil erosion and its effect Loss of macro & micro-organs Destruction of peoples property	Ngando Sub county	Fire lines Awareness Formulation of By-Laws	Ngando Sub county
	Strong winds	Human and livestock populations Crops Infrastructure including homes, schools and hospitals Natural vegetation including trees	Kalamba,Kibibi Sub counties & Gombe TC	Accidents Increased plants, human and animal diseases & Pests Reduced crop & Animal production Destruction of property Air pollution by dust.	Kalamba,Kibibi Sub counties & Gombe TC.	Use of support on crops like bananas Tree planting Constructing planned houses.	District
Economic component	Invasive species	Crops Livestock	District	Low income in the long run as a result of poor yield and low productivity High costs of removal Increased costs of production	District	Destruction of weeds through uprooting, burning and slashing Spraying by use of herbicides.	District

	Land conflicts	Human population	Bulo, Kibibi, Kalamba Sub counties & Gombe TC.	Retards personal and community development High court expenses Community breakups Witch craft Death.	Bulo, Kibibi, Kalamba Sub counties & Gombe TC.	Sensitise people on land developments and land use Clearly demarcating and defining land owner ship Court Encourage people to buy land elsewhere	District
	Wetland degradation	Lakes Crops Human population	District	Loss of income Loss of government revenue Loss of fishing grounds Loss of water supply Loss of natural plants used for Herbal medicine & craft materials.	District	Sensitisation through radios Enforcement of wetland laws Demarcation of wetlands Prosecuting culprits to Court Wetland management committee Eviction	District
	Crop pests/animal parasites and diseases	Human and livestock populations Crops	District	Loss of income Loss of government revenue Increased expenditure on pesticides and drugs	District	Vaccination Spraying Sensitization Planting disease resistant crops Quarantine Mosquito nets Abandoning farms e.g. coffee farms Destruction of effected crops& animals Alternative income sources Crop rotation Pest traps.	District

	Soil erosion	Human population Crops	Ngando Kibibi & Kalamba Sub counties	Loss of income Loss of government revenue	Ngando Kibibi & Kalamba Sub counties.	Tree planting Sensitization Soil and water conservation i.e. bridges, trenches, mulching	District
	Hailstorms	Human and livestock populations Crops	Kalamba, Kibibi,Budde Sub Counties & Gombe TC.	Loss of income Loss of government revenue	Kalamba, Kibibi,Budde Sub Counties & Gombe TC.		District
	Drought	Human and livestock populations Crops	Ngando Sub county	Loss of income due to low productivity Loss of government revenue	Ngando Sub county	Drought resistant crops Storage of food Sensitization Farming in wetlands Water harvesting Reduced food ratios, one meal per day Theft Transactional sex Labour for food Migration	District
	Water, Road accidents	Human populations	District wide	Loss of lives hence low incomes	District wide	Regular guidance by traffic officers Construction of humps and road signs Reflector jackets, seat belts and helmets Spot checks for alcoholism Spot road improvement.	District

	Wetland degradation	Crops Human and livestock population	District wide	Loss of biodiversity Reduced water quality & quantity Increased incidences of water borne diseases Loss of natural medicine-Herbs Loss of craft materials.	District wide	Tree planting along the wetland area Awareness Other income generating activities Other alternative farming activities ie irrigation	District
	Human wild life conflicts	Crops Human and livestock population	Kalamba Sub county	Loss of income Spread Diseases	Kalamba Sub county	Trapping Hunting Gazetting natural resources Involving UWA Positioning Scare crows	District
	Deforestation	Human and livestock populations	District wide	High costs of water treatment Increases cost of living in rural areas Loss of natural tree species for Tourists	District wide	Tree planting Use alternative sources of fuel like bio gas Use of energy saving stoves Awareness Agro –Forestry Establishment of tree nursery bed.	Sub county
	Bush fires	Crops	Sub county	Low income	Sub county	Fire lines Awareness Formulation of By-Laws	Sub county

	Strong winds	Human and livestock populations Crops Infrastructure including homes, schools and hospitals Natural vegetation including trees	Kalamba, Kibibi,Budde Sub Counties & Gombe TC.	Low income Loss of government revenue Loss of property Spread of pests, parasites and diseasespests, parasites and diseases	Kalamba, Kibibi,Budde Sub Counties & Gombe TC.	Use of support on crops like bananas Tree planting Constructing of strong planned houses	District
Environmental component	Invasive species	Crops	District wide	Loss and stunted growth of crops	District wide	Destruction of weeds through uprooting, burning and slashing Use of herbicides	District
	Land conflicts	Crops Human population	District	Destruction of crops Encroachment on forests & Wetlands Climate change	District	Sensitise people on land developments and land use Clearly demarcating and defining land owner ship Court	District
	Wetland degradation	Lakes Crops Human population	District	Loss of bio diversity Drying of water resources climatic change Loss of water catchment areas.	District	Sensitisation through radios Enforcement of wetland laws Demarcation of wetlands Prosecuting culprits to Court Wetland management committee Eviction	District

	Soil erosion	Human population Crops	Sub county	Loss of vegetation cover including trees and crops Land degradation Silting of water sources. Invention of aversive species.	Sub county	Tree planting Sensitization Soil and water conservation i.e. bridges, trenches Mulching.	District
	Crop pests/animal parasites and diseases	Human and livestock populations Crops	District	Loss of crops and animals Toxification of environment by herbicides	District	Vaccination Spraying Sensitization Crop rotation Planting disease resistant crops Quarantine	District
	Hailstorms	Human and livestock populations Crops	District	Loss of vegetation cover including trees and crops Death of animals	District	Zero grazing	District
	Drought	Human and livestock populations Crops	Ngando Sub county	stunted growth of crops Loss of pasture Death of animals	Ngando Sub county	Drought resistant crops Storage of food Sensitization Farming in wetlands Water harvesting Reduced food ratios, one meal per day Theft Transactional sex Labour for food Migration Irrigation mechanisms.	District

	Human wild life conflicts	Crops Human and livestock population	Kalamba Sub county	Destruction of crops Spread of diseases and pests	Kalamba Sub county	Trapping Hunting Gazetting natural resources Involving UWA Scare crows Chiredren	District
	Lightning	Human and livestock populations Crops Infrastructure including homes, schools and hospitals Natural vegetation including trees	Kalamba, Kibibi Sub counties & Gombe TC	Destroy natural vegetation and crops Death of animals & humans	Kalamba, Kibibi Sub counties & Gombe TC.	Install lightning conductors Witch craft Planting specific tree species	District
	Strong winds	Human and livestock populations Crops Infrastructure including homes, schools and hospitals Natural vegetation including trees	Kalamba, Kibibi Sub counties & Gombe TC.	Destruction of crops, Buildings.	Kalamba, Kibibi Sub counties & Gombe TC.	Use of support on crops like bananas Tree planting Constructing strong and planned houses	District
	Deforestation	Human and livestock populations	District wide	Loss of biodiversity Climate change. Loss water catchment areas.	District wide	Tree planting Use alternative sources of fuel like bio gas Use of energy saving stoves Awareness Establishment of tree nursery bed.	District

	Bush fires	Crops	Ngando Sub county	Loss of bio diversity Destruction of crops Migration of wildlife	Ngando Sub county	Fire lines Awareness Formulation of By-Laws	Sub county
Physical components	Invasive species	Crops Livestock	District	Harbours snakes and pests Increases weeding costs Death of animals.	District	Destruction of weeds through uprooting, burning, slashing & Spraying.	District
	Crop pests/animal parasites and diseases	Human and livestock populations Crops	District	Loss of livestock and humans Complete crop failure Stunted growth of crops Management costs	District	Vaccination Spraying Sensitization Planting disease resistant crops Quarantine Mosquito nets Abandoning farms e.g. coffee farms Destruction of effected crops& animals Alternative income sources Crop rotation	District
	Wetland degradation	Lakes Crops Human population	District	Drying of water sources Bio diversity destruction Loss of fishing grounds	District	Sensitisation through radios Enforcement of wetland laws Demarcation of wetlands Eviction	District

	Soil erosion	Human population Crops	District	Stunted crop growth Siltation of water bodies Decreased biodiversity Destruction of property Transportation of evasive species Loss of soil fertility	District	Tree planting Sensitization Soil and water conservation i.e. bridges, trenches, mulching Inter cropping.	District
	Water, Road accidents	Human and livestock populations	District	Human and animal deaths	District	Regular guidance by traffic officers Construction of humps and road signs Reflector jackets, seat belts and helmets Spot checks for alcoholism Spot road improvement. speed governors.	District
	Hailstorms	Human and livestock populations Crops	District	Loss of livestock Complete crop failure Stunted growth of crops Loss of plant cover	District		District
	Land conflicts	Human population Crops & livestock		Loss of property Displacement of people Death	Kalamba, Kibibi, Bulo Sub Counties & Gombe TC	Sensitise people on land developments and land use Clearly demarcating and defining land owner ship Court Acquiring land titles Witch Craft Migration	District

	Drought	Human and livestock populations Crops	Ngando Sub county	Loss of vegetation cover Lowering of water levels Death of livestock Scarcity of water Proliferation of livestock diseases Limited pasture Shortage of food supply.	Ngando Sub county	Drought resistant crops Storage of food Sensitization Farming in wetlands Water harvesting Reduced food ratios, one meal per day Theft Transactional sex Labour for food Migration	Ngando Sub County
	Human wild life conflicts	Crops Human and livestock population	Kalamba Sub county	Death of people Destruction of property Spread of diseases Tension	Kalamba Sub county	Trapping Hunting Gazetting natural resources Involving UWA Poisoning Abandoning of farms Human migration	Sub county
	Lightning	Human and livestock populations Crops Infrastructure including homes, schools and hospitals Natural vegetation including trees	Kalamba, Kibibi Sub counties & Gombe TC	Death and injury of human and livestock Destroy properties	Kalamba, Kibibi Sub counties & Gombe TC.	Install lightning conductors Witch craft Planting specific tree species	Sub County

	Strong winds	Human and livestock populations Crops Infrastructure including homes, schools and hospitals Natural vegetation including trees	Kalamba, Kibibi Sub counties & Gombe TC.	Destruction of crops and properties	Kalamba, Kibibi Sub counties & Gombe TC.	Use of support on crops like bananas Tree planting Constructing strong & planned houses	District
	Deforestation	Human and livestock populations	District wide	Loss of biodiversity Loss of water catchment areas Siltation of water sources Loss of natural herbs Loss of fuel wood source	District wide	Tree planting Use alternative sources of fuel like bio gas Use of energy saving stoves Awareness Formulation of By-Laws Establishment of tree nursery bed.	District
	Bush fires	Crops & Animals	Ngando Sub county	Loss of bio diversity Destruction of crops Migration of wildlife	Ngando Sub county	Fire lines Awareness By-Laws	Sub county
	Wetland degradation	Lakes Crops Human population	District wide	Bio diversity destruction Low arts and crafts production Conflicts on water sources Loss of water catchment areas Loss of natural herbs	District wide	Sensitisation through radios Enforcement of wetland laws Demarcation of wetlands Prosecuting culprits to Court Wetland management committee Eviction	District

4.4 Conclusion and recommendations

It was established that Butambala District has over the last 30 years increasingly experienced multi-hazards including floods, drought, invasive species, strong winds, pests, parasites and diseasespests, parasites and diseases for crops and livestock, soil erosion, land conflicts, lightning, deforestation, burning, wetland degradation, road accidents and hailstorms putting livelihoods at increased risk. The limited adaptive capacity (and or/resilience) and high sensitivity of households and communities in Butambala District increase their vulnerability to multi-hazard exposure necessitating urgent external support.

The multi-hazards that are experienced in Butambala District can be classified as:

i. Geomorphological and geological hazards including soil erosion

ii. Climatological or hydro-meteorological including hailstorms, lightning, drought and strong winds

iii. Ecological or biological hazards including crop pests/animal parasites and diseases and invasive species

iv. Technological hazards including road.

v. Environmental hazards including wetland degradation, deforestation and land conflicts

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

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

ii. Building capacities to withstand and cope with the hazards and risks

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

Recommended policy actions that should target vulnerability reduction include:

i. Improved enforcement of policies aimed at enhancing sustainable environmental health;

ii. Increased awareness campaigns aimed at sensitizing farmers/communities on disaster risk reduction initiatives and practices.

iii. Revival of Disaster Risk Committees at the District levels

iv. Support extensive research on the occurrence and frequency of disasters prior to disaster management

v. Improve the communication channel between the Disaster Department and Local communities

vi. Office of the Prime Minister should decentralise their activities at the District level

vii. OPM should strengthen the District Disaster Committees by developing guidelines and trainings

viii. Establishment of disaster fund at the District levels

ix. Fund and equip recruited extension works

x. Establish a fund aimed at disaster preparedness and management at District levels

xi. Increase funding and staff to monitor wetland degradation and non-genuine agro-inputs

xii. Support establishment of a disaster risk early warning systems

xiii. Provide support in form of free seedlings to promote afforestation and reforestation programmes

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