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TESO SERERE District HAZARD, RISK AND VULNERABILITY PROFILE June 2014





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Acronyms

CBPP	Contagious bovine pleuropneumonia
DDMC	District Disaster Policy Committee
DRC	Democratic Republic of Congo
FGD	Focus Group Discussion
GIS	Geographical Information Systems
GPS	Global Positioning System
LC	Local Council
MTN	MTN Group, a South African telecom company
NAADS	National Agriculture Advisory Services
NGO	Non-Governmental Organization
OPM	Office of the Prime Minister
RDC	Resident District Commissioner
TC	Town Council
UNDP	United Nations Development Programme
UTL	Uganda Telecom



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Hon. Hilary O. Onek

Minister for Relief, Disaster Preparedness and Management



EXECUTIVE SUMMARY

This Serere District Hazard, Risk and Vulnerability Profile integrates scientific information provided by GoU agencies and hazard and vulnerability knowledge provided by communities on the district base map to contribute to a Ugandan atlas of disaster risk. It will support planning and decision-making processes to manage disaster risk in the District

The methodology provided for four phases of work:

Phase I	Preliminary activities
Phase II	Field data collection, mapping, verification and ground truthing
Phase III	Participatory data analysis, mapping and report writing
Phase IV	Refinement, validation and final map production/reporting

The report characterizes the district in terms of location, geography, climate, administrative arrangements, natural resources, gender demographics by sub-county, livelihoods, agricultural production, poverty and environmental degradation.

The discussion of the nature of each hazard and its geographic extent in terms of sub-counties provides a qualitative assessment of the situations that the communities face. Maps corresponding to each hazard show the areas where the hazard is significant, and also hotspots as points of incidence of the hazard.

Serere District is located in Eastern Uganda. Formerly, it was part of Soroti District. Physically the District lies approximately between latitudes 1° 33' and 2° 23' north and 30° 01' and 34° 18' degrees east, and is over 2500 feet above sea level.

The Serere district profile ranks endemic hazards in eleven classes: floods, land conflict, extended drought and famine, crop and animal disease, pest infestation, heavy storms, hailstorms, lightning, environmental degradation, vermin, bush fire, mines and unexploded ordinance, and landslide.

The Serere sub-county communities perceive high vulnerability to almost all of the hazards endemic in the district. Flooding, land conflict and drought hazards rank as the most significant. Only bush fires and pest infestations scored consistently as medium.

All of the Serere sub-counties registered at least 6 hazards each and even the Kasilo and Serere Town Councils had three. These aggregate hazards suggest that complex disasters in Serere are a real risk to which planners must direct preventive action as soon as resources allow.



INTRODUCTION

The district and the sub-region as whole have suffered from various disaster-related challenges that have affected development progress. Cattle rustling and insurgency from 1985 - 1993 by Karamojong warriors have been serious set-backs. Famines followed from 1992-94, worsened by an outbreak of the cassava mosaic viral disease which led to the extinction of the extant cassava varieties. In 2007 the entire sub-region experienced floods that destroyed lives and property. In 2009 the region was stricken by drought that destroyed 65% of the crops.

Like the other districts in the sub-region, Serere is prone to a range of hazards and associated disasters including floods, crop and animal epidemic, severe hails storms, land conflict, pest infestation, environmental degradation and drought.

This multi-hazard mapping exercise was implemented in Serere district among others to reduce the population's vulnerability to natural disasters and to prepare district disaster profiles that will aid decision making and planning. Hazards such as floods and hail storms pose risks to life, property and livelihoods, and are compounded by physical exposure and proximity to hazard-prone areas, and adverse socio-economic, and cultural and behavioural conditions.

The multi-hazard mapping exercise is a critical guide in optimizing development gains and minimizing potential loss of economic resources, infrastructure, physical assets, human resources, and environmental capital.

Objectives

The objective of the hazard, risk, and vulnerability mapping exercise is to produce a District Profile that will aid planning and decision making processes to address disaster risks in Serere District.

Methodology

The multi-hazard, risk and vulnerability mapping approach employed a people-centered, multi-sectoral, and multi-stakeholder approach. A mapping team led by the Office of the Prime Minister (OPM) and involving representatives from UNDP and district sector offices deployed on a field mission to Teso sub-region to capture the required information and produce the district profile.

The team employed a variety of data-collection methods including use of a mix-scale approach involving the integration of primary and secondary data. Secondary data were acquired through government sources (relevant ministries, departments and agencies, the



districts in Teso and Rwenzori sub-regions) and data bases from other organizations/NGOS operating in these districts. The raw spatial data and satellite images were assembled from relevant sources and analysed with descriptive statistics and remote sensing technology.

The mapping exercise involved four critical phases as follows:

Phase IPreliminary activitiesPhase IIField data collection, mapping, verification and ground truthingPhase IIIParticipatory data analysis, mapping and report writingPhase IVRefinement, validation and final map production/reporting

Phase I: Preliminary Activities

In this phase the mapping team undertook a series of planning and programming activities before start of field activity including holding meetings with relevant teams, mobilizing required resources, acquiring required equipment and materials, review of relevant literature, establishing relevant contacts and developing a checklist of activities to be undertaken in Phase Two.

The main objectives of Phase One were to prepare and undertake preliminary assessment of the quality and nature of the resources/materials, develop a quick understanding within the mapping team and other actors of the task of the multi-hazard, risk, and vulnerability mapping before any detailed physical field work was undertaken. This phase enabled the scoping and design of specific content and legends for the thematic maps.

The phase was also useful for preparing the resource deployment plan, and outlining procedure and field work plans, etc. It articulated, among other issues, the utilization of various stakeholders to ensure maximum participation in locating disaster prone locations and any other information relevant to the mapping exercise.

Phase II: Field Data Collection and Mapping

Stakeholder mapping and local meetings. A preliminary field meeting was held in each district to capture key local issues related to disaster incidence and trends. The meetings gave opportunities for the mapping team and stakeholders to identify other key resource persons and support staff from within the local community for consultation.

Stakeholder participation practices. Stakeholder participation was a key component of the mapping exercise. The team conducted consultations with district technical sector heads under the overall purview of the District Disaster Management Committee (DDMC) involved in the ground truthing exercises to ensure district leadership and ownership of the data and results. During exit meetings, stakeholders, particularly those at district level, were given the opportunity to validate, update and also contribute any other relevant information vital to the mapping process.



Capture of spatial data. Spatial data were captured and complemented by base maps prepared at appropriate scales. The base maps contained relevant data including location of existing social-infrastructure and services, district area boundaries, environmental elements, forest areas, utilities like roads, drainage and river course, contours and flood prone settlements.

Secondary data or desktop research. A desk review of relevant documents at the district and other umbrella organizations, including policy and legal documents, previous maps/ report and studies, was conducted.

A checklist summarized the required information according to the multi-disaster risk indicators being studied/mapped. Data from documents were analysed using various methods including content analysis.

Critical observation and ground truthing. This approach was used to critically assess the conditions, nature and location of disaster prone zones, "current human activity" and settlement patterns along disaster prone areas. Critical observation and ground truthing included inspection and observation of social infrastructure, major household economic activities being practiced, natural drainage lines, rivers etc. Non-mappable and non-physical situations were captured through remote sensing (e.g. satellite images) and physical observation.

Main instruments of data collection. The main instruments used for data collection were manuals of instructions (guides to mapping assistants), use of key informant guides and notebooks, high resolution GPS receivers, digital camera for taking critical photographs, high resolution satellite images and base maps/topographic sheets of the mapping areas.

Exit/feedback meetings with stakeholders. After field activities and data collection, feedback and exit meetings with stakeholders were carried out in the district. These meetings provided additional information regarding the disaster mapping exercise, validated the data generated, and provided clarity on the expected outputs and the way forward into the next phase.

Phase III: Data Analysis and Verification

Analysis of collected data. The mapping team and district government officials analyzed the collected data, and developed thematic disaster maps by integrating features generated from GPS data with base maps and high resolution satellite images. The main activities at this phase included:

- Data entry, cleaning and coding
- Preparation of base maps and process maps
- Preparation of disaster risk and vulnerability maps



Methods used for data analysis. Data analysis methods used are the following:

- Geo-processing, data transformation and geo-referencing
- Discussions/FGDs
- Drafting, digitizing and GIS Overlays
- Compiling of different data and information

Data editing, coding and cleaning. Data entry clerks, data editors and coders digitized, edited, coded and cleaned data collected using the various tools mentioned above. Both qualitative and quantitative data obtained from the field were entered via a data entry interface customized to the layout of the field data forms. Data coding and analysis started immediately the data was available. Arrangements were made in the field to handle manual editing and coding as and when data was received from the field crew. Furthermore, data entry, verification, screen editing and system development followed sequentially to enable the preparation of draft maps.

Data analysis package. The mapping team analysed acquired data using MS Word and MS Excel for Windows, and spatial data using ArcGIS 10 software and mobile GIS applications. They performed rapid and systematic GIS overlays to generate base maps and risk and vulnerability maps.

Descriptive statistics. The mapping team investigated trends per given indicator using tables, graphs, charts and frequencies. As processing of data developed, they merged it for cross tabulation and eventual production of thematic maps for the various types of hazards.

Generation and appraisal of draft Maps: Prioritization set by the districts determined the various hazards presented on the thematic maps. The team convened a field workshop to present, appraise and validate the risk and vulnerability maps with respect to their accuracy and completeness. Information gaps were identified and filled in the final risk and vulnerability maps.

Phase IV: Refinement, validation and reporting

A final workshop was conducted by the OPM to facilitate validation and dissemination of the district hazard, risk, and vulnerability profile to relevant partners.

Brief Overview of the District

Location

Serere district is located in eastern Uganda. Formerly, it was part of Soroti District. Physically the District lies approximately between latitudes 1° 33' and 2° 23' north and 30° 01' and 34° 18' degrees east, and is over 2500 feet above sea level. Serere borders Buyende to the south, Pallisa in the South East, Soroti in the North East, Kaberamaido in the North and



Ngora in the East.

Historical background and administrative arrangements

Like all other districts, Serere operates under a decentralized system. This administrative arrangement is expected to facilitate more effective and efficient service delivery to the population. Currently the district is administratively divided into the two rural counties of Kasilo and Serere. There are a total of 8 sub-counties and 2 town councils, 31 rural parishes and 208 villages. The district has established political and administrative structures down to village level within this decentralized approach. The Local Councils make up the political structures, i.e., LC V at the District level to the LC 1 at the village level. The RDC is a central government representative.

The district administrative structure is hierarchical, down to the parish level. The Chief Administrative Officer (CAO) heads the civil servants at the district, coordinates the government departments and is therefore the Chief Executive of the district. According to the new structure of Local Governments, the district has 11 departments: Administration, Production, Works and Technical Services, Education, Health, Finance, Planning, Community Based Services, Natural Resources, Council and Statutory Bodies and Internal Audit.

Climate and Rainfall

Climate

The climate of the district is modified by the large swamp area surrounding it. The rainy season is March to November, with a marked minimum in June, and marked peaks in April to May and August to October. December and January are the driest months. Recent rainfall has been unreliable and unpredictable, affecting the activities of people, e.g., agriculture, livestock rearing, etc.

Rainfall

Rainfall normally ranges from 1000mm to 1500mm coming in two seasons: March–July and September – November. There is normally a short dry spell between the two rain seasons during mid-June – mid July. The long dry season sets in during late November through to early March. Areas bordering Northeast experience earlier dry seasons. This is also a common occurrence at the lakeshore areas, which sometimes experience very sharp spells of drought.

Temperature, Humidity, Wind and Evapo-transpiration

Serere District has a mean annual maximum temperature of around 31.3°C and a mean annual minimum of 18°C. Its highest temperatures are in February, of 35°C. The highest ever recorded was in February, 1949 where temperatures reached 40°C. Relative humidity



ranges from 66% to 83% at 0600 GMT in the morning. However, it falls in the afternoon (35%-57% at 1200GMT) thereby reducing chances of rainfall. During the N.E. monsoon the area is swept by a wind that has traversed Somalia, passed between Abyssinian massif and Kenya highlands and the hills of Karamoja. The water vapour content of this wind is consequently low. The southwards passage of the inter-tropical convergence zone in October brings no more rain than is sufficient to produce a gradual falling off from the July peak. There are relatively high rates of evaporation in Serere District as it lies near the equator. Evaporation is particularly high in the dry seasons.

Topography and vegetation

Geology and soils

Some areas in Serere District are underlain by rocks of the basement complex Precambrian age that include granites, mignalites, gneiss, schists and quartzites. The soils fall mainly under four major units; Serere catena; Metu complex series. These are mainly of the ferralitic type (sandy sediments and sandy loams). They are well drained and friable. Bottomlands contain widespread deposits of alluvium, pierced by isolated inselbergs.

Vegetation

Serere has wooded savannah, grass savannah, forests and riparian vegetation. The wooded savannah mainly comprises moist Acacia savanna associated with hyparrhenia spp and combretum savanna associated with hyparrhenia spp. These are mainly found in south-western part of the district, i.e., Kasilo County. The riparian category comprises certain scattered tree grasslands associated with Setaria incrassate Hyparrheria rufa, Accacia sayel Accacia fistula, Balanities aegyptica and Terminalia spp.

Serere also has extensive wetlands which cover vast areas including Apujan from Kyere Sub-County in Serere district to Ngora County in Kumi District. Vegetation with thorny shrubs adapted to semi-arid climate occurs further to the northeast.

Demographic Information

Human population

Serere District has a total population of 176,479 (2002 Final census results) of which 85,925 are male and 90,554 are female. Table 1 shows the population by county and sub-county disaggregated by gender. The projected population for 2010 was 264,900 persons.



County	Sub-county	No. of Households	Male	Female	Total	Average House- hold Size
	Atiira	2,925	6,664	6,933	13,597	4.6
Serere	Kateta	6,046	16,895	18,038	34,933	5.8
	Kyere	5,755	15,019	16,110	31,129	5.4
	Olio	4,670	12,103	12,636	24,739	5.3
Sub-Total		19,396	50,681	53,717	104,398	
	Bugondo	4,178	10,897	11,654	22,551	5.4
Kasilo	Pingire	6,046	15,999	16,406	32,405	5.3
	Kadungulu	3,305	8,348	8,777	17,125	5.2
Sub-Tota	S	13,529	35,244	36,837	72,081	
Grand T	otals		85,925	90,554	176,479	

Table 1 Population by sex, sub-county and county

Source: Population and Housing census 2002, Final results

Population growth rate

During the period of insecurity, 1980 – 1991, the population of Serere District shrank at -0.9%. The 2002 Population and Housing Census results showed a rebounding annual population growth rate of 5.12% in 1991–2002, one and a half times higher than the national average of 3.3 %.

Serere District has a population density of 151 persons per km², higher than the national average of 124 persons per sq² and is the third most densely populated among the districts of the Teso Sub-region after Pallisa (328) and Kumi (160) (2002 final census results). Much of this population (89%) is rural, with 51% women. The data reveal a high dependency ratio, since 56% of the population are children of whom 46.5% are under 5 years of age.

The demographic figures also indicate that women and children form 75% of the population, a fact to be considered in planning, support and resource provision to properly target the needs of the population.

Migration

The district has always experienced large immigration and emigration from the neighboring district due to insurgency experienced from 1987 – 1991, the LRA incursion in 2003-2005 and the recent floods in 2007. However, seasonal migrations also occur from November to March when the Karamojong nomads cross into the relatively wetter parts of the District in search of water and pasture. The major migratory districts are Katakwi, Amuria, Kaberamaido and partly from Kumi. High land costs in Serere County reflect demand for land for settlement.



Ethnicity and language

As shown in Table 2, the district is mainly composed of three major tribes, in dominant order: Iteso, Kumams, and Bakenye; however the district has smaller populations of Bagishu and Baganda. Non-Ugandans from Kenya, Tanzania, DRC, and other Africans have also come to Serere District.

Ethnicity/citizenship	Total population	Percentage
Iteso	102,479	58.07
Kumam	25, 674	14.55
Bakenye	18,860	10.69
Other Ugandans	28,736	16.28
Kenyans	297	0.17
Tanzanians	83	0.05
Congolese	58	0.03
Other Africans	87	0.05
Outside Africa	130	0.07
Non-Ugandans Not stated	75	0.04
Total	176,479	100.00

Table 2 Population by ethnicity in Serere district

Source: Abstract from Population and Housing Census, 2002

Religious affiliation

The ranking of religions by numbers of members in Serere is Anglican, Catholic, Pentecostal, Muslim and others. An insignificant proportion of the population (about 0.89%) of the population does not belong to any faith.

Livelihoods

The major source of livelihood is subsistence agriculture accounting for 76% of income, followed by earned income from employment 16.7%, property income 0.5% and other sources 6.9% according to 2002 population and housing census. A considerable proportion of the population also relies on social safety networks, i.e., dependency for livelihood on relatives and others. This culture is slowly fading with the tendency toward smaller families.

Recently the population is adopting commercial agriculture especially in the area of fruit growing mainly oranges, mangoes, pineapples and avocadoes, mainly due to the assistance farmers get from NAADS. Access to and control over key production assets and resources is still male dominated. Most rural women are without independent sources of income and so have less access to productive resources.



Housing and communication

Housing

The dwelling units are mainly detached houses 82.4%, semidetached houses 10.4%, tenants 5.3% and other 2.0%,. The main type of tenure of dwelling units is owner occupied 83.9%, free 4.5%, rented 11.5 and other 0.1%. Typical of rural areas in the district, dwellings (83.7%) are mainly grass thatched roofs with wattle walls and rammed earth floor. Just 7.8% live in permanent dwellings, 3.4% in semi-permanent structures, and a small proportion in temporarily roofed houses.

The main pressures behind these include:

- Inclination toward traditional construction
- The thinking that only the extremely rich can build permanent houses
- Lack of sensitization to live within personal means and put up structures within available resources like in Bugisu, Buganda and Mbarara
- Poor physical planning and lack of the district staff surveyor

Communication

The Serere-Soroti roads are highways linking Serere to the south-western part of Eastern Uganda. The old Mbale Road also provides access from Serere – Soroti and to Mbale via Kumi. In the nearby Soroti District, Soroti Municipality has a fairly developed aircraft runway, with Soroti Flying School, and this links Soroti to Entebbe international airport. The airfield belongs to the East African Flying Academy that came into being during the East African Co-operation. The airfield has a modern runway and navigation aids that with improvement could justify it as a second international airport.

Natural resources

Energy and minerals

Fuel wood is the predominant source of energy: 99% of the district population depends on it either directly or indirectly, in the form of firewood in rural areas and charcoal in the urban areas. There is also considerable use of agricultural crop residue. Other energy sources such as electricity, petroleum, paraffin, solar and biogas are of insignificant use, or not in use at all in some parts of the District, accounting for only 1% of the energy used.

Tourism

Though tourism-related establishments and attractions are not conspicuous in Serere, there is potential to develop this sector to generate revenue for the District and the community. The Iteso have a very rich culture manifested in traditional dress, rites, foods, dance (Ajosi), songs, artisan pottery, weaving and knitting, but these are presently under-exploited.



The flat terrain of much of the District presents appealing landscapes that visitors from other parts of the world would appreciate. Walking, camping, and bird and butterfly watching on the Bugondo and Ogera hills present an exciting experience for both locals and foreign visitors and could be complemented with comfortable accommodation in well-kept hotels, bars and restaurants that are now appearing around town.

Water sports such as boating, sport fishing and swimming offer scope for tourism development. The small regional museum is a stop of interest. The widespread MTN and UTL services also contribute towards and provide for reliable communication that is crucial for the tourist industry to develop.





Table 3 Hazard summary

Sub-counties	Floods	Severe storms	Crop and animal disease	Pest infestation	Land conflict	Mines and unexploded ordinance	Environ-mental degradation	Drought /Food Insecurity	Vermin	Bush fires	Land-slides	Total
Atiira	\checkmark	./	./	./	./		\checkmark	\checkmark				7
		v	v	v	v							1
Bugondo	\checkmark	v √	v √	▼ √	▼ √		√	√				7
Bugondo Kateta	✓ ✓	✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	√	√ √	√ √		\checkmark		7 7 9
Bugondo Kateta Kadungulu	✓ ✓ ✓	✓ ✓ ✓	 ✓ ✓ ✓ ✓ 	 ✓ ✓ ✓ ✓ 	▼ √ √	√	· ✓ ✓	· ✓ ✓		✓ ✓		7 7 9 8
Bugondo Kateta Kadungulu Kasilo TC	✓ ✓ ✓ ✓	 ✓ ✓ ✓ ✓ 	 ✓ ✓ ✓ ✓ 	 ✓ ✓ ✓ ✓ 	 ✓ ✓ ✓ ✓ ✓ ✓ 	~	· ✓ ✓	· ✓ ✓ ✓		√ √		7 9 8 3
Bugondo Kateta Kadungulu Kasilo TC Kyere	✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	 ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ 	√ √	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	✓	✓ ✓	✓	7 9 8 3 10
Bugondo Kateta Kadungulu Kasilo TC Kyere Labori	✓ ✓ ✓ ✓ ✓ ✓	 ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ 	 ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ 	 ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ 	 ✓ 	✓	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	✓ ✓	✓ ✓ ✓	✓	7 9 8 3 10 8
Bugondo Kateta Kadungulu Kasilo TC Kyere Labori Olio		✓ ✓ ✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	✓ ✓	✓ ✓ ✓ ✓ ✓	 ✓ 	✓ ✓ ✓	✓ ✓ ✓	✓	7 9 8 3 10 8 7
Bugondo Kateta Kadungulu Kasilo TC Kyere Labori Olio Pingire		✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	 ✓ 	 ✓ 	 ✓ ✓	✓ ✓	· ✓ ✓ ✓ ✓	· ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	✓	7 9 8 3 10 8 7 9
Bugondo Kateta Kadungulu Kasilo TC Kyere Labori Olio Pingire Serere TC			✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	✓ ✓ ✓	· ✓ ✓ ✓ ✓ ✓	 ✓ 	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	✓	7 9 8 3 10 8 7 9 9 3



Table 4 Hazard status

Hazard	Status	Sub-County	Rank
Floods See Figure 1	Increased flooding attributed to destruction of the major wetland systems, deforestation, sand mining. Flooding usually occurs every year with heavy rain causing submerging of many roads. Other effects include destruction of crops, cattle diseases including foot rot and liver flukes, displacement of persons, destruction of dwellings and food insecurity. Incidences of floods reported in the wetland areas/low lying areas, e.g., Kyere-kateta road submerges, Kyere- Soroti Angole road submerges, Elogu bridge is affected	Atiira,, Bugondo, Kateta, Kadungulu, Kasilo Town Council, Kyere, Labori, Pingire	1
Land conflict See Figure 2	Cases of land conflict report	District wide	2
Drought/Food Insecurity See Figure 3	Covers the whole district and is an act of nature, worsened by destruction of environment. It occurs seasonally in each year resulting in famine, displacement of persons and deaths.	District wide	3
Crop and animal disease See Figure 4	Normally occurs during extreme weather conditions. Limited knowledge in part of farmers contributes to contagion, seen throughout the year but intensities differ according to seasons. The effects include food insecurity, household income reduction, livestock losses. Incidents of potato horn worm and fruit fly, cassava mosaic, cassava brown streak, foot and mouth, CBPP and foot rot are reported.	Atiira, Bugondo, Kateta, Kadungulu, Kasilo Town Council, Kyere, Labori, Olio, Pingire	4
Pest infestation See Figure 5	Threatens fruit growing farmers, attributable to poor husbandry methods as a result of limited knowledge and notable throughout the year with ultimate effects of food insecurity, reduced household incomes, livestock losses Incidences reported.	Atiira, Bugondo, Kateta, Kadungulu, Kyere, Labori, Olio, Pingire	5
Heavy storms and Lightning See Figure 6	Storms cause destruction of dwelling places, crops, displacement of persons, in extreme cases, death.	Olio, Kadungulu, Bugondo	6



Environmental degradation See Figure 7	Cases of damaging human activities reported in the district	Atiira, Kyere, Kadungulu, Kateta, Bugondo, Olio, Pingire, (Apujan from Kyere Sub-County in Serere district to Ngora County in Kumi District).	7
Vermin See Figure 8	Incidents of vermin's and problem animals reported	Labori, Kyere, Olio, Pingire (Muuria Parish, Kelim Parish and villages of Omagoro-, Kachinga, Omagoro- Kachinga)	8
Bush fire See Figure 9	Incidents of fires are reported	Kadungulu , Kateta , Labori , Pingire	9
Mines and unexploded ordinance	Incidents of unexploded appliances have been reported in some parts of the district.	Kateta , Kyere, Serere Town Council, Olio Primary school in Serere town council, Kikoota village and Kyere Sub-County headquarters, Orupe villages	10
Landslide	Falling boulders are a hazard reported in Kelim parish (Omogoro-Kachinga villages)	Kyere	11





Table 5 Hazard risk assessment

Hazard	Atiira	Bugondo	Kadungulu	Kateta	Kasilo TC	Kyere	Labori	Olio	Pingire	Serere TC
Floods	М	Н	Н	Н	L	Н	Н		Н	
Extended Drought and Food insecurity	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н
Crop and Animal Epidemic	М	М	Н	Н	L	Н	Н	L	Н	
Pest infestations	М	М	М	М	М	М	М	М	М	М
Vermin		L				М	Н	М	Н	
Severe storms: hail, lightning	L	Н	Н	Н		L		Н	L	
Bush fires			М	М			М		М	
Environmental Degradation	Н	Н	Н	Н		Н		Н	Н	
Mines and Unexploded Ordinance		L	Н	L		Н			Н	L
Cattle theft	М	L	Н	L	L	Н	L		L	L
Widespread public land disputes	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н
Widespread between households over land	Н	Н	Н	Н	Н	Н	Н	Н	Н	Н
Key: High = H, Medium = M	Key: High = H, Medium = M, Low = L, Blank = Not reported									



Flood risk



Figure 1 Flood risk map

Floods occur throughout the district with the exception of Olio Sub-County and Serere Town Council. They have become almost annual events during the wet season, affecting farmers especially those in the valleys and near wetlands areas. Upstream erosion causes stream siltation, reduction in watercourse capacity and consequent increase in flooding instances. The impacts of floods in the district are felt especially when roads are submerged, crops destroyed and bridges washed away.

Generally, the district records high flood risk situations with most cases identified in; Kadubgulu, Budongo, Pingire, Labori, Kateta and Kyere sub-counties. Across these sub-counties, numerous risk hot spots are reported and include Kagwara, Iruko and Kadungulu (Kadungulu Sub-County); Bugondo and Kongoto parishes in Bugondo Sub-County; Aaropo, Aarapoo and Labori parishes (Labori Sub-County), Pingire and Odapakol (Pingire Sub-County), Kateta and Kanyangan (Kateta Sub-County); Kelim, Kyere and Kamurojo parishes in Kyere Sub-County, among others.



Land Conflict risk



Figure 2 Land conflict risk map

Land conflicts occur throughout the district resulting from population growth, land fragmentation and land scarcity. Significant recent land conflicts have resulted in displacement of people, food insecurity, civil insecurity and deaths. For instance, in Kyere Sub-County, Alilimo village an old man and his son were killed with pangas over a land-related dispute. Other incidents occurred in Pingire and Kadungulu sub-counties.



Drought and food insecurity risk



Figure 3 Drought and food insecurity risk map

Unpredictable climatic patterns result in reduced pasture, water scarcity, food insecurity, social disintegration and population migration. Crop pest and disease infestation and flooding experienced in the district are among the main causes of poor food production. Drought and associated food insecurity occur seasonally throughout the district.



Crop and animal epidemic risk



Figure 4 Crop and animal epidemic risk map

Crop and animal disease outbreaks occur throughout the district, compromising food security. Risk levels are high in Kadungulu, Labori, Pingire, Kateta and Kyere sub-counties. Bugondo and Atiira sun-counties have moderate risk. Risk hot spots are Okidi, Pingire, Adapakol and Kidetok in Pingire Sub-County; Kelim, Kamurojo, Kamusala, Olupe and Kangato (Kyere Sub-County), and Kadungulu, Kagwara and Iruko in Kadungulu Sub-County. Some of the common crop diseases in the district are; potato horn worm and fruit fly, cassava mosaic and cassava brown streak. Foot and mouth, CBPP and foot rot reduce livestock productivity.



Pest infestation risk



Figure 5 Pest infestation risk map

Pests afflict the entire district throughout the year, especially fruit growers. Across the district, pest infestation is rated moderate with numerous risk hot spots reported in; Kagwara, Iruko and Kadungulu (Kadungulu Sub-County); Aaropoo and Labori (Labori Sub-County), Odapakol, Okidi and Kidetok (Pingire Sub-County), Kamed, Kangoto, Ogera and Bugondo (Bugondo Sub-County) among others. The major citrus pests are citrus fruit fly, mites, aphids and scales. Groundnut pests are aphids and leaf miners. Cassava pests are cassava mealy bugs, scales and mites. Sorghum pests are strigar, central shoot fly and stem borers.



Heavy storm and lightning risk



Figure 6 Heavy storms and lightning risk map

As in adjacent districts, the changing weather patterns in Serere District manifest in aseasonal and extreme weather events. Heavy rains and lightning are experienced annually and sometimes associated with fatalities and destruction of property. Wind storms accompanied by lightning are a menace in Kadungulu, Bugondo, Atira, Olio and Kateta sub-counties. The reported risk hot spots in these sub-counties among others include; Kagwara, kadungulu, Kongoto, Bugondo, Ogera, Okulonyo, Kanyangan and Ojetenyang.



Environmental degradation risk



Figure 7 Environmental degradation risk map

Environmental degradation is generally high throughout the district. Serere District communities practice unsustainable exploitation of ecological services in activities that include charcoal burning, rice cultivation in wetlands, sand mining and stone quarrying, brick making, over-grazing, bush burning and deforestation.



Vermin risk



Figure 8 Vermin risk map

Monkeys and baboons raid gardens mainly in Olio Sub-County while hippos raid in Pingire, Labori and Kyere sub-counties. Their prevalence is seasonal and associated with abundance of food, weather changes, and destruction of their habitats. Effects include destruction of gardens resulting in food insecurity, spread of diseases to animals and humans, and loss of animals. Risk levels are higher in Pingire and Labori sub-counties than elsewhere. Risk hot spots are reported in Olio, Kelim, Aaropoo, Pingire and Bugondo.



Bush fires risk



Figure 9 Bush fires risk map

Fires are deliberately set by farmers during preparation of gardens, by hunters to flush game and by honey harvesters. The burning is usually during dry season with the intention of letting new tender grass to sprout for grazing animals or to clear the bushes during hunting to flush out hunted animals. Fires can get out of control and destroy households, properties, crops and ecosystems, and cause human and animal deaths. Fire outbreaks also occur due to clearance of land for agriculture, burning grass for pest control, charcoal burning and negligence in homesteads. Bush fire risk is medium in Kadungulu, Labori, Pingire and Kateta.



Mines and unexploded ordinance risk



Figure 10 Mines and unexploded ordinance risk map

Ordinance includes grenades, land mines, rockets and abandoned bullets. Accidental explosions occur in former battle zones or military camps. In Serere district such an explosion occurred in Ocaapa Trading centre adjacent to the police post where two women who were seated under the tree near the explosion were killed by a grenade. Risk of mines and unexploded ordinance is high in Kadungulu, Pingere and Kyere sub-counties and low in Kateta, Bugondo and Serere Town Council.



VULNERABILITY

Table 6 Risk vulnerability

Hazard	Atiira	Bugondo	Kadungulu	Kateta	Kasilo TC	Kyere	Labori	Olio	Pingire	Serere TC
Floods	2	3	3	3	1	3	3		3	
Drought and Food insecurity	3	3	3	3	3	3	3	3	3	3
Crop and Animal Epidemic	2	2	3	3	1	3	3	1	3	
Pest infestations	2	2	2	2	2	2	2	2	2	2
Vermin		1				2		2	3	
Severe storms: hail, lightning	1	3	3	3		1		3	1	
Bush fires			2	2			2		2	
Environmental Degradation	3	3	3	3		3		3	3	
Mines and Unexploded Ordinance		1	3	1		3			3	1
Cattle theft	2	1	3	1	1	3	1		1	1
Widespread public land disputes	3	3	3	3	3	3	3	3	3	3
Widespread between households over land	3	3	3	3	3	3	3	3	3	3
Score: High = 3, Medium = 2, Low	′ = 1	, No	t rep	oorte	ed =	Bla	nk			



Risk Vulnerability



Figure 11 Risk vulnerability map

Table 6 estimates the relative vulnerability of communities in the sub-counties with respect to the hazards endemic there. The incidence of hazards across the district is not homogeneous, and consequently aggregate vulnerability conditions in Serere District vary from one sub-county to another, as is evident in Figure 11.

Based on the frequency of hazard events and the magnitude of loss suffered, Kadungulu, Pingire, Kateta and Kyere Sub-Counties are assessed at high risk and vulnerability levels.

Bugondo and Atiira sub-counties register moderate risk and vulnerability levels while Serere town council, Olio, Kasilo Town Council and Labori Sub-County rate low in terms of risk and vulnerability.

In the order of risk, the hazards registered in the most vulnerable sub-counties are drought and food insecurity, land disputes, floods, crop and animal epidemic, environmental degradation and pest infestations.



CONCLUSIONS

The multi-hazard vulnerability profile resulting from this mapping exercise is a combination of physical data and information captured from communities using participatory methods in Serere District. The profile shows how communities perceive each hazard according to its likelihood of occurrence and the severity of its impact on them. There were variations in the intensity and level of vulnerability to hazards from one sub-county to another.

In order of risk as assessed by the communities, eleven hazards are typical in Serere District, caused by natural and human-induced processes: drought and food insecurity, land disputes, floods, crop and animal epidemic, environmental degradation, pest infestations, severe storms (hail, lightning), cattle theft, mines and unexploded ordinance, vermin, and bush fires.

Drought, land conflict and floods record high vulnerability levels in all sub-counties in the district compared to the other disasters save for Serere Town Council and Olio where no severe flood incidents are reported.

All of the Serere sub-counties registered at least 6 hazards each and even the Kasilo and Serere Town Councils had three. These aggregate hazards suggest that complex disasters in Serere are a real risk to which planners must direct preventive action as soon as resources allow.

The mapping exercise exploits spatial information related to disasters in Serere District. Sometimes, the hazard or vulnerability map may be based on physical data alone, without data and information derived from the communities/stakeholders themselves as victims and/or operators of disaster management processes. This information should be integrated with the disaster mitigation plans developed by the Serere district local government to plan and minimize the impacts of the disaster.



DEFINITIONS OF TERMS

Drought. Drought is the prolonged shortage of water usually caused by lack of rain. Drought and food insecurity are related because crop and livestock productivity suffer in droughts.

Food insecurity. Food insecurity is a severe shortage of food or means to buy food that may lead to malnutrition and death.

Floods. A flood occurs when large amounts of water cover a place that is meant to be dry. Floods usually occur with high rainfall.

Landslides. These are rapid movements of large mass of mud, rocks, formed from lose soil and water. Landslides occur mainly during the rainy season, but they can also be precipitated by earthquakes. Community settlement on steep slopes and other uncontrolled land use practices increase the probability of landslides.

Epidemics. This is the occurrence of a disease, in a particular community and at a particular period, beyond normal levels and numbers. Epidemics may affect people, crops or livestock.

Human epidemics. The diseases include cholera, meningitis, hepatitis E, marbug, plague, avian influenza, ebola and sleeping sickness among others.

Crop and animal disease. Animal epidemics include swine fever, foot and mouth disease, naganan, and bird flu. Crop disease epidemics include coffee wilt, banana bacterial wilt, and cassava mosaic and cassava brown streak disease.

Heavy storms. Heavy storms in Uganda are often accompanied by hail, lightning and violent winds. Storms can result in destruction of crops, animals, public facilities and human settlements. Lightning can be deadly and may be mitigated by lightning ground conductors on buildings.

Pest infestation. These are destructive insects, worms, caterpillars or any other animal that attacks crops or livestock. Common pests in Uganda include weevils, locusts and caterpillars.

Vermin. Baboons, chimpanzees, bush pigs and other animals which raid crops cause damage and losses which may significantly diminish agricultural productivity.

Land conflict. These are conflicts arising from ownership and use of land and other land resources.



Cattle rustling. This is when one community raids another to steal livestock.

Environmental Degradation. This results from poor land use and other unsustainable ecosystem exploitation that lead to deterioration of the environment. Overgrazing, cultivation on sloping land, unguided and uncontrolled use of fertilizers and pesticides, bush burning, overfishing, deforestation, mining, poor wastewater treatment, inappropriate waste disposal and wetlands reclamation are examples of causes of environmental degradation.

Mines and unexploded ordinance. Mines are devices designed to explode with fatal effect when disturbed. Unexploded ordinance are unspent bullets, grenades, rockets, etc., which are discarded or stored.

Bush fires. Fires set deliberately to clear forest or pasture for agricultural purposes may go out of control and consume far more than intended.

Earthquakes. Earthquakes results from sudden violent movements of the earth's surface, sometimes causing massive loss of lives and property due to building collapse.

Invasive Species. A non-native plant or animal that invades a habitat or bioregion with adverse economic, environmental, and/or ecological effects. An example is a grass that is dominating pasture in the Rwenzori sub-region, reducing the grazing capacity of the land.





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