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TESO
KABERAMAIDO
District

HAZARD, RISK AND VULNERABILITY PROFILE

June 2014

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Acronyms

CAO	Chief Administrative Officer
DDMC	District Disaster Management Committee
GIS	Geographical Information Systems
GMT	Greenwich Mean Time
GPS	Global Positioning System
MS	Microsoft
NGO	Non-Governmental Organization
OPM	Office of the Prime Minister
TC	Town Council
UBOS	Uganda Bureau of Statistics
UNDP	United Nations Development Programme
UPHC	Uganda Population and Housing Census

Acknowledgements

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Hon. Hilary O. Onek

Minister for Relief, Disaster Preparedness and Management

EXECUTIVE SUMMARY

This Kaberamaido 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.

Kaberamaido District is located in north-eastern Uganda, approximately between latitudes 1^0 33'N - 2^0 23'N and longitudes 30^0 01' E - 34^0 18'E. It is bordered by the Districts of Amolatar in the Southwest, Dokolo in the West and Northwest, Alebton in the North, Amuria in the North-East, Soroti in the East and Lake Kyoga in the South and Southeast.
The profile identifies endemic hazards in eight classes: floods, hail storms and lightening, crop and animal disease, pest infestation, land conflict, extended drought and famine, environmental degradation and vermin.

Communities assessed the hazard category of hailstorms, heavy rain and lightning as high risk in all sub-counties except Ochero. Although they perceived flooding as most severe in Alwa sub-county, it has medium risk in the remaining sub-counties of the District. Drought afflicts Bululu, Ochero and Kobulubulu severely. Crop and animal diseases are problematic everywhere, most particularly Kobulubulu. Land conflict registers as high risk in Alwa, Ochero and Kobulubulu.

All sub-counties suffer at least five of these hazards, and two, Ochero and Kalaki, manifest all eight, suggesting that the District is in general vulnerable to disasters of aggregated hazards.

INTRODUCTION

Various disaster-related challenges hinder development in Kaberamaido District and in the sub-region as whole. The sub-region suffered from cattle rustling and insurgency from 1985 to 1993 by Karamojong warriors and rebellion against the Government by some individuals. Later, famines followed from 1992-94, worsened by an outbreak of the cassava mosaic viral disease, which led to the extinction of the cassava varieties grown previously. In 2007 the entire sub-region experienced floods that destroyed lives and property. In 2009 the region was again affected by drought that destroyed 65% of the crops.

Like the other districts in the sub-region, Kaberamaido remains prone to a range of hazards and associated disasters including floods, crop and animal epidemic, severe hail storms, land conflicts, pest infestation, environmental degradation, road related accidents, and extended drought and famine.

This multi-hazard mapping exercise implemented in Kaberamaido district has as its goal to reduce the population's vulnerability to natural disasters and to prepare the district disaster profiles that will aid decision making and planning. Hazards like flood and hail storms storm pose risks to life, property and livelihoods and are compounded by physical exposure and proximity to hazard-prone areas, and adverse socio-economic, cultural and behavioral conditions.

Thus the multi-hazard mapping exercise is a critical guide for 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 is to produce a District Profile that will aid planning and decision making processes for managing disaster risks in Kaberamaido 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, and the districts in Teso sub-region) 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 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

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

Background and history

Kaberamaido was granted district status by the then President of the Republic of Uganda, the late Idi Amin Dada. However, following an objection by a group of elders, this status was reduced to that of a sub-district.

After the 1979 war, Kaberamaido like other parts of Uganda suffered from the effects of the political turmoil but continued to be administered as a sub-district under the Central Government until the advent of decentralization when the two counties that currently constitute it were administered by Assistant Chief Administrative Officers of the District of Soroti.

However, the vastness of the Soroti District hampered adequate delivery of administrative and social services to the growing population. Local leaders began to advocate creation of smaller, more effective district local governments by subdivision of Soroti, resulting in 2001 of the current Kaberamaido District.

Geography

Kaberamaido District is located in Eastern Uganda, approximately between latitudes 10 33'N - 20 23'N and longitudes 300 01' E - 340 18'E. It is bordered by the Districts of Amolatar in the Southwest, Dokolo in the West and Northwest, Lira in the North, Amuria in the North-East, Soroti in the East and Lake Kyoga in the South and Southeast.
The District headquarters is situated at Kaberamaido Town Council, 434 km from Kampala City, the capital of the Republic of Uganda.

Table 1 District area

	km^2
Total Area	1,623.9
Total Land Area	1,210.7
Forest Area	22.0
Open Water Area	269.4
Wetlands Area	143.8

Geology

The Kaberamaido District landscape is a flat plateau with a few scattered rock outcroppings. Most areas in Kaberamaido District are underlain by rocks of the basement complex of precambrian age that include granites, mignalites, gneiss, schists and quartzites.

Soils and vegetation

The district has mostly sandy loam soils of ferralitic type. Its bottomland is mainly alluvium. Generally, the soils all over the District are well drained, fertile and suitable for cultivation.

Kaberamaido has a number of sub-counties lying along Lake Kyoga: Ochero, Bululu, Kobulublu, Aperkira and part of Kalaki, and the district is regarded as a well-watered peninsula. Major wetlands are located at Kakure (Olyanai), Kalaki (Ameru swamp), Aperkira (Omabor swamp), Apapai (Omunyal swamp), among others.

The district is largely savannah marked by grasslands, wood forests, isolated trees and riparian vegetation. The wood forests and grasslands are mostly dominated by Acacia, hyparrhenia spp and combretum, found throughout the two counties of Kalaki and Kaberamaido. The riparian grass and tree species include Setaria incrassate, Hyparrheria rufa, Accacia sayel, Accacia fistula, Balanities aegyptica and Terminalia.

Climate

The climate of Kaberamaido District is marked by wet and dry seasons modified by the large swamp area surrounding it. The mean annual rainfall normally ranges from 1,000mm to 1,500mm spread over two rainy seasons; March – July and September – November. Rainfall is at its minimum in June, and with bimodal maxima in April - May and August - October.

Between the two wet seasons, there is usually a short dry spell from mid-June to mid-July. The long, main dry season normally begins in late November and continues to early March. However, early dry seasons are a common occurrence along the lakeshore areas, which sometimes experience very sharp spells of drought. December and January are usually the driest months of the district. However, recent rainfall patterns have become less predictable with deleterious effects on cultivation and livestock rearing.

Kaberamaido District has a mean annual maximum temperature of 31.3^{0}C and a mean minimum of around 18^{0}C. The highest mean monthly maximum temperature is 35^{0}C in February. The highest ever recorded for the District was in February, 1949 when temperatures reached 40oC. Relative humidity ranges from 66% to 83% at 0600 GMT. However, it falls sharply in the afternoon to 35%-57%, thereby reducing chances of rainfall.
During the Northeast monsoon (Dec-Mar) the area is swept by a wind that has traversed Somalia, passed between the Abyssinian massif and Kenya highlands and the hills of Karamoja, with a consequently low water vapour content. There are relatively high rates of evaporation in Kaberamaido District as it lies near the equator. Evaporation is particularly high in the dry seasons.

Administrative structure

Kaberamaido district comprises two counties: Kaberamaido and Kalaki. Kaberamaido County has 5 sub-counties and 1 Town Council; Kalaki County has 6 sub-counties. Table 2 summarizes the administrative structure of the District.

Table 2 Administrative entities

Administrative Level	Number
Counties	2
Sub-counties	11
Town Council	1
Parishes	39
Wards	3
Villages	373
Cells	8

Source: Administration Management Information System

The district has the following key offices supported by District Secretaries and Heads of Departments:

The District Council is headed by the District Council Speaker. The District Council is the overall policy and decision making authority in the District. At the lower local government level, this is replicated by the Sub-county or Town Council, also headed by a Council Speaker.

The District Chairperson is the political head of the District. The office is supported by Secretaries who constitute the District Executive Committee. The Sub-county/Town Council level replicates this scheme.

The Office of the Resident District Commissioner is the representative of His Excellency the President and the Central Government in the district.

The Chief Administrative Officer (CAO) is the Chief Executive at the district level. The CAO is supported by Heads of Departments and Assistant CAOs who head and coordinate government business at County level. At sub-county level, the heads are the Senior Administrative Secretaries who head and coordinate government business. At the lowest administrative unit, the parish, Parish Chiefs lead and coordinate.

Demographics

Population size, gender composition and distribution by sub-county:

Kaberamaido District had a projected total population of 188,961 for 2011 of which 88,856 (49%) were males and 92,432 (51%) were females, up from 131,650 people in 2002. Table 3 presents the distribution of the projected 2011 District Population by sub-county and gender.

Table 3 Projected district population by gender for the year 2011

County	Sub-county	2002	Projected Population 2011			% of Dist.
		Total Pop.	Male	Female	Total	Pop.
Kaberamaido	Alwa	15,515	10,735	11,105	21,840	11.6
	Aperikira	7,791	5,425	5,582	11,007	5.8
	Kaberamaido	11,617	8,088	8,267	16,355	8.7
	Kobulubulu	11,474	8,139	8,016	16,155	8.6
	Ochero	14,343	10,072	10,121	20,193	10.7
	Kaberamaido TC	2,349	1,671	1,637	3,308	1.8
County Total		63,089	44,130	44,728	88,858	47.1
Kalaki	Anyara	14,685	10,359	11,076	21,435	11.3
	Bululu	12,018	8,644	8,898	17,542	9.3
	Kakure	7,894	5,565	5,957	11,522	6.1
	Kalaki	9,951	7,104	7,451	14,555	7.7
	Apapai	7,493	6,281	6,043	12,324	5.6
	Otuboi	16,520	11,188	11,537	22,725	12.8
County Total		68,561	49,142	50,962	100,104	52.9

County	Sub-county	2002	Projected Population 2011			% of Dist.
		Total Pop.	Male	Female	Total	Pop.
District Total	Total	263,300	93272	95,690	188,962	

Source: 2002 Uganda PHC Analytical Report, Kaberamaido District.

Females have a higher proportion of the population than males. Kalaki County has the highest population in the District and at the third Local Government level, Otuboi, Alwa and Anyara Sub-counties lead the District with a contribution of 12.8%, 11.6% and 11.3% in their respective order.

Functional age groups

The 2002 Uganda Uganda Population and Housing Census (UPHC) revealed that the District had mainly a young population with 58% below 18 years of age. Table 4 summarizes some age group statistics derived from the census.

Table 4 Population age statistics

Age Group Category	Age Group (years)	Percentage
Infant population	(< 1)	4.8
Population for immunization	(0-4)	21.6
Primary school age population	(6-12)	21.6
Child population	(0-17)	57.5
Female reproductive age pop.	(15-49)	20.5
Productive population	(15-64)	44.7
Aged population	(60+)	5.9

Table 5 characterizes the religiosity of the District.

Table 5 Population by religious denomination

Denomination	Population	Percentage
Catholic	87,308	48.16%
Anglican	64,392	35.75%
Pentecostal	21,594	11.8%
Seventh Day Adventist	2,121	1.17%
Other	3,590	1.98%
Moslem	1,323	0.73%
None	725	0.40%
Not Stated	18	0.01%

Note: Population statistics derived by extrapolation from the 2002 UPHC.

Population growth rate

In the period 1980-1991, high out-migration from Kaberamaido District due to civil strife prevalent in the Teso region resulted in a population growth rate of -0.9%. However, with the return of peace in the 1990s, the former out-migrants returned to resettle in the district leading to a steep rise in the growth rate to 4.1% in 2001.

Population density and geographical distribution

The District has a population density of 145 persons per km2 (Source: DPU MIS; 2011). The 2002 UPHC results indicate that the majority of the district population was resident in rural areas with only 1.8% being urban. Kaberamaido Town Council had the highest population density with 125 - 254 persons per km2 followed by Anyara and Otuboi Sub-counties both having 107 - 124 persons per km2. The high population density in Kaberamaido Town Council is largely a result of urban pull and rural push factors.

Household population

According to the UPHC (2002), Kaberamaido District had a total of 25,994 households. The average number of persons per household in the district was 5.0, higher compared to the national average of 4.7. The average number of persons per household in the rural areas of the District was 5.1 compared to 4.5 in the urban area (Kaberamaido Town Council). In 2011 the total number of households in the District was estimated to be 29,338 (DPU Population and Housing Projections 2011).

Ethnicity

The 2002 UPHC shows two main ethnic tribes, Kumam and Iteso, in Kaberamaido District. They speak respectively the Kuman and Ateso languages and are of the Nilo-Hamitic group. The Kumam are in the majority, totaling 141,131 (74.7%); followed by Iteso at 37,296 people (20.5%) and Langi at 6,613 people (3.5%). The other tribal groups found in the District constitute less than 1% of the District population. They include the Acholi, Bagwere, Bakenyi, Baruli, Mening, Basoga, Baganda and Alur.

The economy

The main economic activities are agriculture and capture fisheries. There are also small and medium scale enterprises, bodaboda riding and other petty trades.

Poverty

The proportion of the population of the district living below the poverty line was 58.9% in 2011 (UBOS District Population Profile 2011).

Environmental degradation

Deforestation, mining, waste disposal and pollution, and unsustainable soil, wetlands and river banks exploitation are among the contributors to environmental degradation. Urban areas in particular produce unmanaged waste. Environmental pollution is quite low because of very low industrialisation and motor vehicle traffic.

HAZARDS

Table 6 Summary of hazards in Kaberamaido district

Sub-County	Flood	Crop and animal disease	Pest infestation	Land conflict	Hailstorms/ lightning	Environmental degradation	Drought famine	Vermin	Total
Alwa	✓	✓	✓	✓	✓	✓			6
Anyara	✓	✓	✓	✓	✓	✓		✓	7
Aperikira	✓	✓	✓	✓	✓				5
Otuboi	✓	✓	✓	✓	✓				5
Bululu	✓	✓	✓	✓	✓	✓	✓		7
Ochero	✓	✓	✓	✓	✓	✓	✓	✓	8
Apapai	✓	✓	✓	✓	✓		✓		6
Kobulubulu	✓	✓	✓	✓	✓		✓	✓	7
Kakure	✓	✓	✓	✓	✓				5
Kaberamaido	✓	✓	✓	✓	✓		✓	✓	7
Kalaki	✓	✓	✓	✓	✓	✓	✓	✓	8
TOTAL	11	11	11	11	11	5	6	5	71

Table 7 discusses the nature of the hazards experienced by communities in Kaberamaido District and links each hazard to a risk map which shows the extent of the hazard on a base map with respect to geographic features and infrastructure. It ranks the hazards by decreasing risk, as perceived by the communities.

Table 7 Hazards

Hazard	Status	Sub-County	Rank
Floods See Figure 1	Most of the sub-counties in the district lie along lake Kyoga; Ochero, Bululu, Kobulublu, Aperkira and part of Kalaki and the district is regarded as a well-watered peninsula. The worst floods occurred in 2007 affecting all the 11 sub-counties and town council. The worst hit sub-county was Alwa houses flooded, people were displaced, crops rotted and houses collapsed.	District wide especially in the sub-counties engulfed by wetlands (major wetlands are located at: Kakure (Olyanai), Kalaki (Ameru swamp), Aperkira (Omabor swamp), Apapai (Omunyal swamp) amongst others.	1
Hail storm and lightning See Figure 2	Incidences of hail storms and lighting reported in the district. A farmer was struck dead while ploughing using oxen with his wife in 2012 at Oryamo parish, Awimon village in Alwa Sub-county. Two women were also struck near the communication boosters in Town Council but survived.	District wide but recently in Alwa Sub-county	2
Crop and Animal Disease See Figure 3 Reference source not found.	Banana bacterial wilt occurred in 2004, Cercospora fruit and citrus leaf spots started in 2010 and continue to date. Foot and Mouth Disease outbreaks occurred in 2010/2011 causing food insecurity, loss of household incomes and decline in livelihoods	District wide but recently in Alwa Sub-county	3
Pest Infestation See Figure 4	The sweet potato horny worm infestation in 2009 and devastated the crop; Cassava Brown streak Disease reduced cassava production in 2005/2006 but has now rebounded with the introduction of resistant varieties such as MM96/4271(NASE 14); Striga infestation on cereals caused severe yield reductions where crop rotation is not practiced; the fruit fly continued to be a problem on citrus and mangoes in 2011/2012, the bean fly devastated bean production in the district for three years and production just improved from 2012	District wide but recently in Alwa Sub-county	4
Land conflict See Figure 5	Incidences reported at household levels and between institutions.	Land conflicts are widespread in all sub-counties sometimes resulting in killings and revenge.	5

Hazard	Status	Sub-County	Rank
Drought and Food insecurity See Figure 6	Severe drought and food insecurity occurred in 2011/2012	Ochero, Kobulubulu, Apapai, Kaberamaido, Kalaki and Bululu Sub-counties	6
Environmental Degradation See Figure 7 Reference source not found.	Instances of charcoal burning, wetland degradation, brick making, sand mining, stone quarrying reported in the district	Severe degradation due to deforestation in Ochero, Alwa Bululu, Kalaki	7
Vermin See Figure 8	Instances reported in the district especially in the villages of Lwala Kaga, Amotot and Okile	Anyara Ochero Kobulubulu Kaberamaido and Kalaki Sub-county	8

RISKS

Table 8 shows the communities' perception of the magnitude of risk of each hazard in their respective sub-county. Empty cells indicate that the hazard has not been reported in that
sub-county.

Table 8 Hazard risk assessment

Hazard	Alwa	Anyara	Aperikira	Otuboi	Bululu	Ochero	Apapai	Kobulubulu	Kakure	Kaberamaido	Kalaki
Floods	H	M	M	M	M	M	M	M	M	M	M
Drought					H	H	M	H		M	H
Crop and animal disease	M	M	M	M	M	M	M	H	M	M	M
Pest infestations	H	M	M	M	M	M	M	H	M	M	M
Vermin		H				H		H		M	M
Hailstorms, heavy rains, lightning	H	H	H	H	H	L	H	M	H	H	H
Land conflicts	H	M	M	M	M	H	M	H	M	M	M
Environmental degradation	M	L			H	H				M	H

Key: High = H, Medium = M, Low = L, Not reported = Blank

Floods

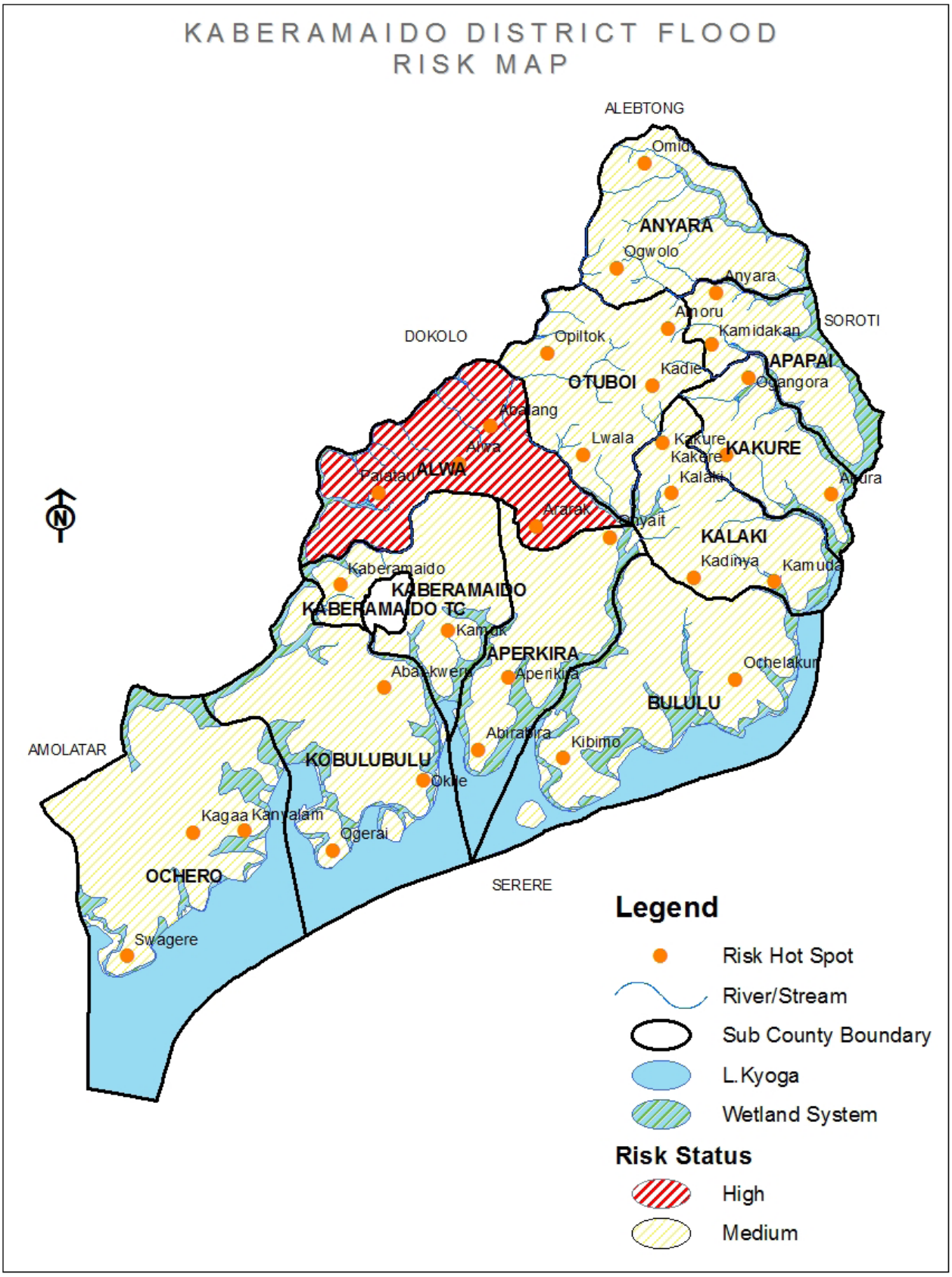

Figure 1 Flood risk map

Over the years, the district has suffered from severe flooding. In the second halves of 2008 and 2010 floods devastated crops and social infrastructure. Heavy rains in the second season of 2011 were again unfavourable to agriculture.

Floods are highest in Alwa Sub-County with severe risk hot spots recorded in Abalanga, Palatau and Alwa parishes. The Lake Kyoga shore sub-counties Ochero, Bululu, Kobulublu, Aperkira and part of Kalaki also experience moderate flooding. Risk hot spots are reported in Kagaa, Kanyalam and Swagere parishes (Ochero Sub-County), and Abakawaru, Okile, and Ogerai in Kobubulu Sub-County. Kebimo and Ochelakum are risk spots in Bululu Sub-County, and Kamuk and Kaberamaido parishes in Kaberamaido Sub-County. In Otuboi Sub-County, risk hot spots are reported in Opilitok, Kadie, Amoru and Lwala parishes while Amid and Ogwolo risk hot spots are reported in Anyara Sub-County. Other risk hot spots are Abirabira and Aperikira parishes in Aperikira Sub-County.

Hailstorms and lightning

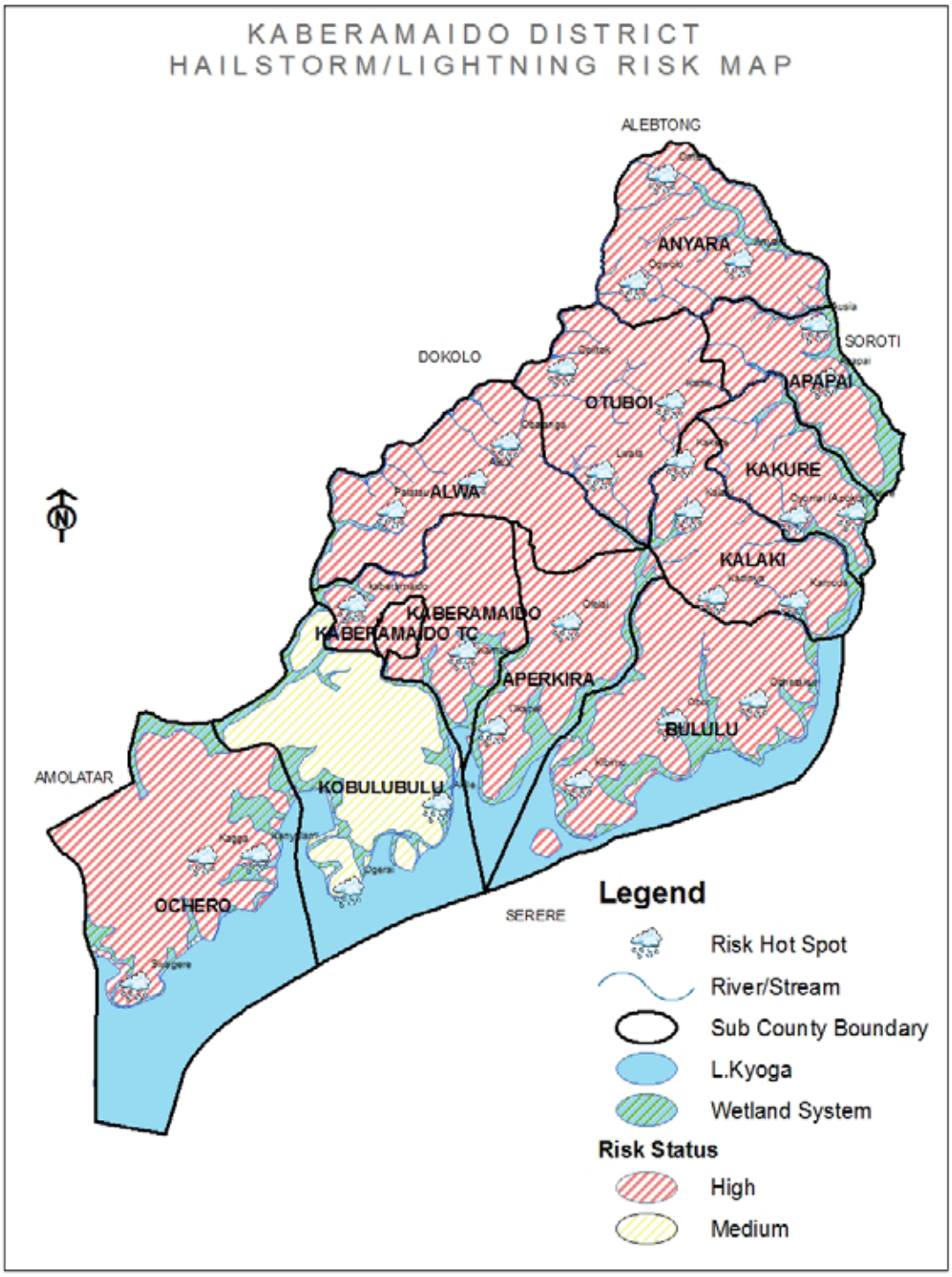

Figure 2 Hailstorm and lightning risk map

Hailstorms and lightning are common in the wet seasons, occurring throughout the district with a high level of risk, except in Kobulubulu where the risk is reported medium. Risk hot spots are reported in Kagga, Swagere and Kanyalam in Ochero Sub-County, Kibimo, Obur (Bululu Sub-County), Olalai and Okapel (Aperikira Sub-County), Obalanga, Palatau and Alwa (Alwa Sub-County), Lwala, Opiltok and Kadie (Otuboi Sub-County), Ogwolo, Omito and Anyara (Anyara Sub-County), Ausia and Arapai (Arapai Sub-County), Oyoma and Akure (Kakure Sub-County).

Crop and animal disease

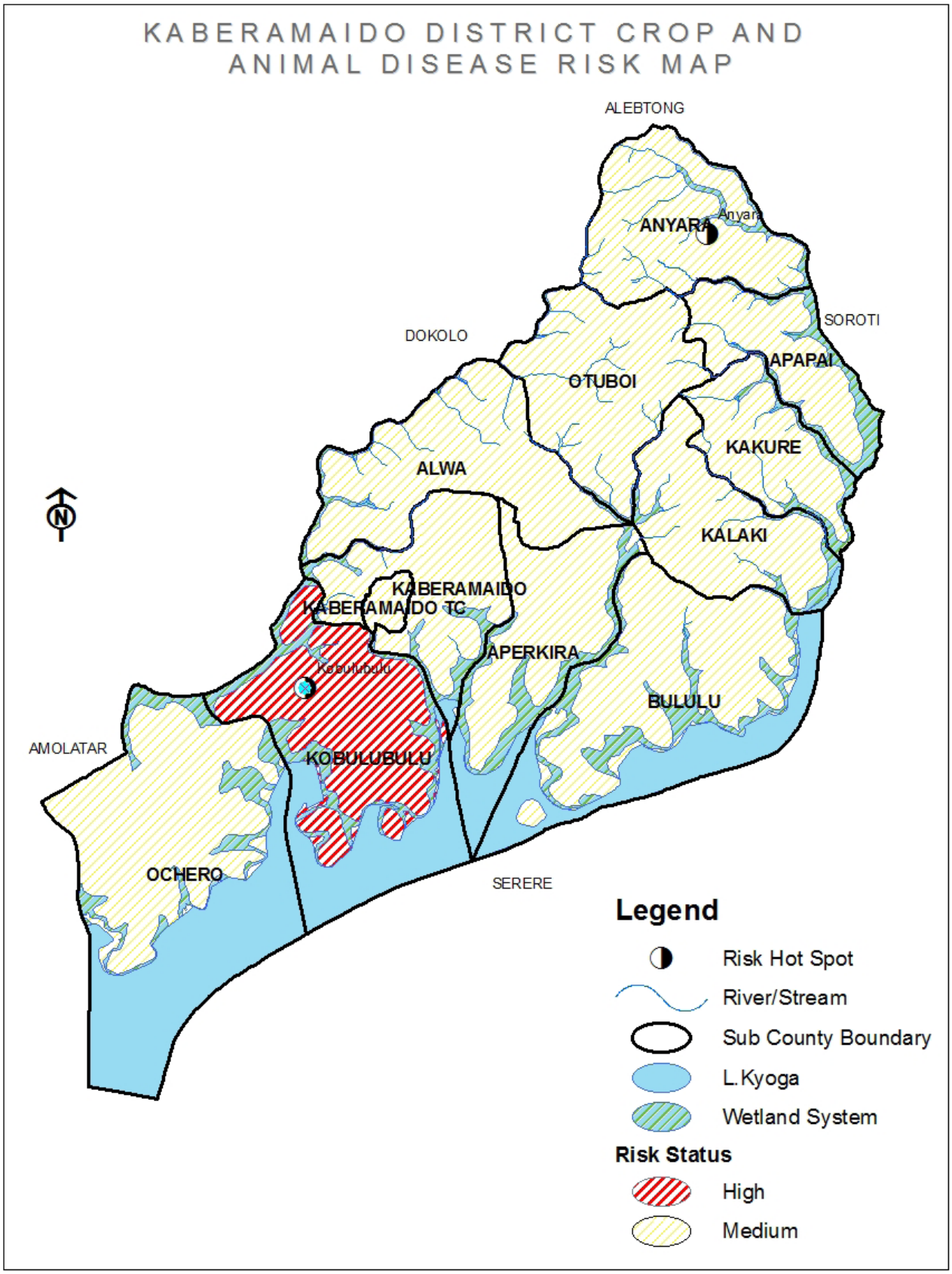

Figure 3 Crop and animal disease risk map

In general the livestock disease situation in the district has improved over the years but Nagana and foot and mouth disease are still commonly reported. For instance, in a 2011 outbreak of foot and mouth disease in Ochero Sub-County 500 heads of cattle were estimated to be infected. Rabies cases have been on the rise also; 700 dogs were vaccinated in 2011.

However, the most common livestock diseases are vector borne in nature, and include East Coast Fever, Anaplasmosis, Babesiosis, Heart water and Nagana (Animal Trypanosomosis). The common viral diseases include lumpy skin disease, foot and mouth disease and foot rot. Bacterial diseases include black quarter and CBPP.

Kobulubulu Sub-County rates high in crop and animal disease risk risks; the rest of the sub-counties have medium risk. Recent foot-and-mouth outbreaks reported in Anyara have reduced household incomes. Risk hot spot for crop and animal disease are reported in Anyara Sub-County, Anyara parish in the villages of Ojama and Angoltok.

Pest infestation

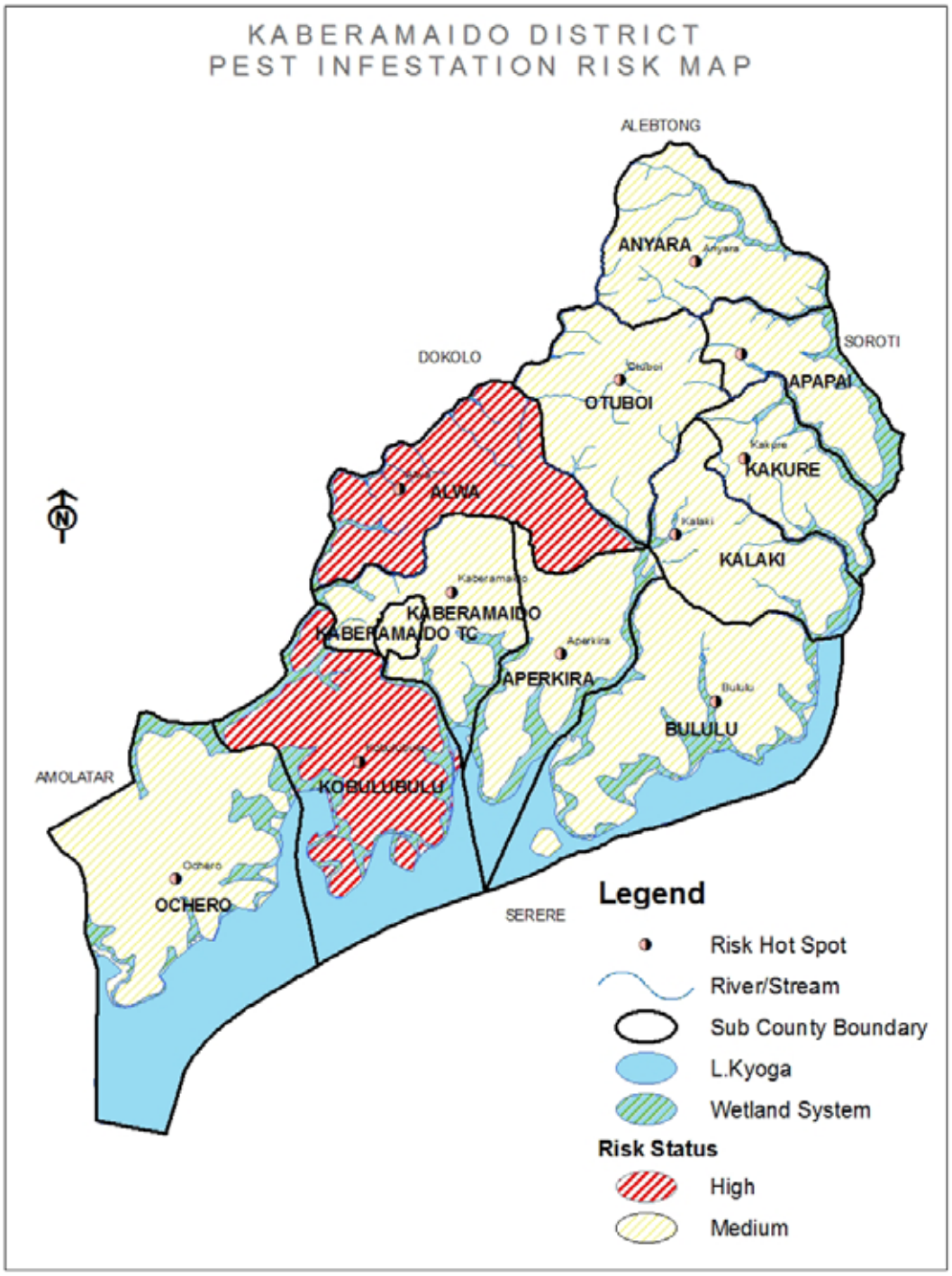

Figure 4 Pest infestation risk map

The common parasites and pests reported in the district include helminths, ecto parasites (Mange), ticks and biting flies. Goats and sheep suffer from worm infestation, heart water, orf, ticks and ecto parasites. Dogs and cats mainly suffer from rabies. Pigs suffer African swine fever, pediculosis and malnutrition. Newcastle disease, fowl typhoid, and fowl cholera and black head commonly attack poultry. Others are fowl pox, coccidiosis and poultry mites.

Risk levels for pest infestations are high in Kobulubolu and Alwa sub-counties, and medium elsewhere in the district.

Land conflict risk

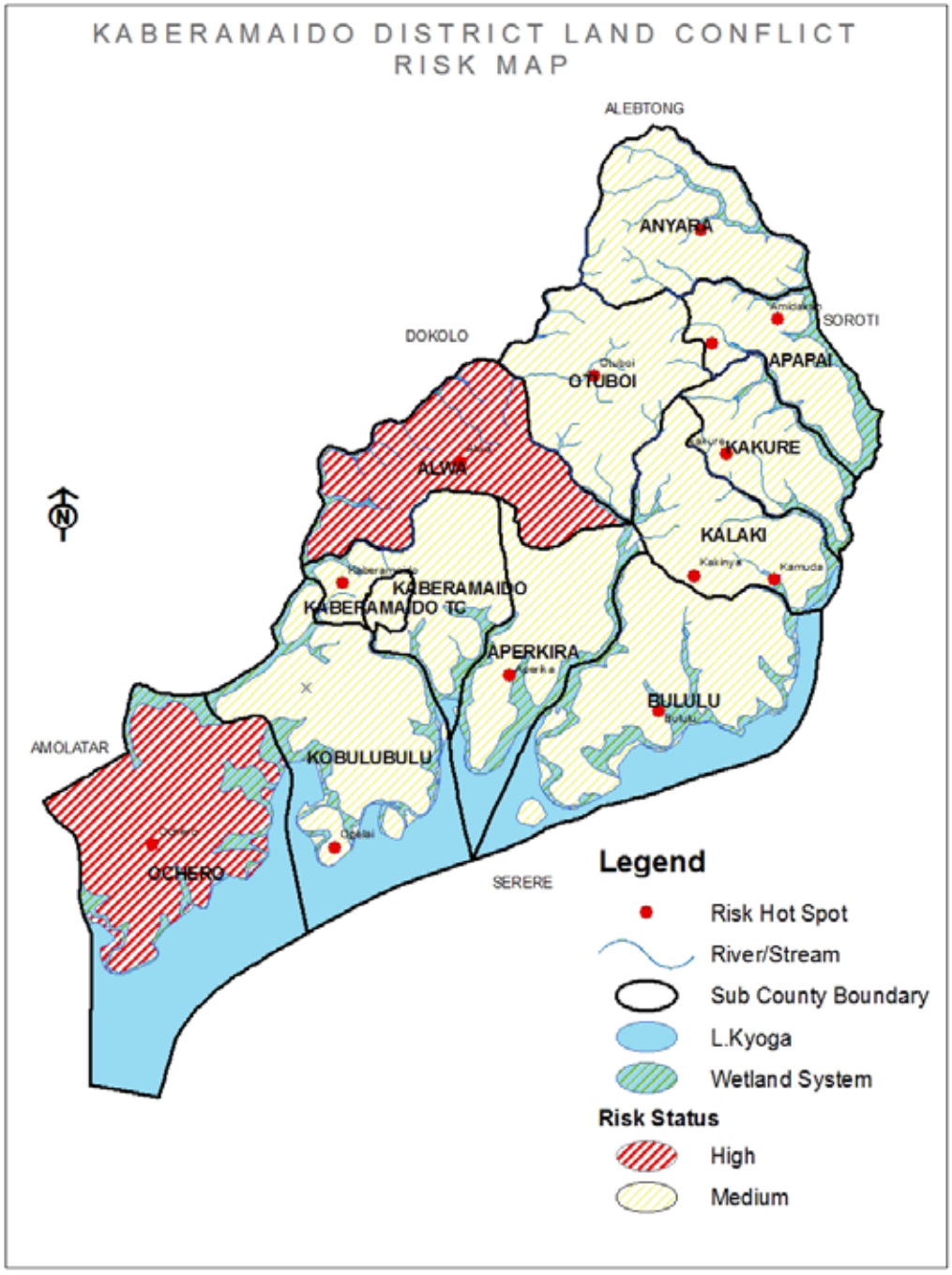

Figure 5 Land conflicts risk map

Land conflicts are distributed throughout the district, arising from increasing land fragmentation due to rapid population growth. The gender-based patrilineal system of property ownership and inheritance also intensifies the land conflicts in terms of ownership rights and allocation of resources.

High risk levels are reported in Ochero and Alwa sub-counties. Reported risk hot spots are in Ochero parish (Ochero Sub-County), Alwa in Alwa Sub-County, Kakinya and Kamuda sub-counties in Kalaki Sub-County and Amidakan in Arapai Sub-County.

Drought and food insecurity

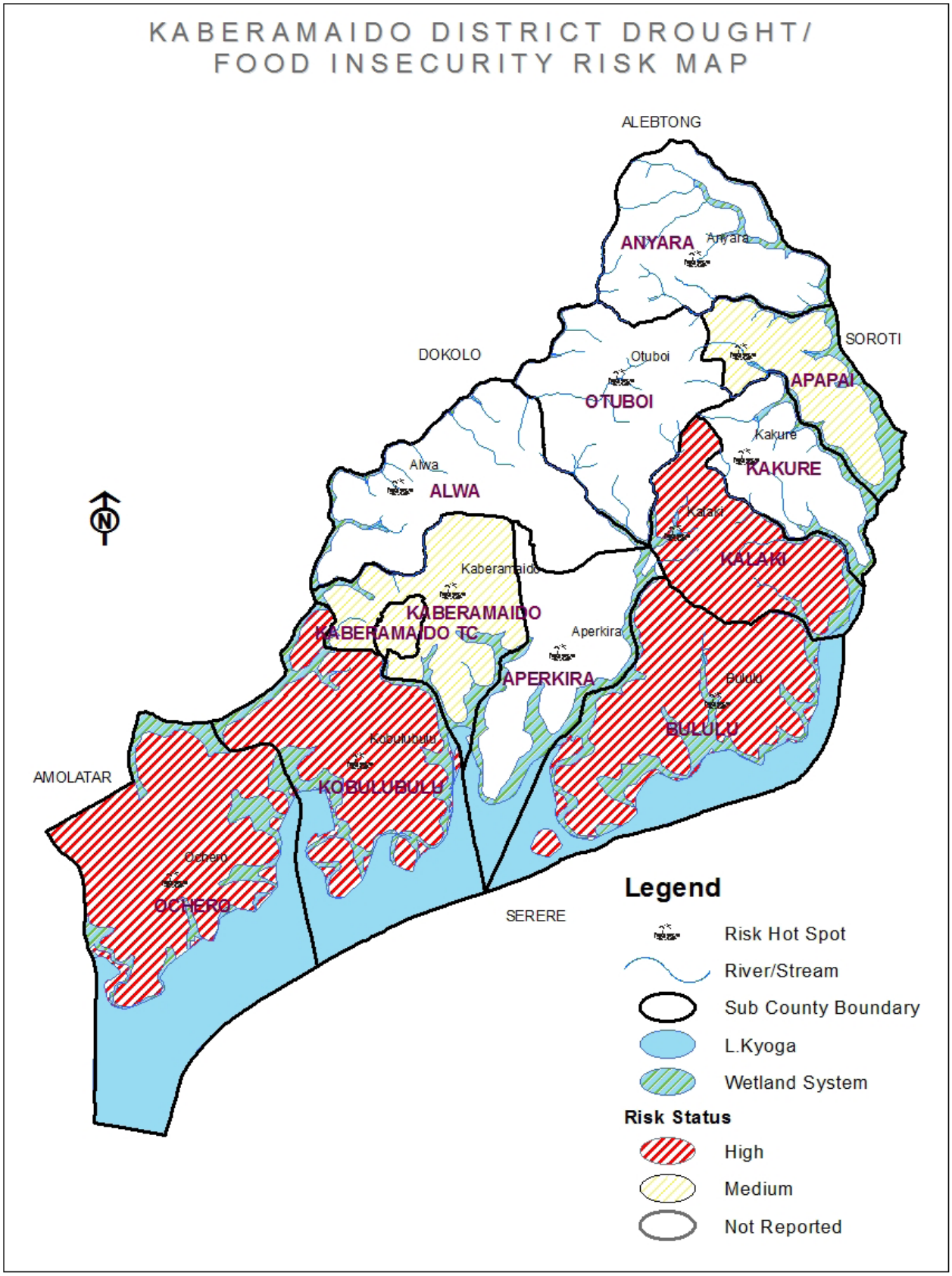

Figure 6 Drought risk map

Droughts commonly follow the two wet seasons: a short dry spell running from mid-June – mid July and the main long dry season which normally sets in during late November and runs through December, January and February to sometimes early March. However, early onset of dry seasons is a common occurrence along the lakeshore sub-counties, which sometimes experience very sharp spells of drought. December and January are usually the driest months of the district. However, recently rainfall has become unreliable and unpredictable, affecting agricultural activities including cultivation and livestock rearing. For instance, in 2009 and 2011, scanty rains in the first seasons resulted in poor harvests leaving households in a fragile food security situation.

The risk for suffering food insecurity as a result of drought is high in Ochero, Kobulubulu, Bululu and Kalaki sub-counties and medium in Kabermaido and Apapai sub-counties.

Environmental degradation risk

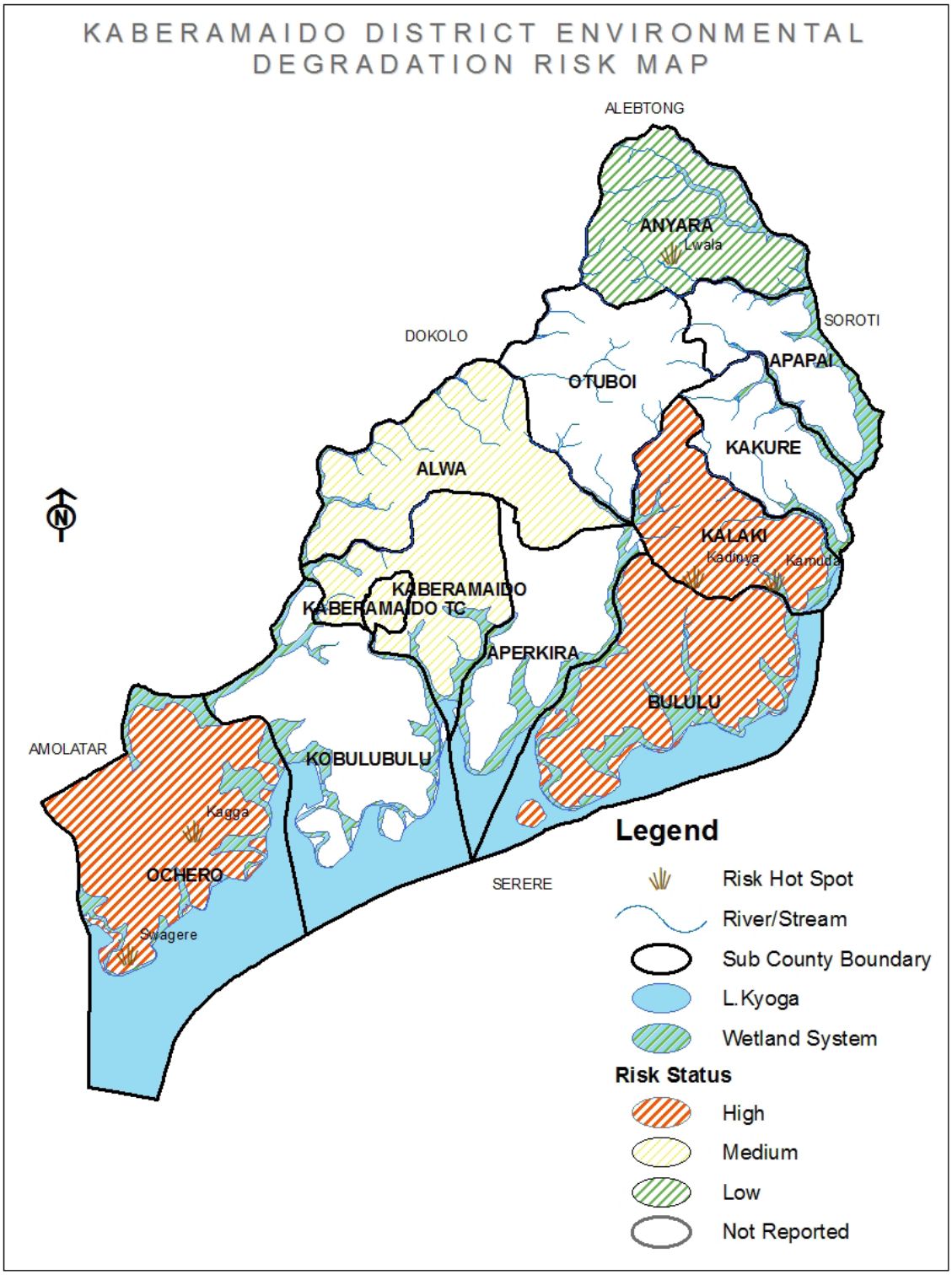

Figure 7 Environmental degradation risk map

The environment suffers in Ochero, Alwa, Bululu and Kalaki sub-counties from deforestation and wetland degradation. Risk hot spots are reported in Kagaa Parish, Ochero Sub-County, Kadinya and Kamuda in Kalaki Sub-County. Low incidence is reported in Anyara Sub-County with Lwala Parish recording a risk hot spot.

Vermin risk

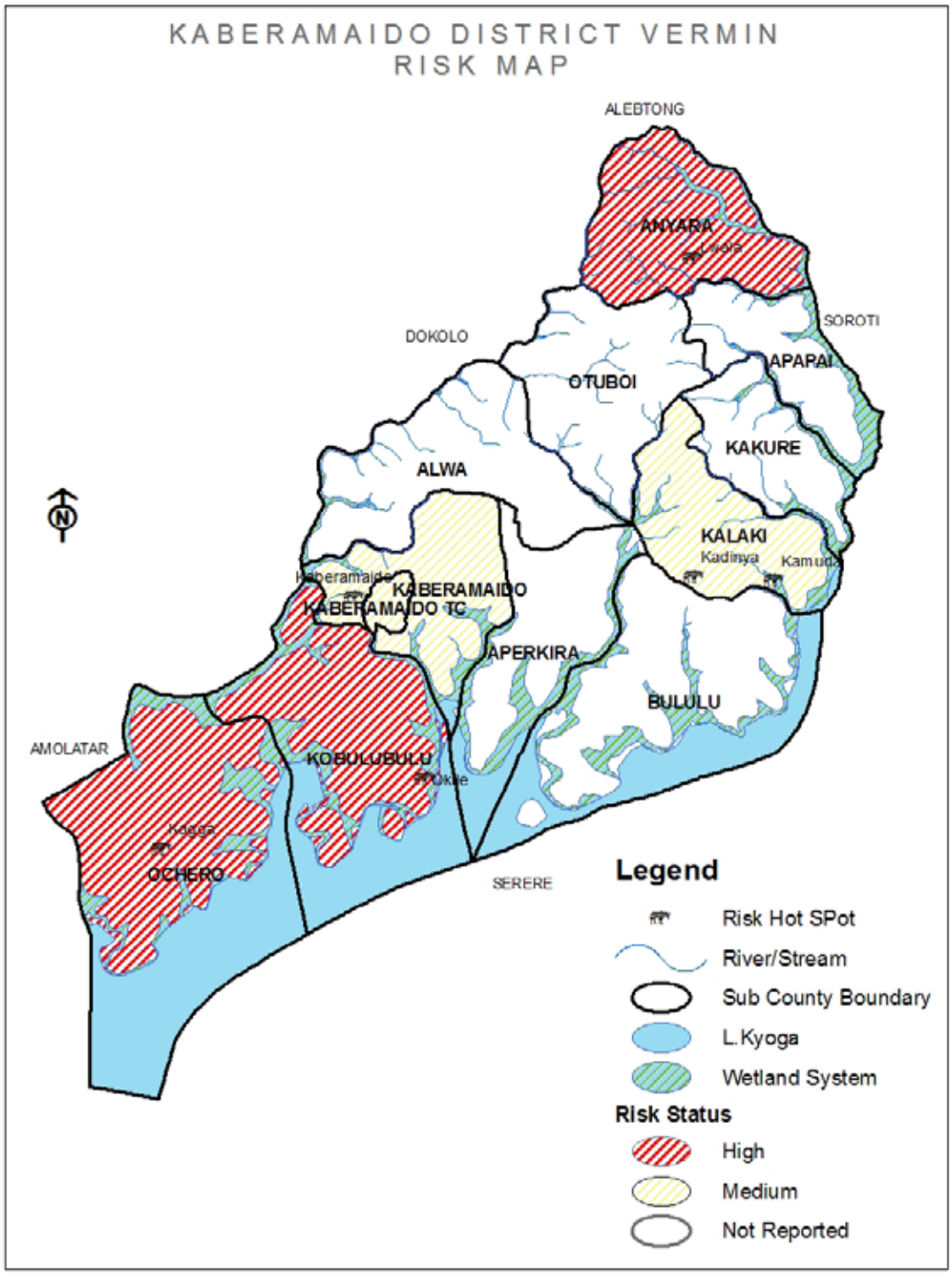

Figure 8 Vermin risk map

Vermin incidence is reported in the district, especially in the sub-counties of Anyara, Ochero, Kobulubulu where cases are high. Risk hot spots are cited in Kagaa in Ochero Sub-County, Okile parishes in Kobulubulu Sub-County and Iwala Parish in Anyara Sub-County. Vermin are reported with moderate risk in Kaberamaido and Kalaki (Kadinya and Kamuda parishes). Bird damage to crops is especially high in sub-counties along the lakeshore. The rest of the sub-counties in the district did not report cases of vermin.

VULNERABILITY

Table 8 Risk vulnerability

Hazard	Alwa	Anyara	Aperikira	Otuboi	Bululu	Ochero	Apapai	Kobulubulu	Kakure	Kaberamaido	Kalaki
Floods	3	2	2	2	2	2	2	2	2	2	2
Drought					3	3	2	3		2	3
Crop and animal disease	2	2	2	2	2	2	2	3	2	2	2
Pest infestations	3	2	2	2	2	2	2	3	2	2	2
Vermin		3				3		3		2	2
Hailstorms, heavy rains, lightning	3	3	3	3	3	1	3	2	3	3	3
Land conflicts	3	2	2	2	2	3	2	3	2	2	2
Environmental degradation	2	1			3	3				2	3
Score: High = 3, Medium = 2, Low = 1, Not reported = Blank											

Vulnerability map

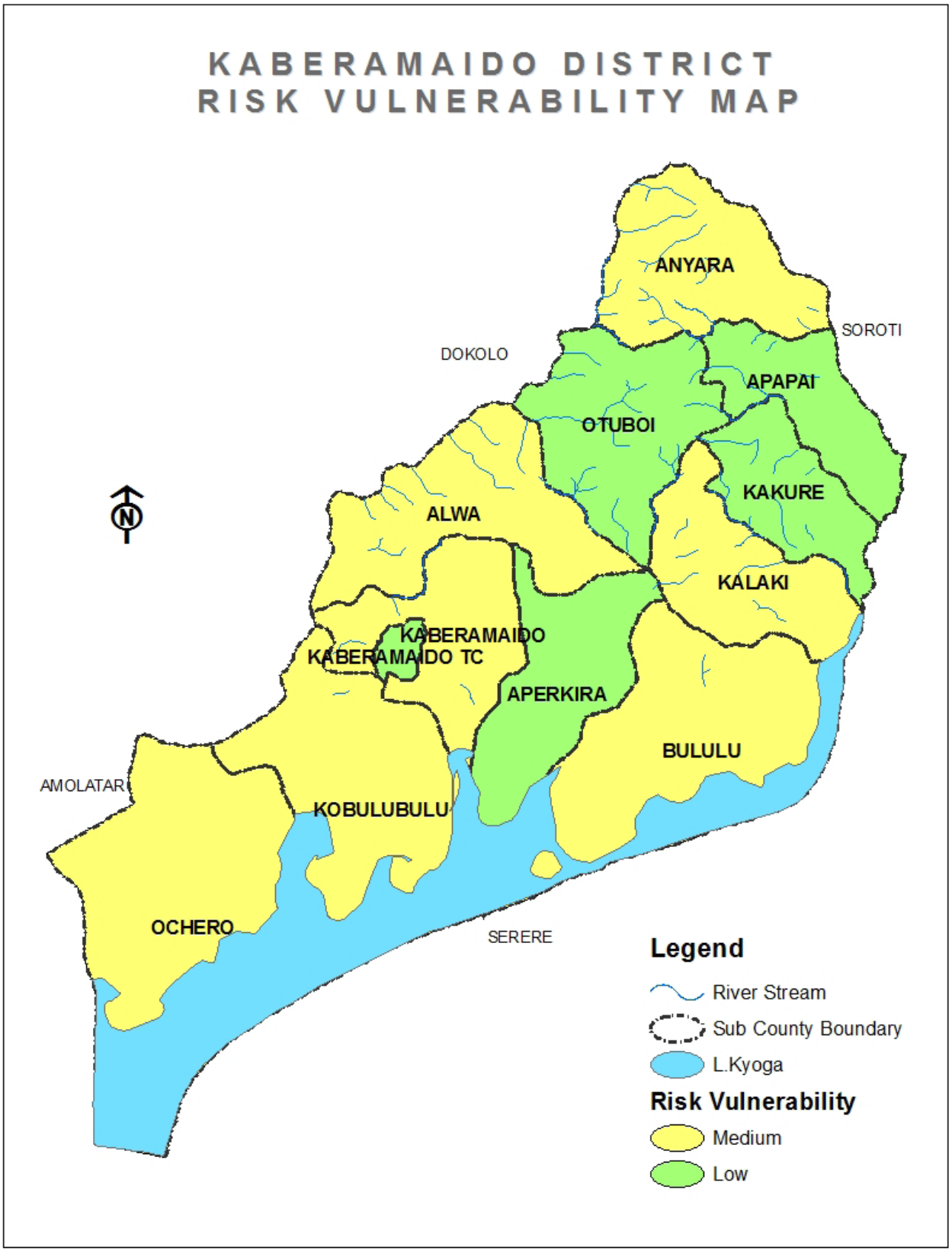

Figure 9 Risk vulnerability map

Based on the frequency of hazard events and the magnitude of loss suffered, Ochero, Kobulubulu, Bululu, Kalaiki, Kaberamaido Town Council, Kaberamaindo Sub-County, Alwa and Anyara

sub-counties are assessed at medium risk and vulnerability levels. Otuboi, Kakure, Kaberamaido Town Council, Aperikira and Arapai sub-counties have the lowest vulvnerability levels in the district. Significant risks registered in the most vulnerable sub-counties are hailstorms, heavy rains, lightning, land conflicts, pest infestations, floods, crop and animal disease, drought, environmental degradation, vermin.

Significant sources of environmental degradation in the highly vulnerable sub-counties are charcoal burning, brick making, rice cultivation, sand mining, stone quarrying and wetland reclamation.

CONCLUSIONS

The multi-hazard vulnerability profile output of this mapping exercise combines spatial data and information captured during participatory consultation with communities in Kaberamaido District. The profile shows how communities in each sub-county perceive each hazard based on likelihood of occurrence and severity of impact on them.

Eight hazards are typical in Kaberamaido District, caused by natural and human-induced process. Clearly storms with hail and lightning are the most dangerous hazard for people in Kaberamaido district, perceived as consistently high risk across sub-counties. Flooding, land conflicts, extended drought, bush fires, and vermin are of medium to high risk in most sub-counties in the district.

Seven sub-counties stand out as highly vulnerable, because they are exposed to eight or more of the endemic hazards: Ochero, Kobulubulu, Bululu, Kalaki, kaberamaido, Alwa and Anyara.

The hazard mapping shows the importance of spatial information to characterize disaster risk in Kaberamaido District. The hazard, risk and vulnerability profile information should be reflected in district development planning and in the disaster mitigation plans developed by district local government to plan action to minimize hazard impacts.

DEFINITIONS OF TERMS

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

Food insecurity. Food Insecurity is the severe shortage of 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 epidemics. Animal epidemics include swine fever, foot and mouth disease, naganan, and bird flu. Crop disease epidemics include coffee wilt, banana bacterial wilt, 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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