THE REPUBLIC OF UGANDA

Ntoroko District

Hazard, Risk and Vulnerability Profile

2016

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Acronyms

DDMC	District Disaster Management Committee
DRM	Disaster Risk Management
GIS	Geographic Information System
GPS	Global Positioning System
NGO	Non Governmental Organization
OPM	Office of the Prime Minister
SC	Sub County
TC	Town Council
UNDP	United Nations Development Programme

Acknowledgement

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

I extend my sincere thanks to the Department of Relief, Disaster Preparedness and Management, under the leadership of the Commissioner, Mr. Martin Owor, for the oversight and management of the entire exercise.

The HRV assessment team was led by Ms. Ahimbisibwe Catherine, Senior Disaster Preparedness Officer supported by Ogwang Jimmy, Disaster Preparedness Officer and the team of consultants (GIS/DRR specialists); Dr. Bernard Barasa, and Mr. Nsiimire Peter, who provided technical support.

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

My appreciation also goes to Ntoroko District Team.

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

This Ntoroko District Hazard, Risk and Vulnerability Profile integrates scientific information provided by GoU agencies 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, history, gender demographics and livelihoods.

It identifies endemic hazards in ten classes, in order of high to low risk: flooding, drought, severe storms, landslides, crop and animal pests and diseases, pest infestation, animal attacks, internal conflicts, earthquake and crop raiding.

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.

Ntoroko District is located west of the Ruwenzori Mountains, at 01˚ 06'N, 30˚ 24'E, bordered by the Democratic Republic of the Congo to the west and north, Hoima district to the northeast, Kibaale district to the east, Kabarole district to the south and Bundibugyo district to the southwest.

Communities perceive that Ntoroko district is vulnerable to ten hazards, in order of high to low risk: flooding, drought, severe storms, landslides, crop and animal diseases, pest infestation, animal attacks on crops, animals and human beings, internal conflicts, earthquake and crop raiding.

Nombe, Bweramule and Butungama Sub-Counties are the most vulnerable in the district ranking medium at the vulnerability scale. Kanara, Rwebisengo TC, Kibuuku, Rwebisengo and Karugutu sub-counties with weighted vulnerabilities of 4 each have low vulnerability though are fast keeping pace at the vulnerability scale. The other sub-counties (Kanara TC and Karugutu TC) are the least vulnerable communities in the district.

Timely early warning systems especially on the Rwenzori Mountains, for floods and other DRR interventions would enhance the resilience of the people of Ntoroko to the effects of climate change.

This profile is therefore a compelling outcome of an integration of the spatial information obtained from the mapping exercise and the community perception of the hazards. It should henceforth inform the contingency as well as the district development planning process towards disaster proof plans.

Introduction

Ntoroko District is vulnerable to a number of hazards that often escalate to disasters. These hazards include environmental degradation, severe storms, flooding, landslides, animal pests and diseases, earthquake, and animal attacks on crops, livestock, and humans. While these hazards and their occurrences have been reported, there has not been an attempt to consolidate and map this information in order to analyse the district's exposure and susceptibility to disaster risks.

The Ntoroko District Local Government and the Department of Relief, Disaster Preparedness and Management in the Office of the Prime Minister (OPM), with the support of the United Nations Development Programme (UNDP), embarked on a process of mapping the different hazards and analyzing the disaster risks and vulnerability of Ntoroko district. The information contained in this District Hazard, Risk, and Vulnerability Profile will guide the adoption of disaster risk management (DRM) measures in the district and inform the development of the district's contingency development plans.

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 Ntoroko 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 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.

Overview of the District

Location

Ntoroko District is located west of the Rwenzori Mountains. The district is bordered by the Democratic Republic of the Congo to the west and north, Hoima District to the northeast, Kibaale District to the east, Kabarole District to the south and Bundibugyo District to the southwest. Ntoroko District headquarters are located approximately 75 km (47 mi) by road northeast of Bundibugyo, and approximately 320 km (190 mi) by road west of Kampala, the capital of Uganda. The coordinates of the district are: 01 06N, 30 24E.

History

Ntoroko District was created by Act of the Ugandan Parliament and became operational on 1 July 2010. Prior to that, the district was part of Bundibugyo District. The district is part of Rwenzururu sub-region and within the Rwenzururu Kingdom.

Population

In the census year 2002, the Rwenzururu sub-region had 750,000 inhabitants.

Table 1 Projected (2012) population of town councils and sub-counties

	Male	**Female**	**Total**
RwebisengoTC	6,200	6,700	12,900
KanaraTC	3,400	3,300	6,700
KarugutuTC	5,200	5,900	11,100
KibuukuTC	7,000	7,200	14,200
Butungama SC	6,600	6,900	13,500
Bwaramule SC	7,000	7,200	14,200
Kanara SC	3,300	3,500	6,800
Nombe SC	2,300	2,400	4,700
Total	**41,000**	43,100	84,100

Cultures

Table 2 Ntoroko District tribes and languages spoken, by town council and sub-county

	Tribe	Language
Karugutu SC	Bakonzo, Batooro, Banyarwanda, Bamba, Babwisi	Rukonzo, Rutooro, Rubwisi,and Kinyarwanda
Karugutu TC	Bakonzo, Batooro, Banyarwanda, Bamba, Babwisi	Rukonzo, Rutooro, Rubwisi,and Kinyarwanda
Nombe SC	Bakonzo, Batooro, Banyarwanda, Bamba, Babwisi	Rukonzo, Rutooro, Rubwisi,and Kinyarwanda
Bwaramule SC	Batuuku, Babiira,Bakonzo,	Rutuuku /Rutooro and Rukonzo
Rwebisengo SC	Batuuku	Rutuuku / Rutooro
Rwebisengo TC	Batuuku,	Rutuuku /Rutooro,
Butungama SC	Batuuku	Rutuuku /Rutooro,
Kibuuku TC	Batuuku, Bakonzo, Babwisi, Babiira, Bamba	Rutuuku /Rutooro, Rukonzo,Rubwisi
Kanara SC	Batuuku, Bamba, Babwisi, Batooro,Bakonzo	Rutooro /Rutuuku, Kiswahili, Rubwisi, Rukonzo
Kanara TC	Batuuku, Baganda, Balegha, Bagungu, Banyoro, Batooro Bangite, Babwisi, Bakonzo and Bamba	Kiswahili Rutooro / Rutuuku / Runyoro, Ruganda, Lulegha, Rugungu, Rukonzo and Rubwisi

Livelihoods

Table 3 Livelihoods

Agro-Ecological Zone	Livelihood	Sub-county
Crop farming and mountain zone	Cassava, coffee, banana, legume, maize, cocoa, Irish and sweet, potatoes, garlic, fruits, rice, barley, onion, poultry and goat farming	Nombe SC, Karugutu SC, Karugutu TC
	Commercial and agribusiness	Karugutu SC, Karugutu TC
	Charcoal burning/deforestation	Karugutu SC
	Stone quarrying, sand mining and brick making	Karugutu TC, Karugutu SC and Nombe SC
	Apiculture/bee keeping	Karugutu SC
Pastoral/animal farming zone	Cattle grazing, poultry and goat rearing	Rwebisengo SC, Rwebisengo TC, Kibuuku TC, Butungama SC, Bwaramule SC, Kanara SC, Nombe SC
	Cassava and pineapple growing	Bwaramule SC, Kanara SC
	Commercial agribusiness	Rwebisengo TC, Butungama SC, Kanara SC
Capture fisheries zone	Fishing on lake Albert and duck farming	Kanara SC, Kanara TC
	Commercial and agribusiness	Kanara SC, Kanara TC

Hazards

Table 4 Hazard Status

Hazard	Status	Place
Flooding	events reported	Nombe, Rwebusengo SC, Rwebusengo TC , Butungama, Kibuku, Kanara SC, Kanara TC, Bweramule
Drought	events reported	Nombe, Rwebusengo TC and SC, Butungama, KanaraSC and TC, Bweramule SC, Kibuku TC
Severe storms	strong winds and hail storm events reported	KarugutuTC and SC, Kanara TC and SC, Rwangara Parish, Nombe, Bweramule
Landslides	events reported	Karugutu, Nombe
Crop and animal diseases	incidence of cassava mosaic, banana bacteria wilt, mango root rot (during rainy season); foot and mouth disease and CBPP reported	Nombe, Karugutu TC and SC, Rwebisengo, Kibuku, Bweramule, Rwamabale, Butungama, Kanara
Pest infestation	incidence of grass hoppers, fruit flies, ticks and tsetse flies reported	Nombe, Rwebusengo TC and SC, Butungama, Kanara SC and TC , Bweramule SC, Kibuku TC
Animal attacks on crops, animals and human beings	instances of lions attacking cattle, warthogs destroying cassava and back bush/ monkeys destroying cassava and banana are reported	Rwebisengo, Nombe, Karugutu, Kanara TC and SC
Internal conflicts	inter-clan conflict reported in 2010	Butungama SC
Earthquake	potential destruction of buildings and earthquake-induced landslides	Karugutu TC, Rwebishengo TC, Kanara TC, Kibuku TC, Karugutu SC, Nombe
Crop raiding		Rwebisengo TC, Butungama SC

Table 4 displays the status and summarizes the nature of hazards in the district and provides the locations of instances. Table 5 provides another view of the relative significance of hazards. The right most column is ordered by the number of hazards endemic in each sub-county, and is a measure of compound vulnerability. The bottom row is ordered by the number of sub-counties that experience each hazard, giving an indication of its geographic prevalence. Table 6 ranks the hazards in their order of occurrence, frequency and magnitude. Their ranking reflects the perception of stakeholders of the relative severity of the corresponding impacts on them.

Table 5: Summary of hazards by sub-county

Sub-county	Floods	Crop pests and diseases	Drought	Animal pests and diseases	Earthquakes	Animal attacks	Hail storms	Internal conflicts	Landslides	Crop raiding	Total
Kanara	✓	✓	✓	✓	✓	✓	✓	✓			8
Nombe	✓	✓	✓	✓	✓	✓	✓		✓		8
Rwebisengo SC	✓	✓	✓	✓	✓	✓				✓	7
Kanara TC	✓	✓	✓	✓	✓	✓	✓				7
Karugutu SC	✓	✓		✓	✓	✓	✓		✓		7
Butungama	✓	✓	✓	✓				✓		✓	6
Bweramule	✓	✓	✓	✓			✓	✓			6
Rwebisengo TC											4
Kibuuku TC	✓	✓	✓		✓						4
Karugutu TC											3
Total	10	8	9	8	8	5	5	3	2	2	60

Table 6: Ranking of hazards

S/No.	Hazard	Frequency (Most Freq=3, Freq=2,Not Freq=1)	Area (No. of sub counties) affected >10=5, 8-10=4, 5-7=3, 2-4=2, <2=1	Magnitude (High=3, Medium=2, Low=1)	Total (Sum of Columns 3,4 &5)	Rank (Ascending order)
1	Floods/water logging	3	4	3	10	1
2	Animal Diseases / Pests(BQ, CBPP, F&MD)	3	3	3	9	2
3	Drought	3	3	3	9	2
4	Crop pests	2	3	2	7	4
6	Hail storm	2	3	2	7	4
7	Earth quakes	1	4	1	6	6
8	Crop raiding	2	2	1	5	7
9	Animal attacks	1	2	1	4	8
10	Internal conflicts	1	1	1	3	9
11	Land slides	1	1	1	3	9

Hazard Risk Assessment

Table 7 expresses the communities' assessment of severity and likelihood of risk in their respective sub-counties. Each of the columns in table 7 below translates into respective hazard risk maps in the following section. The colours red, yellow, and green showing the severity of the hazard risk in the table are also reflected in the corresponding maps.

Table 7: Hazard risk assessment

Sub-county	Floods	Crop pests and diseases	Prolonged Dry Spell	Animal pests and diseases	Earthquakes	Animal attacks	Hail storms	Internal Conflicts	Landslides	Crop raiding and animal attack
Kanara	L	L	H	M	N	L	H	N	N	N
Nombe	M	M	L	L	M	H	H	N	H	L
Rwebisengo SC	H	L	H	H	L	L	N	N	N	L
Kanara TC	L	N	H	L	L	L	H	N	N	N
Karugutu SC	L	H	N	M	L	L	M	N	L	N
Butungama	H	L	H	H	N	N	N	H	N	L
Bweramule	H	H	H	H	N	N	L	M	N	N
Rwebisengo TC	H	H	H	N	L	N	N	L	N	N
Kibuuku TC	M	M	H	L	L	N	N	N	N	M
Karugutu TC	N	L	N	L	L	M	H	N	N	L
Key: H = High, M = Medium, L = Low, N = Not reported										

A.

Risks

Flood

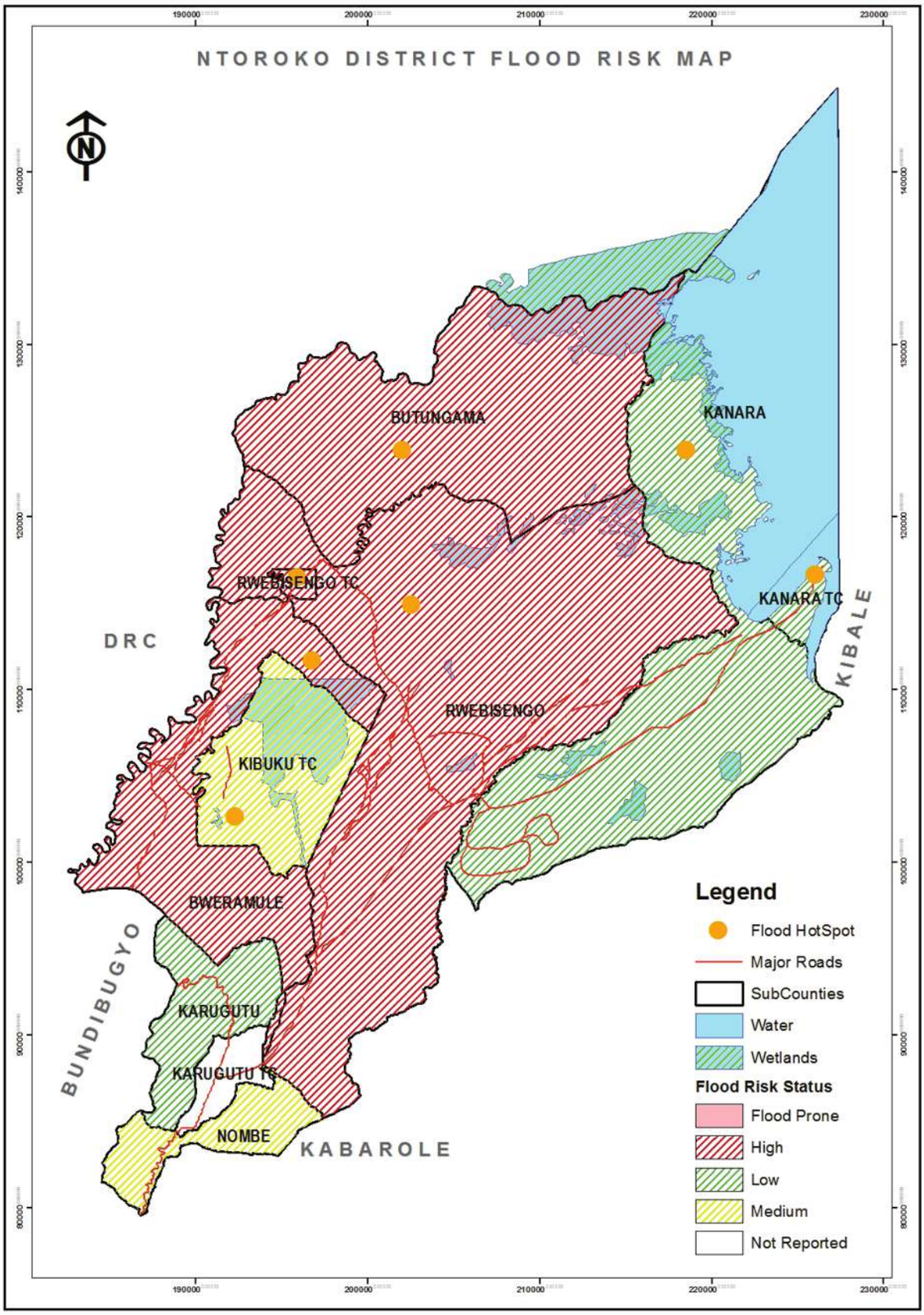

Figure 1: Flood Risk Map

Figure 1 above presents the flood risk status of Ntoroko District. Flooding in Ntoroko

District is mainly caused by River Semiliki and its tributary rivers which include R. Wasa, R. Itojo, R. Semuliki, R. Dorwa and several smaller streams such as Kithoma, Kamayatya, Nyangilika, Kanyamabale, Ngisia which overflow when they are full to capacity. Floods may be independent of rains in the district; with heavy rains in the Rwenzori Mountains, River Semiliki bursts its banks and the water enters the Ntoroko flood plains. This phenomenon is disastrous to the local communities when they suffer loss of their property, houses, crops, and animals. The floods are sometimes so severe that they even use canoes to move in the areas, which used to be their grazing land. The farmers are forced to take their animals to the Democratic Republic of Congo.

The communities prone to high risk of floods are those in Rwebisengo SC, Butungama SC, Bweramule SC and Rwebisengo TC; those Nombe SC, Kibuuku TC, are prone to moderate risk of flood while the communities in Kanara SC, Kanara TC, and Karugutu SC are prone to low risk of floods. Only communities of Karugutu TC are not prone to any risk of floods.

Floods in Kanyasi Ward, Kanara Ward and Twanigene Ward in Kanara Town Council and in Nyakasuyi village, and Masaka and Bwizibwera in Butungama Sub-county respectively led to cholera outbreaks.

Heavy Storms

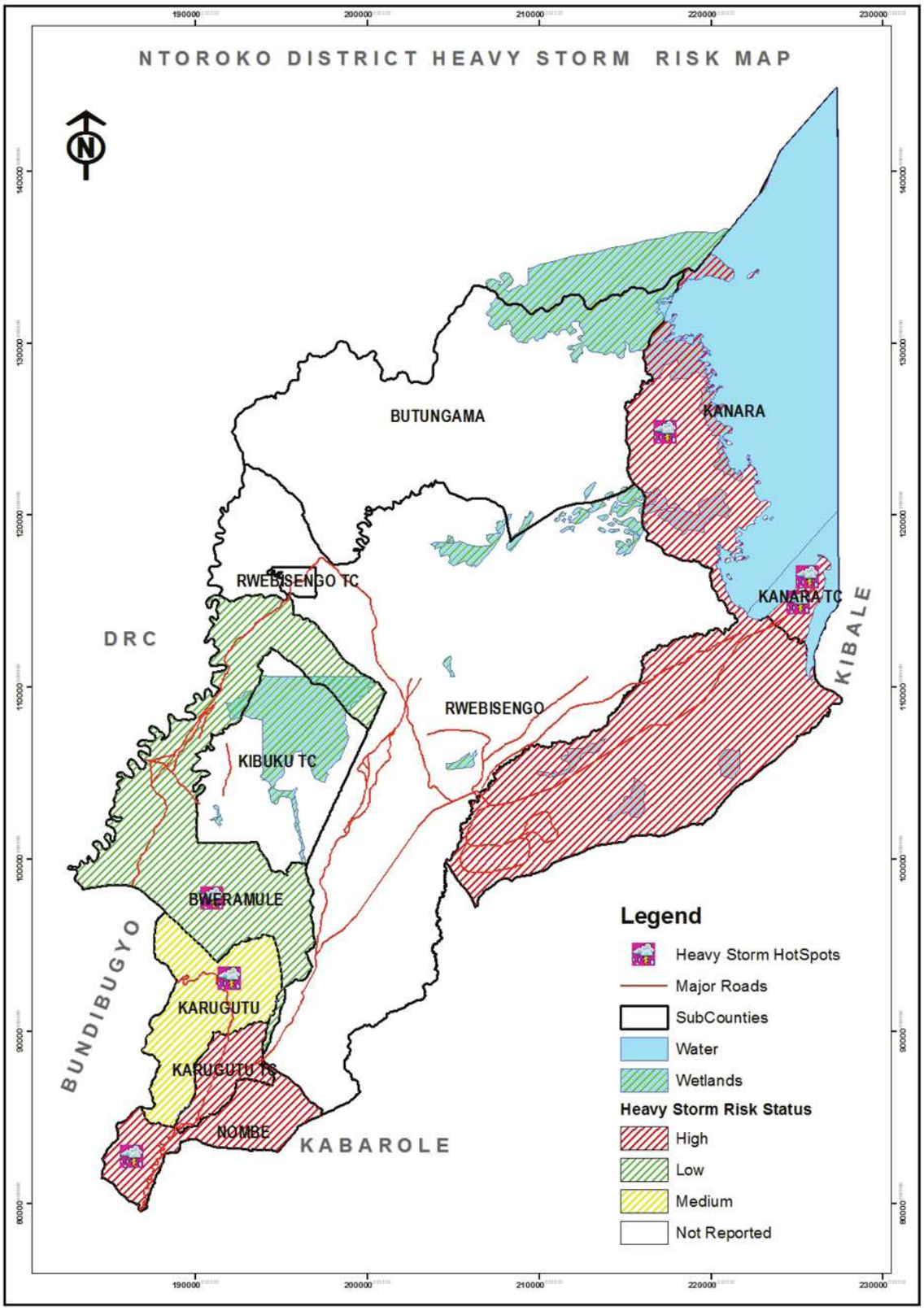

Figure 2: Heavy Storm Risk Map

Figure 2 above presents the risk status of heavy storms in Ntoroko District. These storms are comprised of hails stones, strong destructive winds, heavy torrential rains and lightning.

These are very destructive to property, crops and life.

Recently several buildings were de-roofed, including the Karugutu Health Center IV, St. Maria Stella Maris Catholic Church in Ntoroko west village, a Pentecostal church in Ntoroko north in Ntoroko Ward and several buildings of the surrounding communities. This was so devastating that His Excellency the President of the Republic of Uganda intervened by donating iron sheets for reconstruction of the affected communities.

In another event, the roof of the Karugutu Health Canter IV in Ibanda ward was blown off, two people died in May, 2013 on River Wasa in Kyabandara Parish and Wasa-Wanaba village due to strong winds. A large expanse of banana plantations was destroyed by hail in Karugutu, Kachwamba and Nyabuhuru Wards/Parishes.

The communities of Kanara SC, Kanara TC, Nombe SC and Karugutu TC are prone to high risk of heavy storms. Those in Karugutu SC are prone to moderate risk of heavy storms while those in Bweramule SC are prone to low risk of heavy storms. The rest of the sub-counties and town councils are not prone to heavy storms.

Landslides

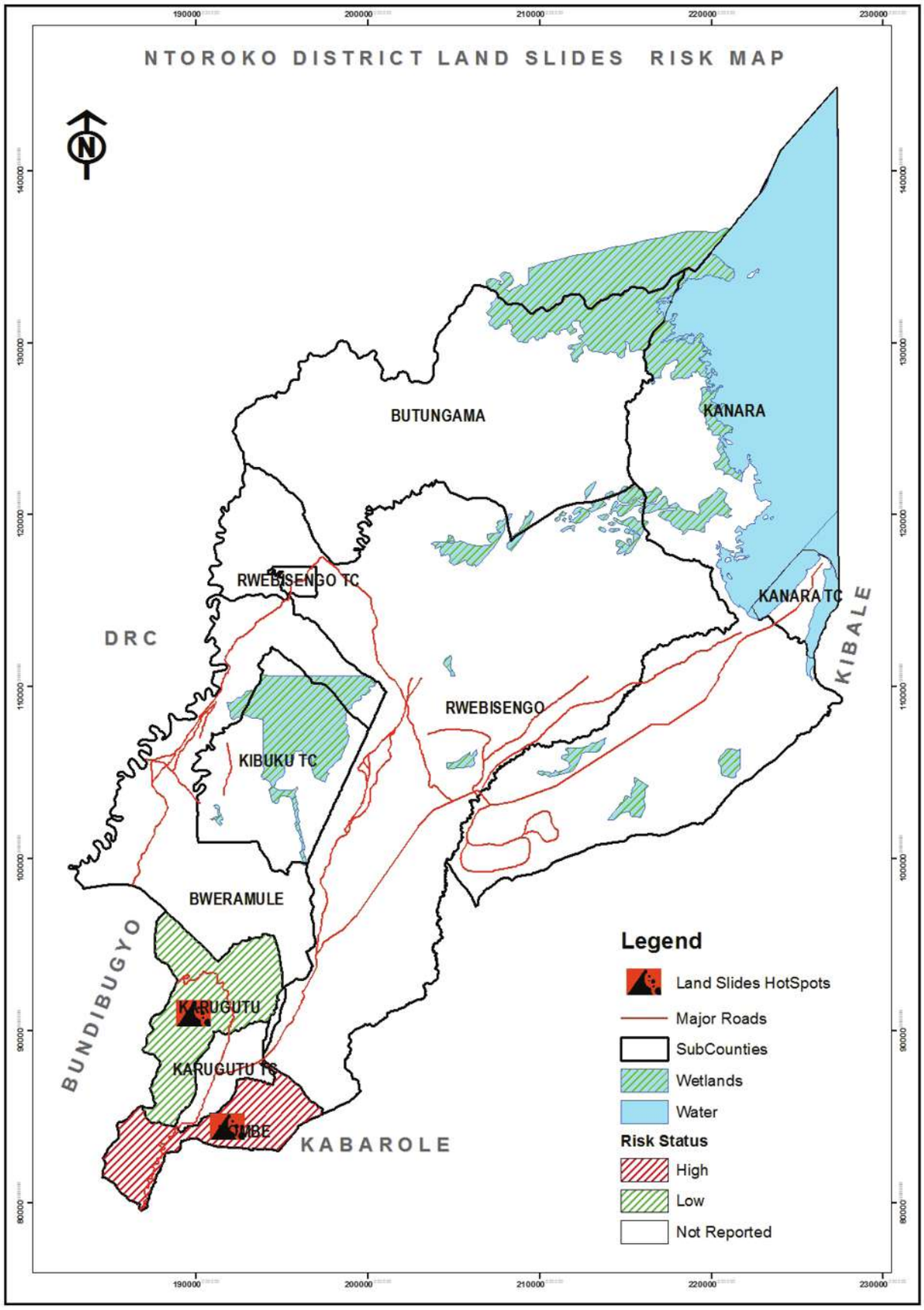

Figure 3: Landslide Risk Map

Figure 3 presents the risk status of landslides in Ntoroko District. The landslides occur mainly in the sub counties of Nombe and Karugutu, which are prone to high and low risks of

the hazard respectively. The rest of the sub counties and town councils of Ntoroko District are not prone to landslides. The most notable landslide events have been in the parishes of Musandama, Nyakatoke and Nombe, which led to destruction of bridges in Kyabandara parish and Musandama, along Wasa River.

The steeper slopes in Karugutu and Nombe sub-counties combined with seismic activity give the area a higher risk of landslides. A recent forest fire has caused deforestation which exacerbates the condition.

Crop Pests and Diseases

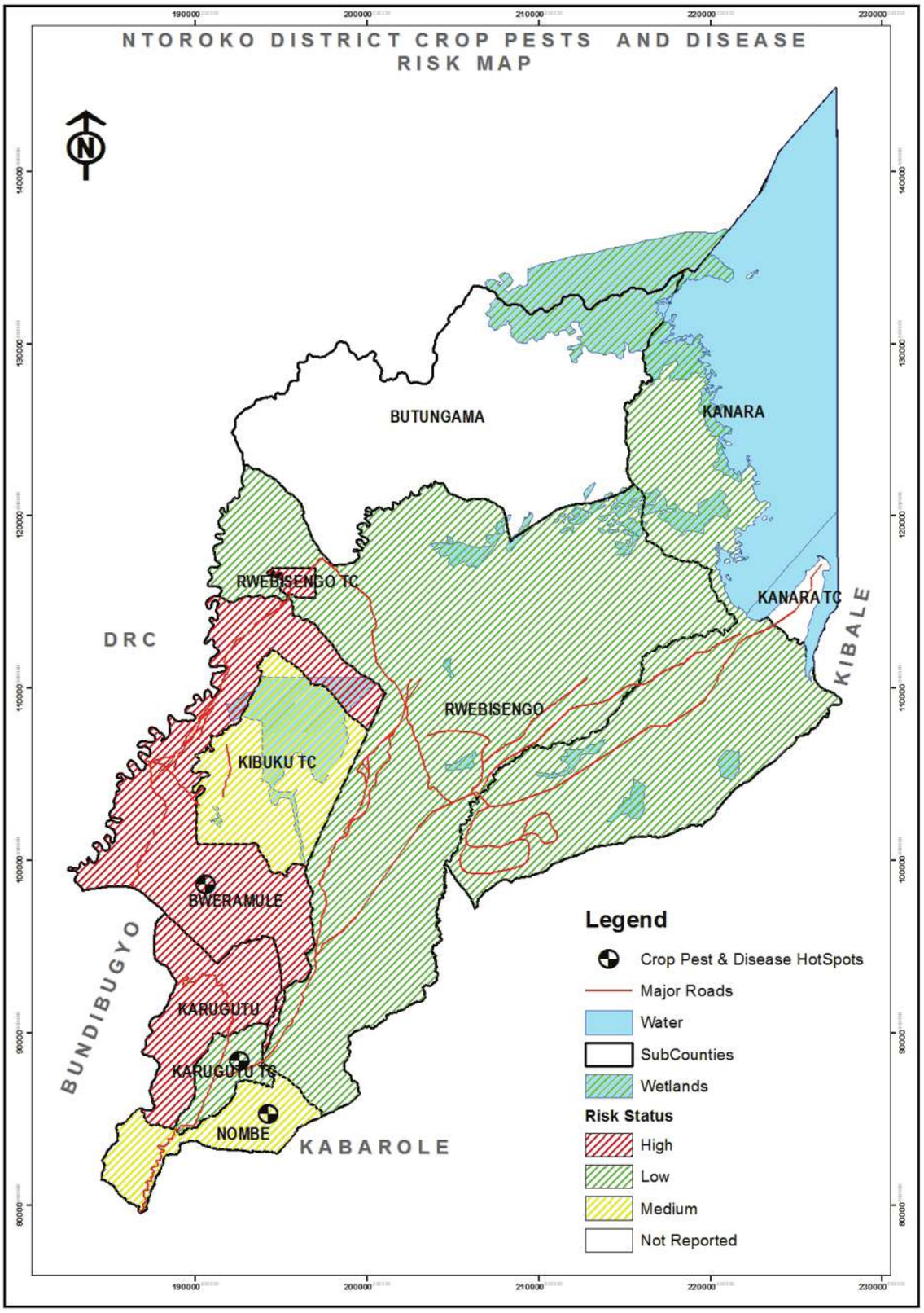

Figure 4: Crop Pests and Diseases Risk Map

Figure 4 above presents the crop pests and disease risk status of Ntoroko District. The population of Ntoroko District mainly undertakes subsistence crop farming and cattle

keeping. Banana bacterial wilt affects Karugutu Ward, Nyabururu Ward and Kachwamba all in Karugutu Sub-County, in Musandama, Nyakatoke, Kyabandara, and Nombe parishes. Fruit flies attack mangoes in Kachwamba, Nyabururu, Ibanda, Nombe and Kyabandara parishes. Cassava mosaic and coffee wilt are problematic in Itojo parish in Karugutu and Nombe Sub-County.

The communities of Karugutu SC, Bweramule SC and Rwebisengo TC are prone to high risk of crop pests and diseases; those of Nombe SC, and Kibuuku TC are prone to moderate risk of crop pests and diseases, while the communities of Kanara SC, Rwebisengo SC, Butungama SC and Karugutu TC are prone to low risk of crop pests and diseases. The communities of Kanara TC are not prone to the risk of crop pests and diseases.

It is anticipated that crop pests and diseases will be on the increase with increase in the number of farmers practicing crop farming but also contagion from improved planting materials acquired from other areas.

Animal Vector and Diseases

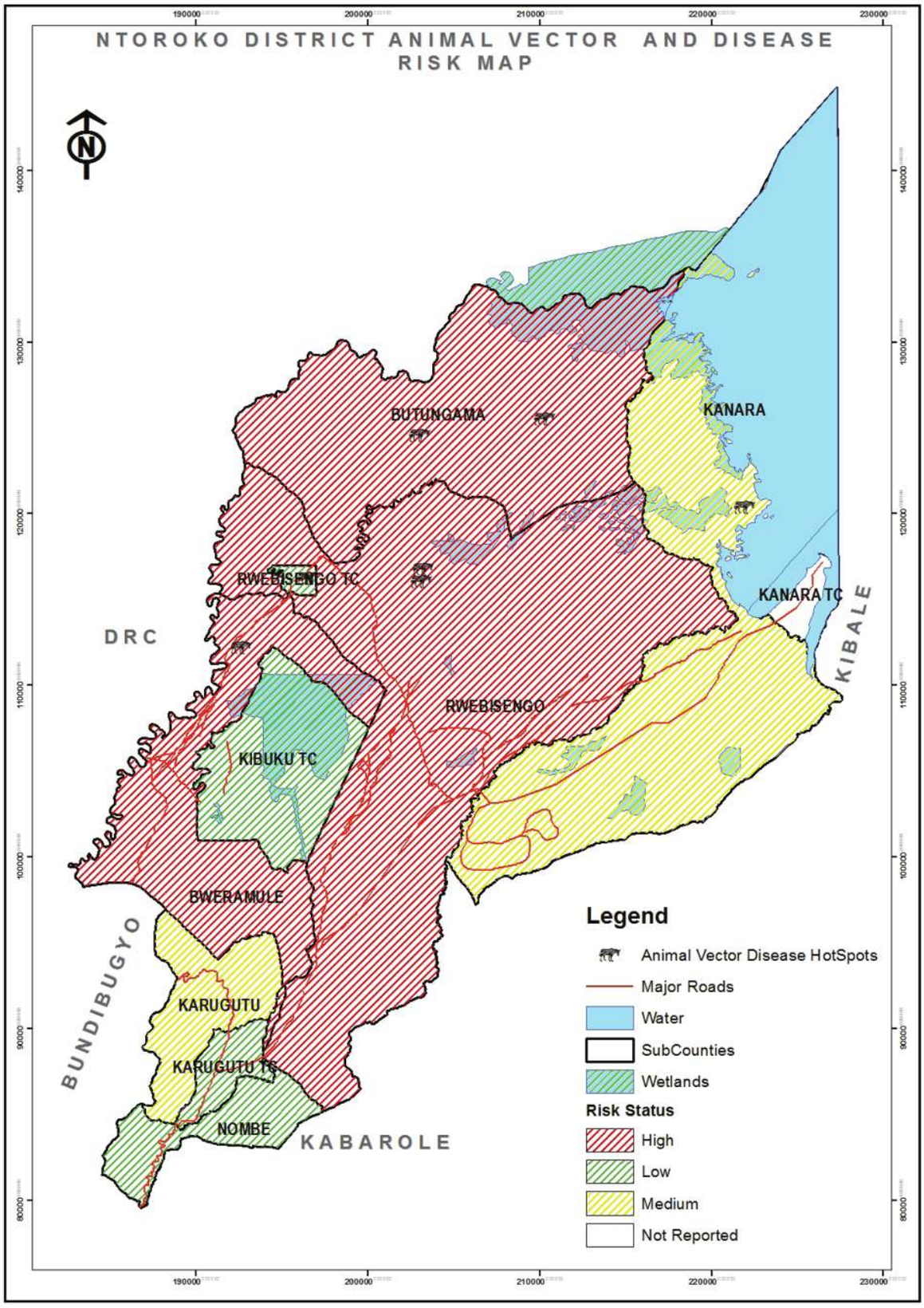

Figure 5: Animal Vector and Diseases Risk Map

Figure 5 above presents the animal vector and disease risk status of Ntoroko District. The District is well known as a pastoralist district where people have large herds of cattle, sheep, poultry and goats. The majority of the communities practice communal grazing in the low lying areas/flood plains.

CBPP affects Kyabandara Parish, Nyakatonzi village in Nombe Sub-county, Kajweka Parish in Kanara Sub-county, Rwebisengo Sub County and Butugama Parish and Nyakasuyi village in Butugama Sub-county. Tick borne diseases are found in Butugama Parish and Nyakasuyi Village in Butugama Sub County. Foot and mouth disease is reported in Majinba Parish.

Interaction of livestock with wild animals in the adjacent national park exposes them to disease. Worsening the problem, during flood time, pastoralists drive their animals to higher ground in the DRC, where they are also exposed. Convergence of livestock from diverse places at water points and communal grazing grounds is another mode of contagion.

The communities of Rwebisengo SC, Butungama SC and Bweramule SC are prone to high risk of animal vector and disease; those of Kanara SC and Karugutu SC are prone to moderate risk of animal vector and disease; while those of Nombe Sc, Kanara TC, Kibuuku TC, Rwebisengo TC and Karugutu TC are prone to low risk of animal vector and disease.

Crop Raiding and Animal Attacks

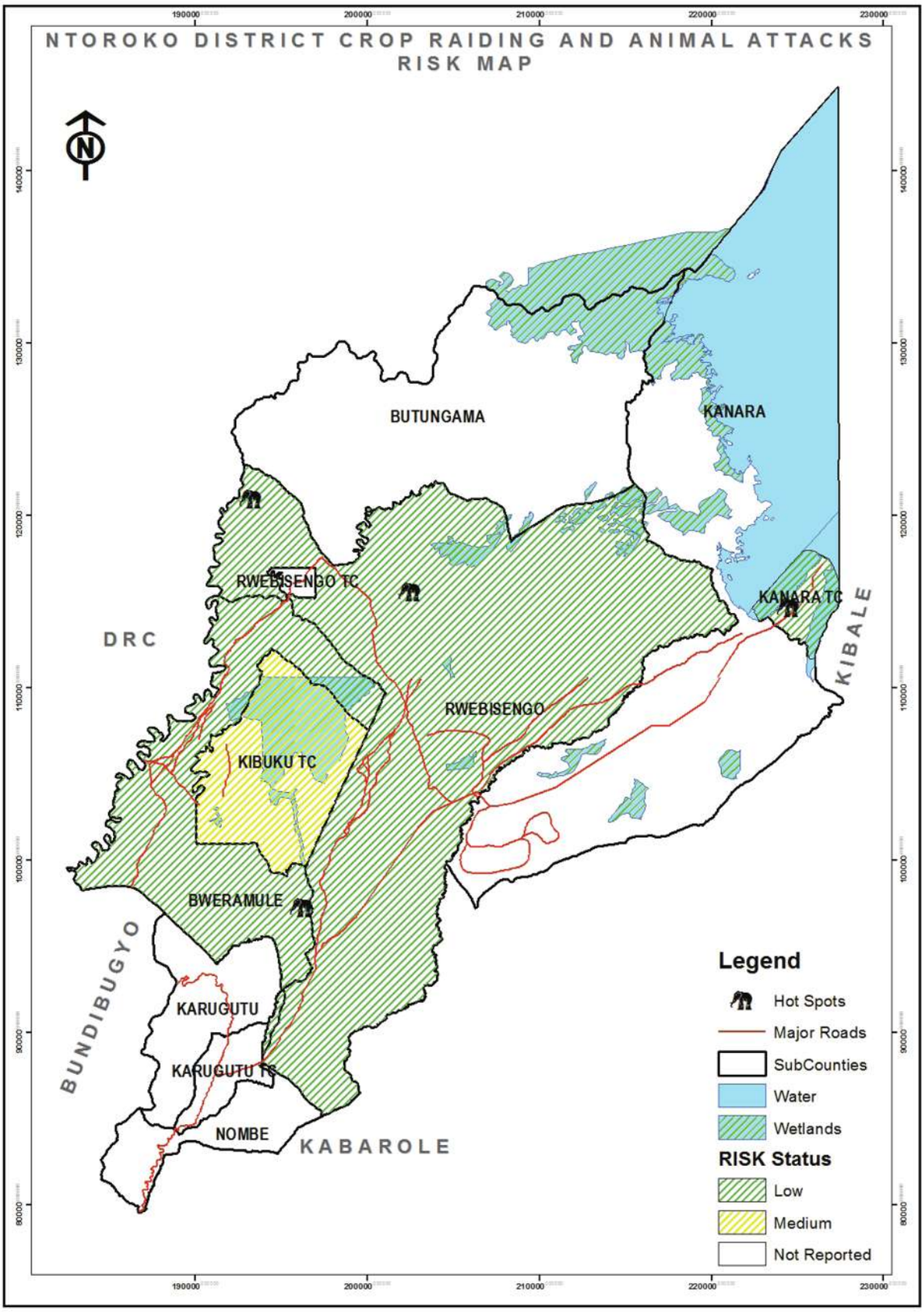

Figure 6: Crop raiding and animal attack risk map

Figure 6 above presents the animal attack and crop raiding risk status of Ntoroko District. The Semuliki Game Reserve in Ntoroko District shares a common border with Bweramule and Rwebisengo sub-counties as well as Kanara Town Council. This predisposes the communities to frequent animal attacks. Instances of lions preying on cattle, warthogs destroying cassava, and bush bucks, monkeys and buffalos destroying cassava, banana and other crops are common. Even people, particularly women and children are attacked by these animals. A case in point is Kanyasi Parish in Kanara Town Council, where one child had to have his leg amputated after being savaged by a baboon.

The communities of Kibuuku TC are prone to moderate risk of crop raiding and animal attacks, while those in Bweramule SC, Rwebisengo SC and Kanara TC are prone to low risk. The rest of the sub counties and town councils are not prone to the risk of crop raids and animal attacks.

Earthquake

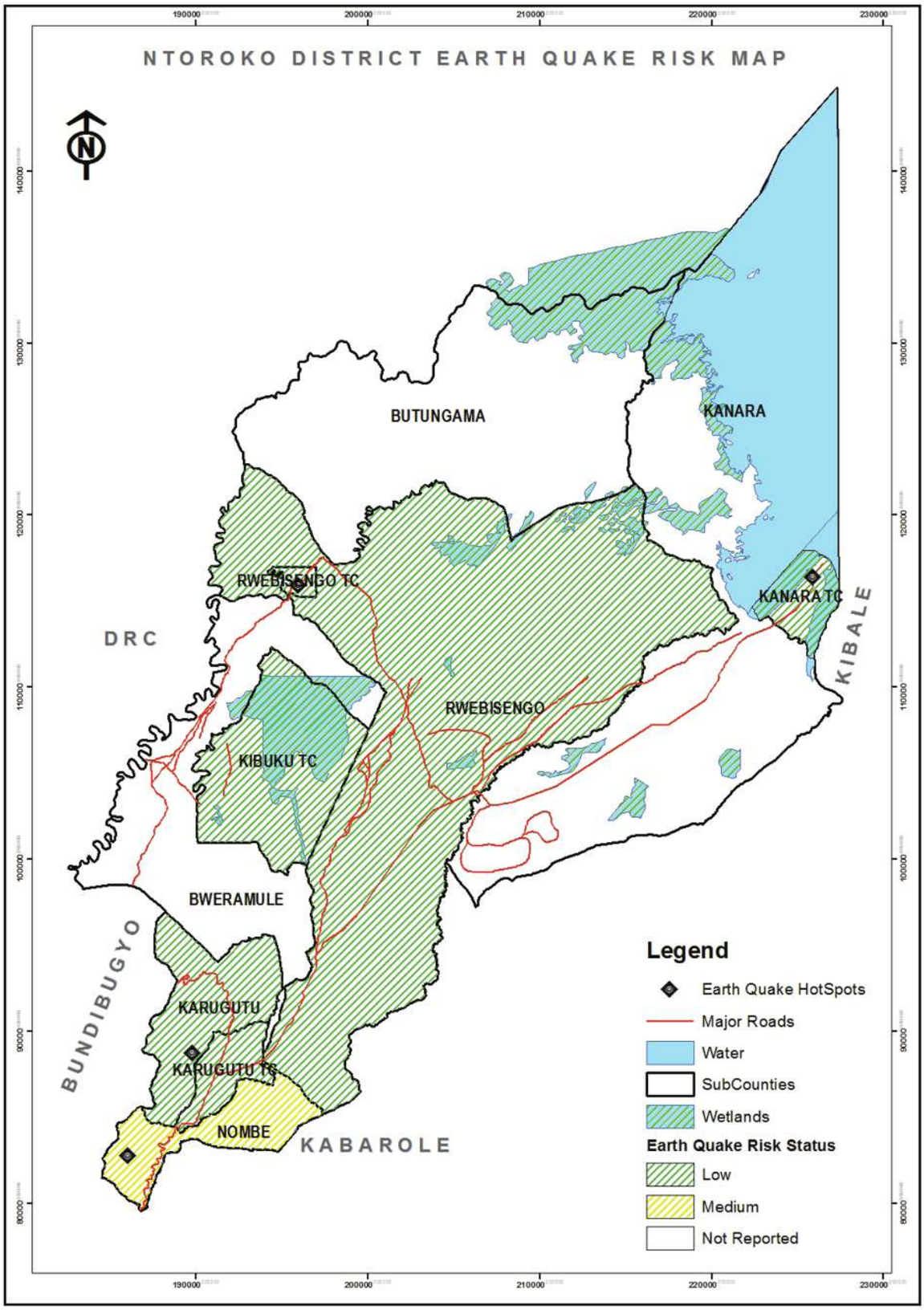

Figure 7: Earthquake Risk Map

Figure 7 above presents the earthquake risk status in Ntoroko District. Ntoroko District

has not recorded any losses suffered from earthquakes due to its relatively low population density. It is anticipated that the risk is increasing with increase in buildings especially in the town councils and population density. The district is in the seismically active Western Rift Valley. The communities of Nombe sub-county are prone to moderate risk of earthquake-induced landslides due to weak soil structure and consequently unstable slopes and so is Karugutu though at a low risk. The others in the low risk category include Rwebisengo TC, Kanara Tc, Karugutu SC, Rwebisengo TC, Kibuuku TC and Kanara TC. The communities of the other sub counties are perceived to be free from the risk of earthquakes.

Internal Conflict

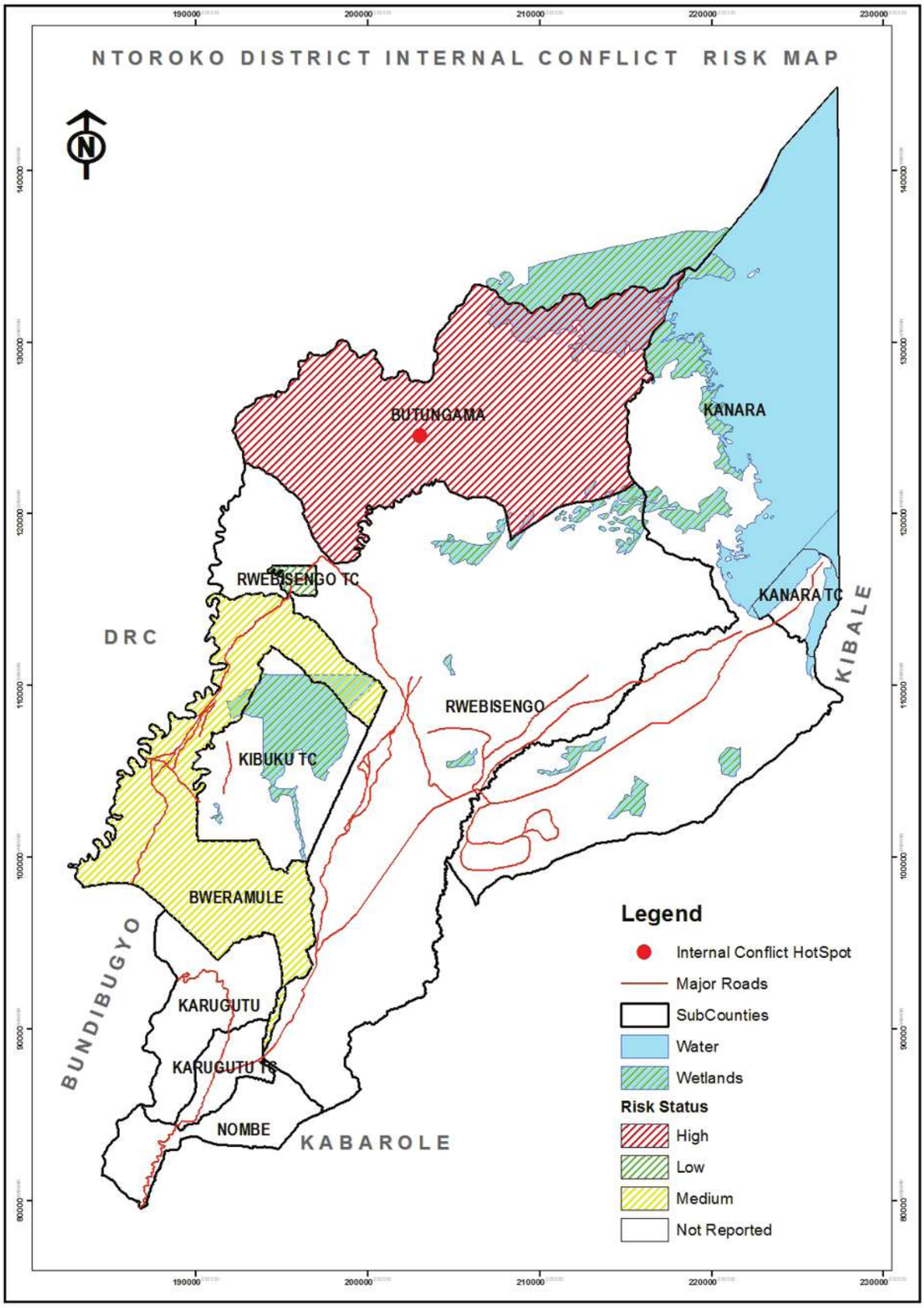

Figure 8 Internal Conflict Risk Map

Figure 8 above presents the internal conflict risk status of Ntoroko District. The most chronic internal conflict is the inter-clan dispute over a land parcel in Butungama parish in Butungama

Sub-county, which has so far claimed three lives. Land use contention is another source of conflict. For example, when crop farmers in search of water for crop production cultivate near the water points, the same water where the pastoralists water their animals; they fence the gardens off to avoid damage of crops by the livestock and end up depriving pastoralists of access to water points and limiting grazing area around the water point. This often results into conflicts over access to and use of '*communal lands'*

The communities of Butungama Sub County are prone to high risk of internal conflicts; those of Bweramule are prone to moderate risk, while those of Rwebisengo TC are prone to low risk of internal conflicts. Apparently all the other sub counties and town councils are not prone to any risk of internal conflicts.

Vulnerability

Table 6 summarizes the communities' assessment of hazard severity and frequency in the sun-counties. Table 7 transforms those qualitative low/medium/high judgements to numerical values 1/2/3 which when summed vertically show the relative risk per hazard. The horizontal sums show both cumulative and weighted vulnerability

Table 8: Risk and vulnerability assessment

Sub-county	Floods	Crop pests and diseases	Drought	Animal pests and diseases	Earthquakes	**Animal attacks**	Hail storms	Internal conflicts	Landslides	Crop raiding	**Cumulative vulnerability (Absolute)**	**Weighted vulnerability (Cumulative/3)**
Kanara	1	1	3	2	0	1	3	0	0	0	11	4
Nombe	2	2	1	1	2	3	3	0	3	1	18	6
Rwebisengo SC	3	1	3	3	1	1	0	0	0	1	13	4
Kanara TC	1	0	3	1	1	1	3	0	0	0	10	3
Karugutu SC	1	3	0	2	1	1	2	0	1	0	11	4
Butungama	3	1	3	3	0	0	0	3	0	1	14	5
Bweramule	3	3	3	3	0	0	1	2	0	0	15	5
Rwebisengo TC	3	3	3	0	1	0	0	1	0	0	11	4
Kibuuku TC	2	2	3	1	1	0	0	0	0	2	11	4
Karugutu TC	0	1	0	1	1	2	1	0	0	1	7	2
Total	19	17	22	17	8	9	13	6	4	6	121	
	Key: 3 = High, 2 = Medium, 1 = Low, 0 = Not reported											

Risk Vulnerability

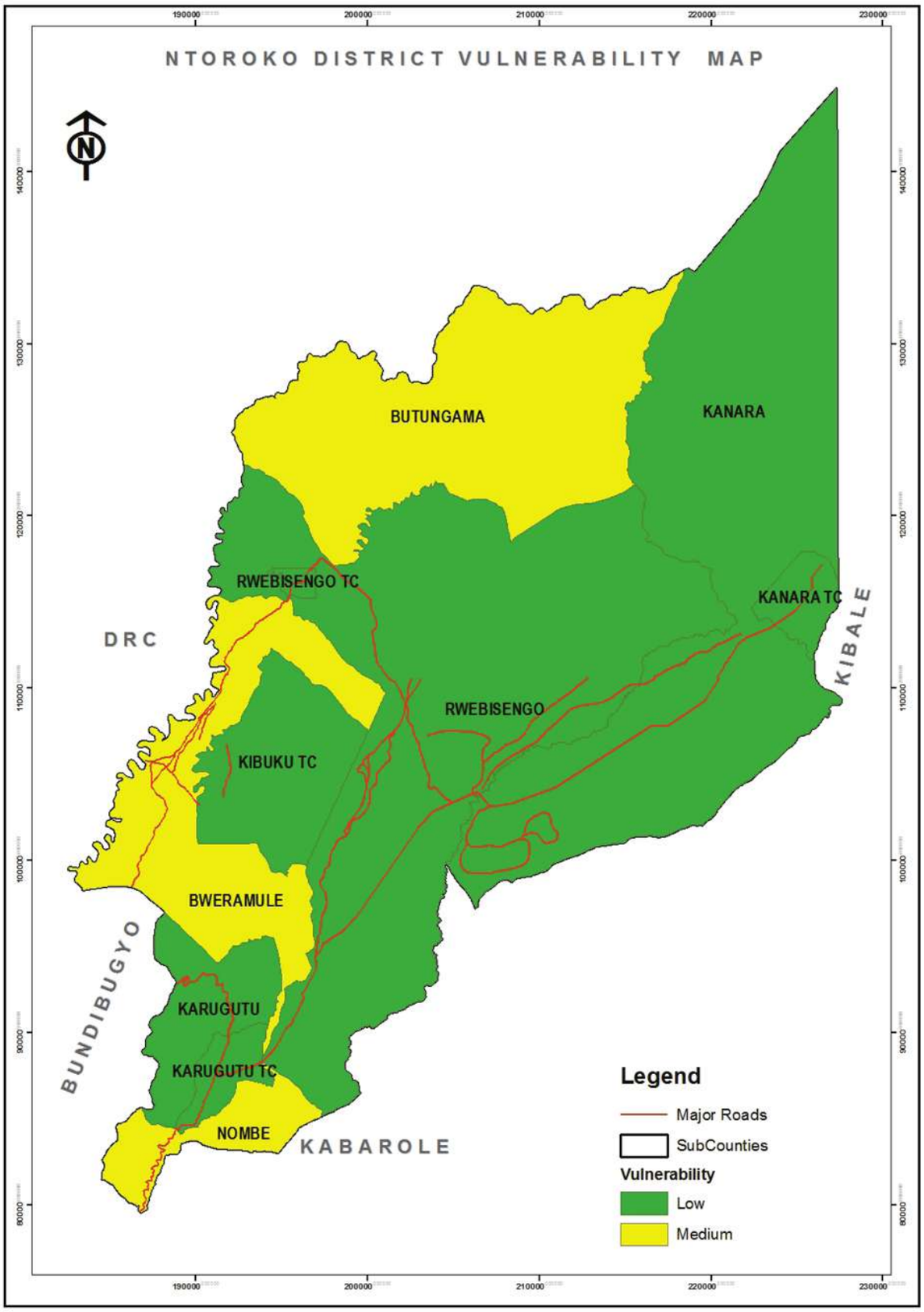

Figure 9 Vulnerability map

The vulnerability map in Figure 9 shows the areas of low, medium and high vulnerability according to the risk and vulnerability table (Table 8) above. In this analysis, the cumulative

vulnerability of each sub-county is calculated and then weighted to provide weighted vulnerabilities for individual sub-counties. Therefore sub-counties with weighted vulnerability values less than 4 are coded “low”, termed low vulnerability areas and are assigned green, those from 5 to 7 are coded “medium”, termed medium vulnerability areas and are assigned yellow while those whose weighted vulnerabilities are 8 or more are coded “high”, termed high vulnerability areas and are represented by red.

Ntoroko district is exposed to 10 hazards namely drought, floods, crop pests and diseases, animal pests and diseases, hail storms, animal attacks, earthquakes, internal conflicts, crop raiding and landslides arranged in their order of risk from highest to lowest.

The district did not report any sub-county that is highly vulnerable (red) but Bweramule, Butungama and Nombe sub-counties are fast keeping pace at the vulnerability scale indicating a medium (yellow) level of vulnerability. The rest of sub-counties are at the lower level (green) of the vulnerability scale. Karugutu town council portrayed the least vulnerability to the mentioned hazards with a weighted vulnerability of only 2.

Though all the elements of the community are vulnerable to the fore mentioned hazards, the burden lies heaviest on the elderly elements, the children and the women. The school children and the farmers are especially vulnerable to floods than any other groups. The poor elements of these communities too feel the pinch of the hazards more than their wealthy counterparts therefore are more vulnerable.

Conclusions

This multi hazard, risk and vulnerability profile for Ntoroko District was produced after conducting a rigorous people centred, multi-sectoral, and multi stakeholder field data collection/mapping, analysis, and map production. It is therefore a synthesis of primary data, secondary data and the perception/experiences of the local people, the community leadership at all levels. Thus it portrays how the people of Ntoroko perceive each of the hazards based on the past trends and the predicted likelihood of their occurrences and impact on the communities.

Communities perceive that Ntoroko District is vulnerable to ten hazards, in order of high to low risk: drought, flooding, animal pests and diseases, crop pests and diseases, hail storms, animal attacks, earthquakes, internal conflicts, crop raiding and landslides.

Nombe, Bweramule and Butungama Sub-Counties are the most vulnerable in the district ranking medium at the vulnerability scale. Kanara, Rwebisengo TC, Kibuuku, Rwebisengo and Karugutu sub-counties with weighted vulnerabilities of 4 each have low vulnerability though are fast keeping pace at the vulnerability scale. The other sub-counties (Kanara TC and Karugutu TC) are the least vulnerable communities in the district.

Timely early warning systems especially on the Rwenzori Mountains, for floods and other DRR interventions would enhance the resilience of the people of Ntoroko to the effects of climate change.

This profile is therefore a compelling outcome of an integration of the spatial information obtained from the mapping exercise and the community perception of the hazards. It should henceforth inform the contingency as well as the district development planning process towards disaster proof plan

Definition 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, nagana, 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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