THE REPUBLIC OF UGANDA

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KARAMOJA
MOROTO District
HAZARD, RISK AND VULNERABILITY PROFILE

August 2014

With support from:

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Acronyms

ABEK	Alternative Basic Education for Karamoja
CAO	Chief Administrative Officer
CBPP	Contagious bovine pleuro-pneumonia
CCPP	Contagious caprine pleuropneumonia
DANIDA	Danish International Development Agency
DAO	Ugandan subsidiary of a Saudi and Kuwaiti construction firm
DDMC	District Disaster Management Committee
DRM	Disaster Risk Management
ERC II	Second Economic Recovery Credit
EU	European Union
FY	Fiscal Year
GIS	Geographical Information System
GPS	Global Positioning System
HA	Hectare
HIV/AIDS	Human Immunodeficiency Virus Infection / acquired immune deficiency syndrome
KADP	Karamoja Agro-pastoral Development Programme
KALIP	Karamoja Livelihoods Programme
LC	Local Council
LGMSD	Local Government Management and Service Delivery
MADEFO	Maruzi Development Forum
MC	Municipal Council
NAADS	National Agricultural Advisory Services
NECDP	Nutrition and Early Childhood Development Project
NGO	Non-Governmental Organization
NUREP	Projects Northern Uganda Rehabilitation-Programme
NUSAF	Northern Uganda Social Action Fund
OPM	Office of the Prime Minister
PHC	Primary Health Care
PMA	Plan for Modernisation of Agriculture
PMU	Project Management Unit
PPA	Participatory Poverty Assessment
PPR	Peste des Petits Ruminats
PRDP	Peace, Recovery and Development Plan for Northern Uganda
RSPS	Road Sector Programme Support
RSSP	Road Sector Support Project
SVI	Italian Development Corporation
UBOS	Uganda Bureau of Statistics
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
WFP	United Nations World Food Programme

Acknowledgement

On behalf of the Office of the Prime Minister, I wish to express sincere gratitude to all of the key stakeholders who provided their valuable inputs and support to this hazard, risk and vulnerability mapping exercise that led to the production of comprehensive district hazard, risk and vulnerability profiles for the Karamoja sub-region.

I especially extend my appreciation to the Department of Disaster Preparedness and Management in the Office of the Prime Minister, under the leadership of the Acting Commissioner, Ms. Rose Nakabugo and the Assistant Commissioner, Mr. Gerald Menyha, for the oversight and management of the entire exercise. My appreciation also goes to the District Disaster Management Committees and the entire body of stakeholders who in one way or another yielded valuable ideas, resources and time to support the completion of this exercise.

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Finally, the field team led by Mr. Solomon Elungat, Senior Disaster Management Officer and supported by Mr. Moses Banduga, GIS Expert, Mr. Samuel Lwetutte, Ms. Pamella Drate, GIS Specialists and the entire district technical team who painstakingly traversed the sub-region gathering local knowledge, mapping hazards and compiling these documents, deserves our thanks.

Hon. Hilary O. Onek

Minister for Relief, Disaster Preparedness and Management

EXECUTIVE SUMMARY

This Moroto 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, gender demographics by sub-county and livelihoods.

Moroto district is situated in the Mid North Eastern Uganda between latitudes 1˚53'N, 3˚05'N and Longitudes 33˚38'E, 34˚56'E and at altitudes between 1,356m – 1,524m above sea level. It shares borders with 4 districts: Kotido to the north, Lira to the northwest, Katakwi to the west, and Nakapiripirit to the south. Kenya is its eastern neighbour.

The findings identify 14 hazards, strong wind, environmental degradation, drought, human disease, crop and animal disease, floods, land conflict, bushfires, cattle theft, vermin, pest infestation, industrial accidents, landslide, hailstorms, lightning, as predominant in the district, in order of decreasing risk.

Strong wind, environmental degradation, drought and human disease ranked closely as the most dangerous and high-risk hazards for people in Moroto District.

All of the sub-counties have significant vulnerability to disaster, accumulating risk from these hazards. Rupa, Katikekile and Tapac, Sub-Counties record high aggregate vulnerability levels. The least vulnerable, Moroto Town Council, has medium risk of strong winds and human disease. This aggregated vulnerability to several hazards at once compounds the exposure to disaster risk and the complexity of managing it.

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.

INTRODUCTION

The Moroto District Local Government and the Department of 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 hazards and analyzing disaster risks and vulnerabilities in Moroto 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 contingency and development plans.

Objectives

The objective of the hazard, risk, and vulnerability mapping is to produce a District Profile that will aid planning and decision making processes in addressing disaster threats/risks in Moroto District.

Methodology

The multi-hazard, risk and vulnerability mapping approach employed a people-centred, 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 Karamoja 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 Karamoja sub-regions studied) and data bases from other organizations 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: Dissemination Workshop

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

Overview of the District

Location

Moroto district is situated in the Mid North Eastern Uganda between latitudes 1˚53'N, 3˚05'N and Longitudes 33˚38'E, 34˚56'E and at altitudes between 1,356m – 1,524m above sea level. It shares borders with 4 districts: Kotido to the North, Lira to the North West, Katakwi to the West, and Nakapiripirit to the South. The entire eastern borderline is shared with the Republic of Kenya. The district lies It has a total area of 8,516 km 2 which is 3.5% of the Country's area coverage. About 3,500 km 2 is available for cultivation after making allowance for Game Reserves (4,900 km 2) and Mountains 100 km 2).

Historical perspective

Moroto was part of what was formerly called Karamoja province, which was later split in 1971 with the creation of Moroto District. In July 2001, there was further split with the creation of Nakapiripirit District. Again last FY 2010/11 Napak district was created from Moroto District.

The Settlement pattern in the district is of a scanty nature with concentrations around productive agricultural areas, trading centres and near rivers and springs. The area is sparsely populated with an overall land density of 20 persons per km2 compared to 17 persons / km2 in 1991. For security reasons, people live in clusters (Manyattas). A typical "Manyatta" has both an outer and inner subdivision fence of thorns.

Administrative Set Up

The district has both political and administrative structures up to grass roots. The political structures being the Local Councils that is Local Council V at district level to Local Council I at village level. It is important to note that LC V, LC III, and LC I are key decision making councils. The other two Local Councils that is LC IV and LC II are administrative unit councils.

The LC V and LC III are independent Local governments. The District Council is the policy-making organ of the District. All councils are policymaking bodies and monitor all developmental programmes in the district. The District Chairperson, who is also the District Political Head, heads the Local council at district level. He is responsible to the electorate through an elected district council. He is assisted in his day-to-day work by a Cabinet (Secretaries) selected by the Chairperson and approved by the District Council from among the councilors. The Chairperson is assisted by a technical team lead by the Chief Administrative Officer (CAO) who is the Accounting Officer, heads all the civil servants and co-ordinates all the activities in the district assisted by the various Heads of Departments.

The current District Council is made up of 16 elected Councilors. The Council has established the Public Accounts Committee, the District Service Committee, the District Land Board, the District procurement Committee and the District.

The Resident District Commissioner and Internal Security Agents are appointed by the President and oversee general implementation of programmes in addition to performing their core security function.

Main programmes by NGOs and Government

Government Programmes

- Universal Primary Education (UPE) targeting access to primary education by children of school going age and the rest of uneducated adult Ugandans who wish to join formal schooling.
- Universal Secondary Education (USE) which is aimed at providing secondary education to all children in Uganda.
- Primary Health Care (PHC) whose main objective is to ensure that everybody gets access to basic/primary health care services.
- Functional Adult Literacy that strives to reduce the illiteracy rate among the adult population. This to increase their literacy and numeracy.
- Rural sector support Programme (RSSP) to increase access to basic services
- Water and Sanitation programme to develop and maintain water supply for both human and animal production.
- Nutrition and Early Childhood Development Project (NECDP) aiming at developing the children in physical, psychosocial and cognitive aspects.
- Local Government Management Service Delivery (LGMSD) which provides funds to enhance the implementation of Local and national Priority Programme Area (PPA) projects.
- Plan for Modernization of Agriculture (PMA) providing a lot of support through Production and Marketing.
- The National Agricultural Advisory Services (NAADS) Programme aimed at enhancing household income and productivity among others.
- Northern Uganda Social Action Fund II (NUSAF II).
- Peace, Recovery and Development Plan (PRDP).
- Karamoja Livelihood Improvement Programme (KALIP), a successor programme to NUREP coordinated by OPM and funded by European Union.
- Sports for Life programme.
- Partner/NGO Programmes

There are NGOs/CSOs and donors contributing directly or indirectly to the district objectives to improve the quality of life of people in Moroto. Among them, DANIDA through Health and Road Sector Support Programmes, which support the District Council to achieve its objectives in the area of healthcare delivery, financial management (capacity building), road network system in addition to managerial and information communication capacity building. UNICEF is currently supporting all Sub Counties/Divisions on the following areas: rights to child health and nutrition; Rights to schools and community water, sanitation and hygiene; HIV/AIDS and rights to self-protection; rights of children in armed conflict and child friendly basic education in particular Alternative Basic Education (ABEK); participatory planning, and Guinea worm eradication activities and ERC II in feeder roads. Save the Children in Uganda supporting ABEK and Early Child hood Development Project.

Other key actors include: Karamoja Agro-pastoral Development Programme (food security, conflict resolution, water management, animal health and civil society empowerment), WFP (emergency food relief), Ministry of Education - PMU (School feeding programme), Karamoja Livelihood Programme which succeeded NUREP-EU (classroom construction, livestock development and micro-finance), SVI Iriir (Agricultural production), Moroto Catholic Diocese Social Services and Development (education, health services, livestock development and social and spiritual development), Church of Uganda – Karamoja Diocesan Development Office (livestock development, education, health services and spiritual development), Co-operation and Development (health services and water provision). Others include Local NGOs or CSOs: Training and Research Centre for Advocacy and Development-TRECAD (training, research, advocacy and consultancy), Riamiriam and MADEFO.

There is presently no development partner on road works since RSPS-2 funded by the Danish embassy ended in 2007. However, UNICEF Supports Borehole drilling, Formation and training of water and sanitation committees and construction of latrines in the water sector. Co-operation and Development is supporting borehole rehabilitation, construction of Cattle Troughs, Drilling new Boreholes, formation and training of water and sanitation committees, training of hand pump mechanics, training on water quality analysis, KADP supports borehole rehabilitation, construction of Cattle Troughs, formation and training of water and sanitation committees, training of hand pump mechanics.

Population and Demographics

According to the Ugandan 2002 census, Moroto is sparsely populated with an overall land density of 20 persons per square kilometer. The district is occupied by the Tepeth and Matheniko clusters of the Karamojong ethnic group, although the urban centers have multi –ethnic composition. While the Tepeth live on Mount Moroto, the Matheniko occupy the rangelands. Although the two clusters have different languages and culture, they are both predominantly agro pastoralists and practice both subsistence agriculture and semi- nomadic livestock rearing. Settlement in the district is mainly scattered with concentrations around productive agricultural areas, trading centers, and water sources; other factors that determine settlement patterns include, security, climate, vegetation,

terrain, accessibility and disease agents.

Approximately 95% of the populations live in rural areas. For security reasons, people live in clusters known locally as Manyattas that are fenced off with wood and thorns; with the occupying population ranging from 50 to 400 individuals. Houses in rural areas are temporary in nature and consist of mud walls and grass thatched roofs with no ventilation. In most urban areas and trading centers, the constructions of dwellings tend to follow existing roads and footpaths. Over 90 % of the dwellings lack proper sanitation and storage facilities and are prone to fire and other natural disasters like strong winds and sand storms. With the agro pastoral and nomadic lifestyles being responsible for settlement patterns, some villages are heavily depopulated during the dry season as pastoralists migrate to refuge grazing areas. While the Tepeth cluster often host the Turkana from Kenya during the dry season during the months of December to February, the Matheniko on the contrary migrate to areas in Nakapiripirit district, and in Rupa Sub County in Moroto in search of better pasture and water for their livestock.

Relations between the people of Moroto and that with the neighboring Karamoja districts and Turkana of Kenya depends on the availability of pasture and water and the direction and intensity of raids. Although the Matheniko and Tepeth just like the other Karamojong clusters were officially armed, a disarmament exercise was launched in December 2004 and is ongoing in the district. The people of Moroto are exposed to both internal and external aggressions due to the prevalent culture of cattle rustling. Internal aggressions often occur between the Matheniko and Tepeth while external raids are carried out by mainly the Jie on the Matheniko but also by other clusters such as the Bokora and Pain on the Matheniko as well the Kenyan Turkana and Pokot. Likewise the Matheniko and Tepeth of Moroto carry out raids in neighbouring districts and in Kenya.Demographic characteristics

Table 1 Projected 2014 population of Moroto District by sub-county

Sub County	Projected Population		
	Male	Female	Total
Katikekile	6000	5700	11,700
Nadunget	23100	24000	47,100
Rupa	24600	20000	44,600
Tapac	14000	12700	26,700
Total for Rural S/C.	67700	62400	130,100
North Division	3700	3300	7,000
South Division	3300	3400	6,700
Municipal total	7000	6700	13,700
District total	74700	69100	143,800

Source: (UBOS 2014)

Table 2 Major tribes and languages spoken in Moroto District

Ethnic group (language dialect)	Area occupied
Karimojong (Mazeniko)	1
Karimojong (Pei)	1
Karimojong (Bokora)	2
Tepes	4
Karimojong	90
Karimojong	

Source; Karamoja Data Center, OPM Uganda

Topography

The vegetation pattern in Moroto district is typically semiarid with dry tree Savannah species dominantly grass species. The main vegetation communities in the district include: forests at high altitudes (dry montane forests), Savannah woodland, semi evergreen thickets, deciduous thickets, Riparian communities, and grass steppe communities. Forests are found only at Localized patches on hills and mountains such as Mt. Moroto, Kamalinga forest on Mt Napak. Forest cover is estimated at 100 km^2

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Climate

The climate in Moroto is semiarid characterized by an intense hot season, lasting from November to March. The rainy season is from April to August with marked minimum in June and marked peaks in May and July. Rainfall is in the range of 300mm to 1200mm per year with mean annual rainfall of 800mm.

The mean maximum temperature ranges from 280^0c – 330^0c during the dry season. Generally, the hottest months are January and February were average maximum temperature may reach 33.50^0c; while in October – December average maximum temperature is 29.50^0c. Mean minimum temperature ranges from 150^0c – 170^0c.

Available records indicate an average relative humidity of 63% during morning hours and 46% during the afternoon. As expected, lowest relative humidity values are experienced during the months of drought and also higher values are recorded in the morning hours.

Livelihoods

Table 3 Moroto District main livelihoods, by sub-county and town council

Zones	Sub County	Livelihood	Remarks
Agro Pastoral	Rupa	Livestock, crop agriculture, mining of gold, limestone, marble and gemstones.	Charcoal burning and fire-wood has a negative impact to the environment
Agro pastoral	Nadunget	Livestock, crop agriculture, sand and murram mining.	
Agro pastoral	Katikekile	Crop agriculture, livestock, limestone and marble	Livestock and crop production is affected by prolonged drought, crop and animal diseases and access to markets.
Agro pastoral	Tapac	Crop agriculture, livestock and limestone	

Source: District DDMC Report May 2014.

Women's Livelihoods

Women in the rural sub counties of Nadunget, Rupa, Kaktikekile and Tapac in literacy status is low meaning high level of illiteracy prevails, girls child education and completion rate is equally doing badly, in terms of say to property ownership is equally low, women have a say in livestock products like milk, ghee and butter but ownership is strictly men dominated. The livelihood pattern has changed over time due to cattle rustling and loss of livestock, power has changed due to increase of poverty among the household, there has been increase in women, headed households, child headed households as well and girl child dropouts. These has led to women going for options in livelihoods like, charcoal burning, firewood and sale of local brew as a substitute to crop agriculture that suffered crop failure for quite a number of years, hence women have become breadwinners in rural Sub Counties of Nadunget and Rupa, while women in urban divisions of North and south of Moroto Municipality though are fairly educated compared to rural Sub Counties, power bargain in terms of ownership of assets and taking of decisions is still low.

HAZARDS

Table 4 Hazard summary

Hazard	Status	Sub County	Rank
Drought.	Incidences reported are associated to the delays in the rainy seasons.	Rupa, Nadunget and katikekile	1
Human diseases	Incidences of meningitis, cholera, Hepatitis E& B, AIDS, dysentery were reported.	Nadunget and Rupa	2
Environmental degradation	Reported incidences are associated with aggravated deforestation resulting from environmental degradation. It is associated to lime stone mining activities, tree cutting for wood and charcoal and soil erosion especially during the rainy season.	Nadunegt and Rupa are the worst hit but Tapac and katikekile have of recent started to clear lots of natural forests in search of cultivable land.	3
Flood	Incidences during rainy seasons reported. Worst incidences occurred in Municipal Council along Lia bridge in 2008 and 2012, the bridge was swept away and the nearby houses were flooded. Schools in Mogoth parish are inaccessible during heavy down pours as the whole area floods.	Nadunget, Rupa, Katikekile & Tapac	4
Strong Wind	Incidences of strong winds reported. The most recent incident reported was at Rural Training Center in Moroto municipality where the boundary wall was blown off by strong winds. In 2014, strong winds blew off roofs in Kakolia in municipal council. Nawanatau primary school in Nadunget Subcounty lost a roof top in 2010.	Nadunget, Katikile, Municipal council and Tapac.	5
Busfires	Incidences reported are associated to preparation of gardens for farming and hunting. Usually occur in November to February every year.	Predominant in Tapac and Katikekile but also occasional in Nadunget and Rupa	6
Cattle theft	Incidences were reported mainly along the border with the Turkana from Kenya.	Tapac, Katikekile, Rupa and Nadunget.	7
Crop and animal diseases	Incidences of CBPP, CCPP and Foot and mouth disease are reported. Animal diseases are associated to communal grazing and kraals. These have led to loss of cattle hence resulting into food insecurity.	Rupa	8

Hazard	Status	Sub County	Rank
Pests, parasitic infestation	Incidences of desert locusts, caterpillars are reported especially during the rainy season.	Katikekile, Nadunget, Rupa and Tapac	9
Land conflict	Incidences reported are mainly border related with neighboring districts or with institutions like Uganda wild life authority.	Rupa and Katikekile	10
Hailstorms, lightning	Incidences reported in Tapac at Napakimu involved the death of cows.	Katikekile, Tapac	11
Industrial accidents	Incidences in the gold mines and accidents due to electricity were reported. Industrial accidents related to gold mining burying the miners underground.	Rupa, Tapac and South Division and katikekile	12
Vermin	Incidences of warthogs, monkeys were reported. The last incidence reported was in 2013 where warthogs destroyed a garden in Tapac and Nakwanga parishes of Tapac sub county.	Tapac and katikekile	13
Landslide	Incidences were reported in 2009 and 2010 in Natumukale village (Tapac sub county)	Tapac & Katikekile	14

Table 5 Summary of hazards by sub-county

Sub County	Floods	Crop and Animal disease	Drought	Pest infestation	Strong winds	Environmental degradation	Cattle theft	Vermin	Human diseases	Land conflicts	Bushfire	Landslide	Industrial accident	Hailstorms/lightening	Totals
Rupa	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		12
Nadunget	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓	11
Katikekile	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			12
Tapac	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	12
Moroto MC	✓		✓		✓				✓				✓		5
Totals	5	4	5	4	4	4	4	3	5	3	4	2	3	2	52

Table 5 shows which and how many hazards exist in each sub county.

Hazard Risk Assessment

Table 6 expresses the communities' assessment of severity and likelihood of risk in their respective sub-counties.

Table 6 Hazard risk assessment

Hazard	Rupa	Nadunget	Katikekile	Tapac	Moroto MC
Flood	H	M	L	L	L
Crop and animal disease	M	M	M	M	N
Drought	H	H	M	M	N
Pest infestation	L	L	L	L	N
Strong wind	H	H	H	L	M
Environment degradation	H	H	H	M	N
Cattle theft	L	L	L	M	N
Vermin	M	N	M	M	N
Human disease	M	M	M	M	M
Land conflicts	H	L	H	N	N
Bushfires	L	L	H	H	L
Landslides	N	N	M	M	N
Industrial accidents	M	N	N	L	L
Hailstorms, lightening	N	N	M	M	N
Key: High = H, Medium = M, Low = L, Not reported = N					

RISKS

Drought Risk

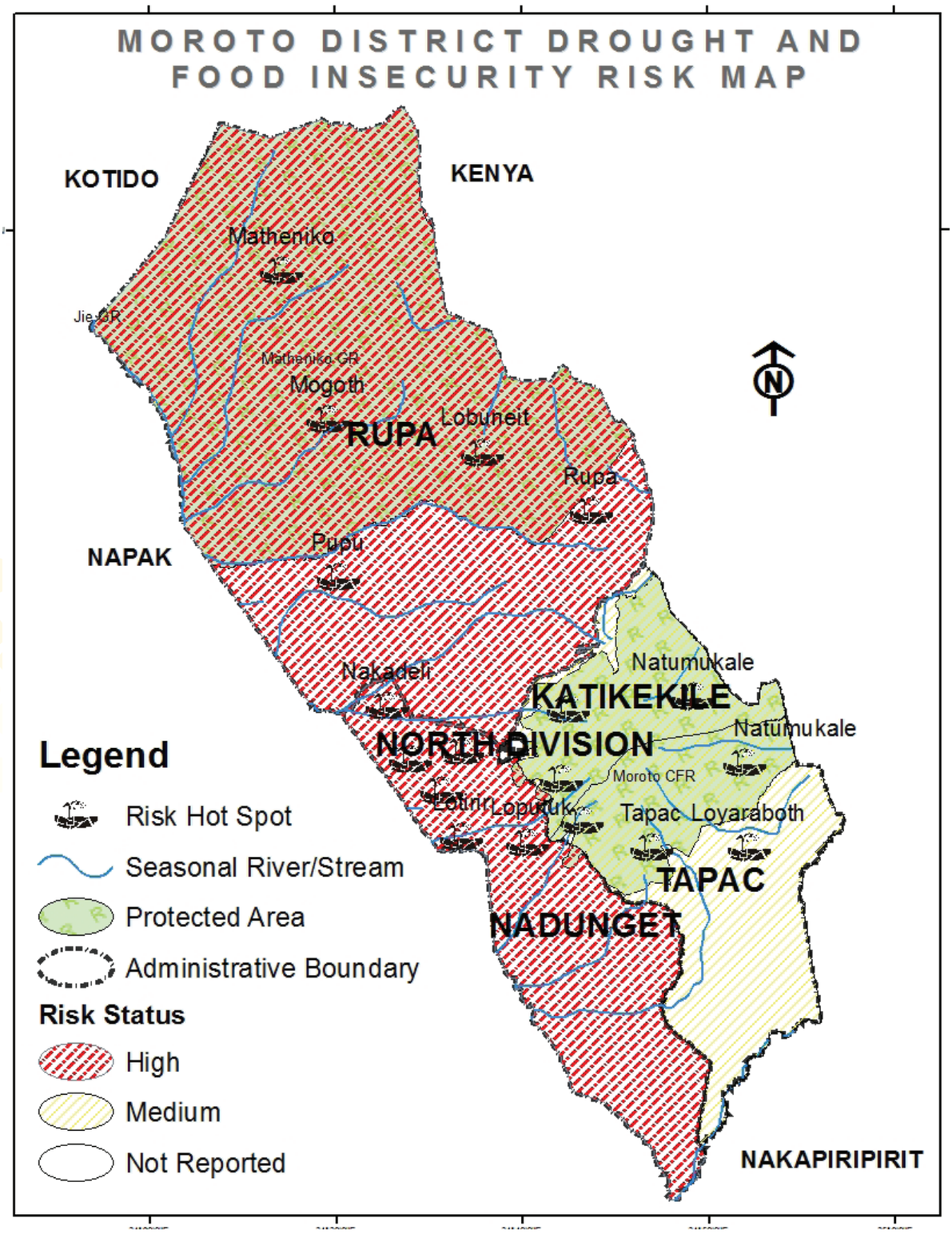

Figure 1 Drought risk

Moroto District has experienced unpredictable climate change conditions over the years. This has heavily impacted on the crop and livestock production. The adverse effects of climate change are manifested in crop failure, reduction in livestock resulting into food insecurity, malnutrition among children, environmental degradation, increase in pest infestation and human epidemics/disease. Climate change has not only enhanced drought and food insecurity but also other related hazards in the district.

Inopportunely, water resources are scarce and unevenly distributed, which makes people and livestock more vulnerable as there is hardly any water for irrigation and for the animals. This has also intensified the low agricultural production combined with effects of conflict that are either domestic or land related.

Due to the unpredictable climatic conditions, the farmers are not sure of the planting season. As a result most of the food consumed in the district is from the neighbouring districts and towns even beyond the Karamoja region.

Drought has highly affected all parts of the district but mostly parts of Nadunget have registered the highest rates of risk.

Flood Risk

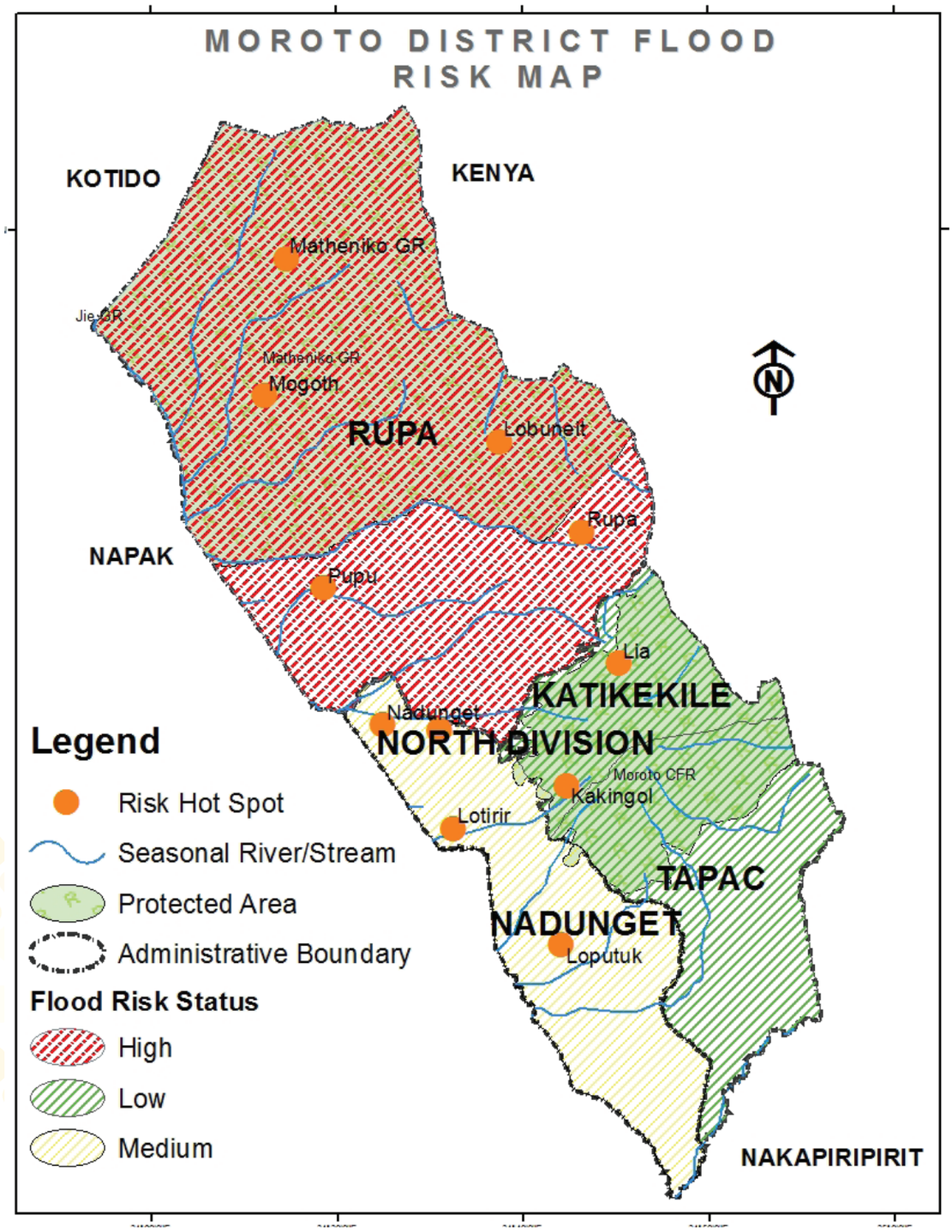

Figure 2 Flood Risk

Floods mainly occur during the rainy season and mostly affect the areas surrounding the streams and rivers. The floods in Moroto are mainly flash floods which only last a few hours after a heavy down pour. The running water is mainly down stream flow from mountain tops that collects in the low lying areas. In areas where trees have been cut in huge numbers, the speed of run-off water causes erosion as well as flooding of low lying areas. Although the area only experiences flash floods, the impact is highly felt especially when roads are submerged, making neighbouring areas inaccessible. High risk levels are reported in Rupa Sub County, registering a number of risk hot spots including Mogoth, Lubuneit, Rupa, Pupu and Matheniko game reserve.

Environmental Degradation

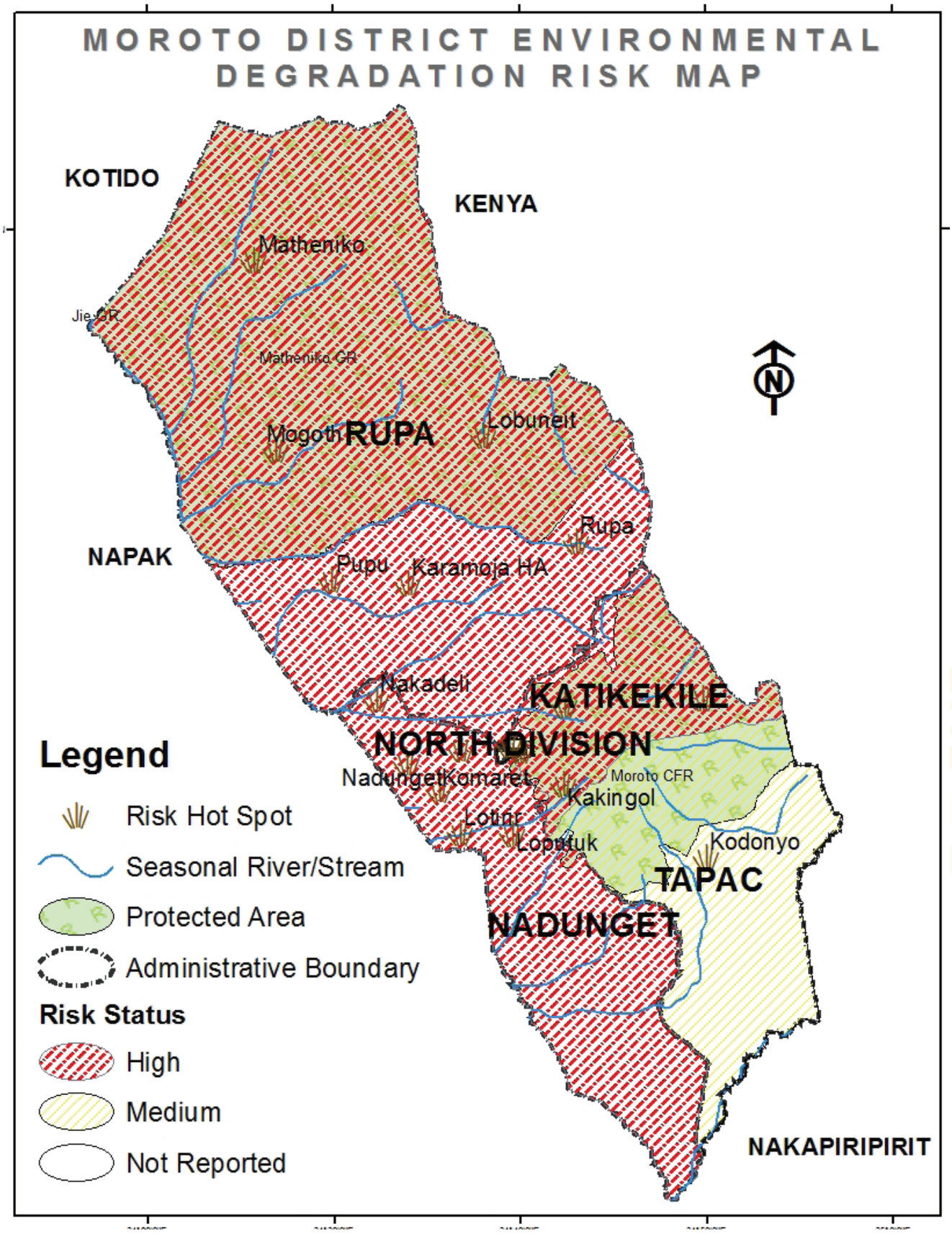

Figure 3 Environmental degradation

The Natural Environment in the district continues to suffer abuse and degradation, because the majority of the population relies directly on natural resources for their livelihoods. Many factors contribute to the continued degradation of the environment and natural resource base including expansion of arable land, higher levels of brick burning, tree cutting for fuel and charcoal burning, and inadequate law enforcement.

This phenomenon is common in almost all parts of the district. Crop failure has prompted many residents to engage in detrimental economic activities such as charcoal burning, making baked bricks and selling firewood, all aggravating deforestation. These activities have increased in the last decade leading to overexploitation of biological resources, especially materials for fuel wood, charcoal burning, building poles, food and herbal medicine, leading to their scarcity and hiking of prices. According to the District Forestry Officer, fencing material for one manyatta alone consumes about 7500m3 of wood. Households use 90kgs of wood and 120kgs of charcoal per household per week. The sub-counties most affected are of Nadunget and Rupa where some areas have become permanently bare, and deeply eroded gulleys have developed over time because of over-cultivation, over-grazing and deforestation for building materials, fuel wood and charcoal.

Human Disease Risk

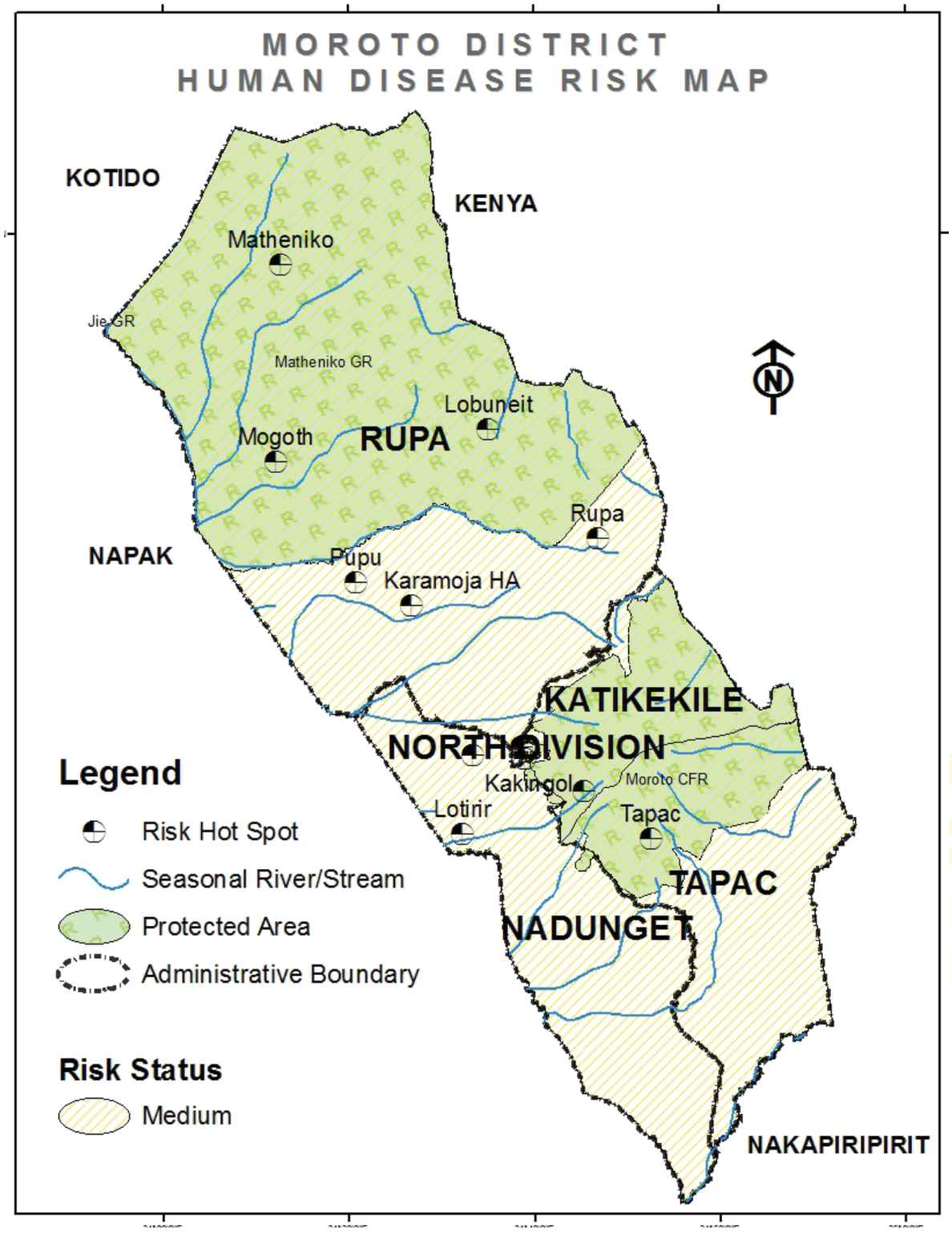

Figure 4 Human Disease Risk

Outbreaks of diseases such as meningitis, cholera, hepatitis B, dysentery have major social and economic impact. Cholera occurs mainly during the rainy season (April to August), and hepatitis B in dry spells (October to March). Fatalities were reported in Naitakawae parish Kanakomol village. Risk hots spots are in; Tapac, Pupu, Mogot, Rupa, Matheniko, Lotirir and Karamoja HA.

Pests, Parasitic Infestation Risk

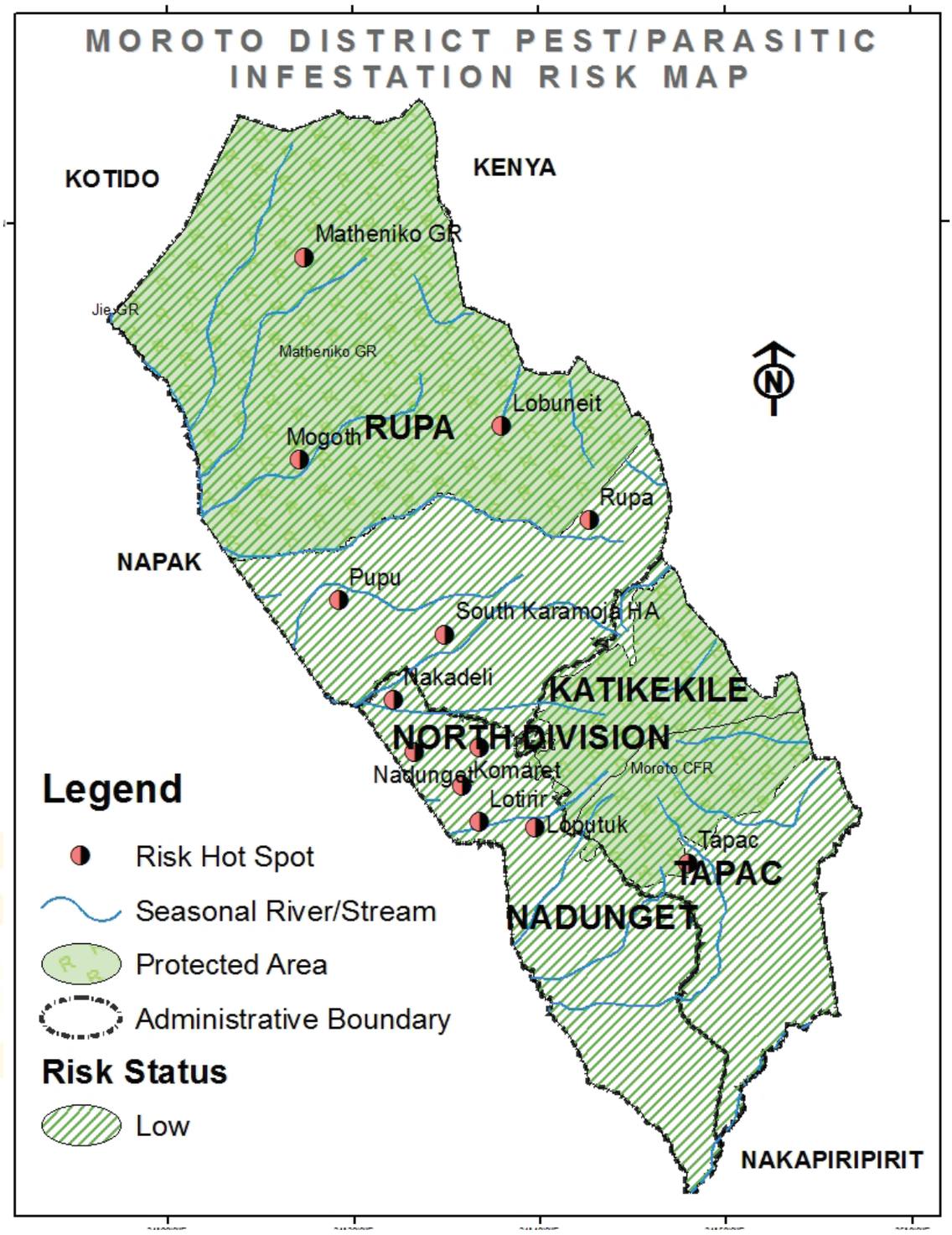

Figure 5 Pests, parasitic infestation risk

Pests and parasitic infestation are outstanding hazards experienced in the district. The impact is directly related to food shortages and food insecurity because they affect the crop production in the area. Reported pests/parasites are desert locusts, honey dew, caterpillars. Other infestations are aphids on legumes and fruit trees, leaf minor on groundnuts, and stalk bores on cereals.

The major animal pests affecting livestock production are worms, lice, flees, ticks and tsetse flies. Generally in Moroto District the main economic activity is pastoralism; agro pastoralism is still on a small scale therefore the pest-parasitic infestation risk situation is low.

Bushfire Risk

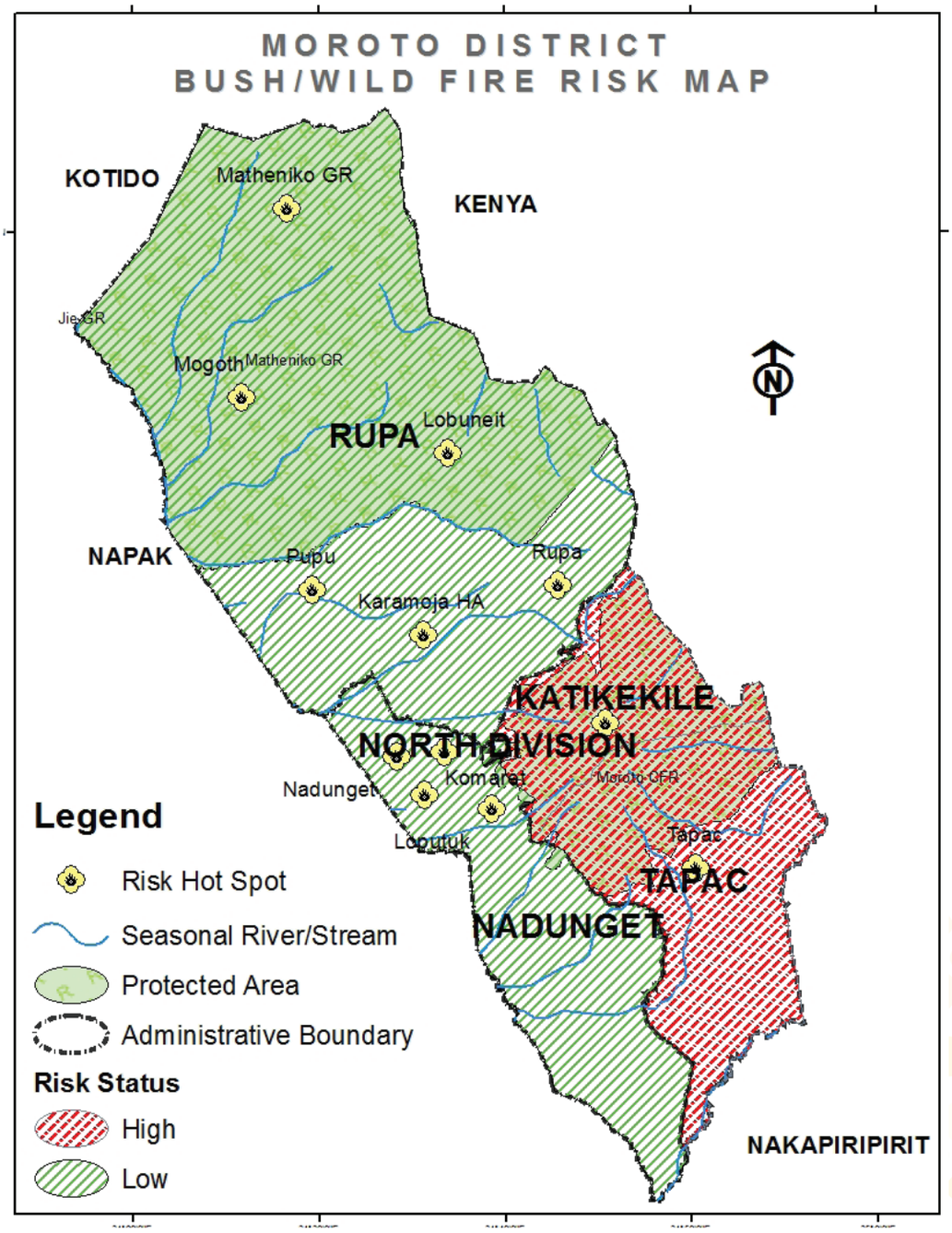

Figure 6 Bushfire risk

Bushfires are mainly experienced during the dry season when most of the grass is highly flamable. Farmers tend to clear their gardens by burning the weeds. The fires often spread very quickly beyond the intended area. In some case these fires burn crops from the neighboring garden or even in worst scenarios whole villages are destroyed since the construction materials, such as the thatched roofing grass and wooden roof structure are set alight.

The pastorals on the other hand set the fires to kill ticks and to enable the regeneration of fresh pastures. Sometimes accidental fires occur when hunters set them to roast wild meat or harvest honey in the wild. This is common on the Mt.Moroto – Katikekile, Kamoret parish, Arechek village and Tapac sub counties, where risk levels are high compared to the other parts of the District.

Strong Wind Risk

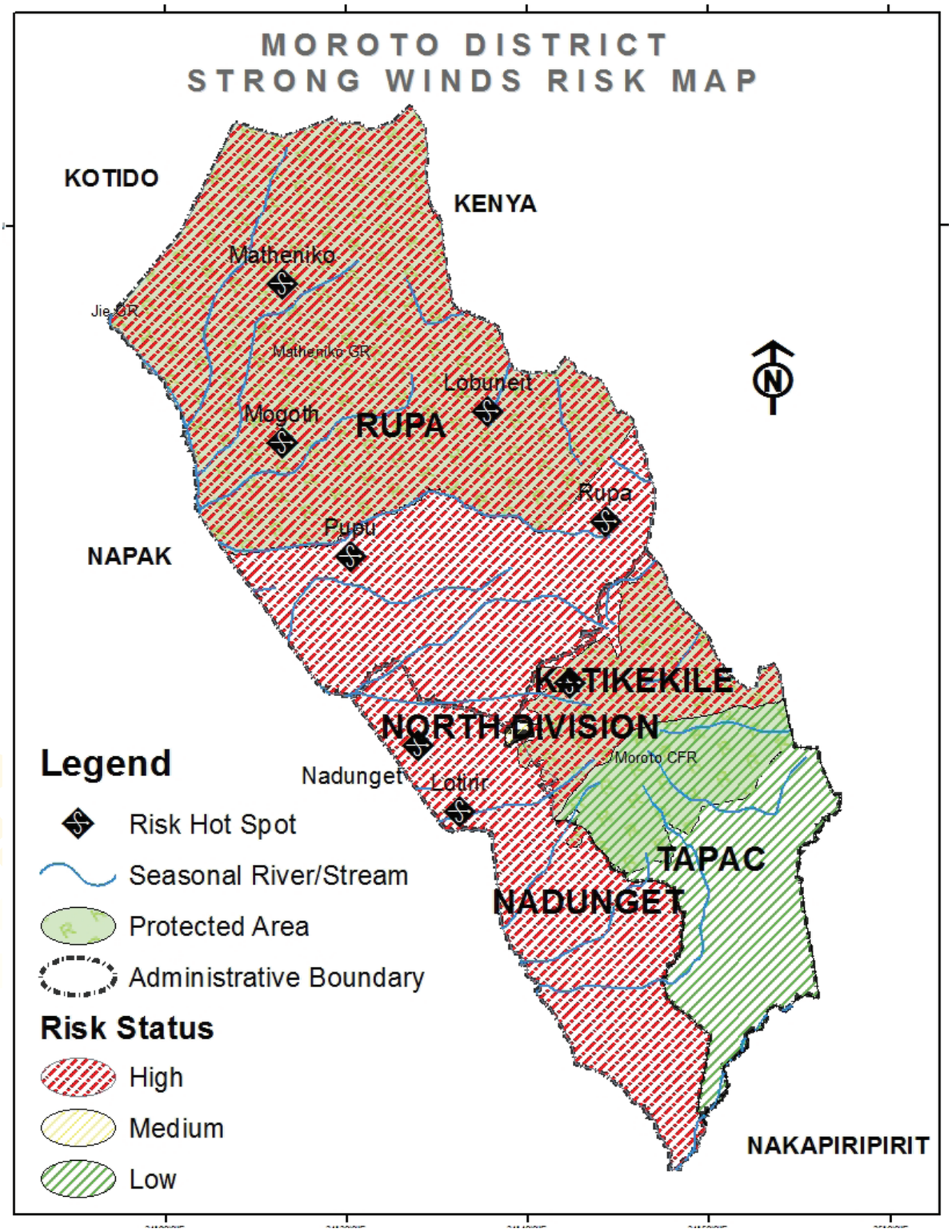

Figure 7 Strong wind risk

Winds are usually very strong at the onset of the dry season, originating from the East, crossing the mountains and gaining momentum from Katikekile Sub County to blow through Moroto town. They destroy the roofs of shanty buildings in Nakapelimen and Kakoliye or Capswahili slums. Strong winds also blow as dust storms from the mountain through Rupa Sub County towards the western direction to Nadunget. High risk levels are reported in 3 sub-counties (Rupa, Nadunget, and Katikekile). Roof tops have been lost in Nadunget Sub County lately in March 2014.

Landslide Risk

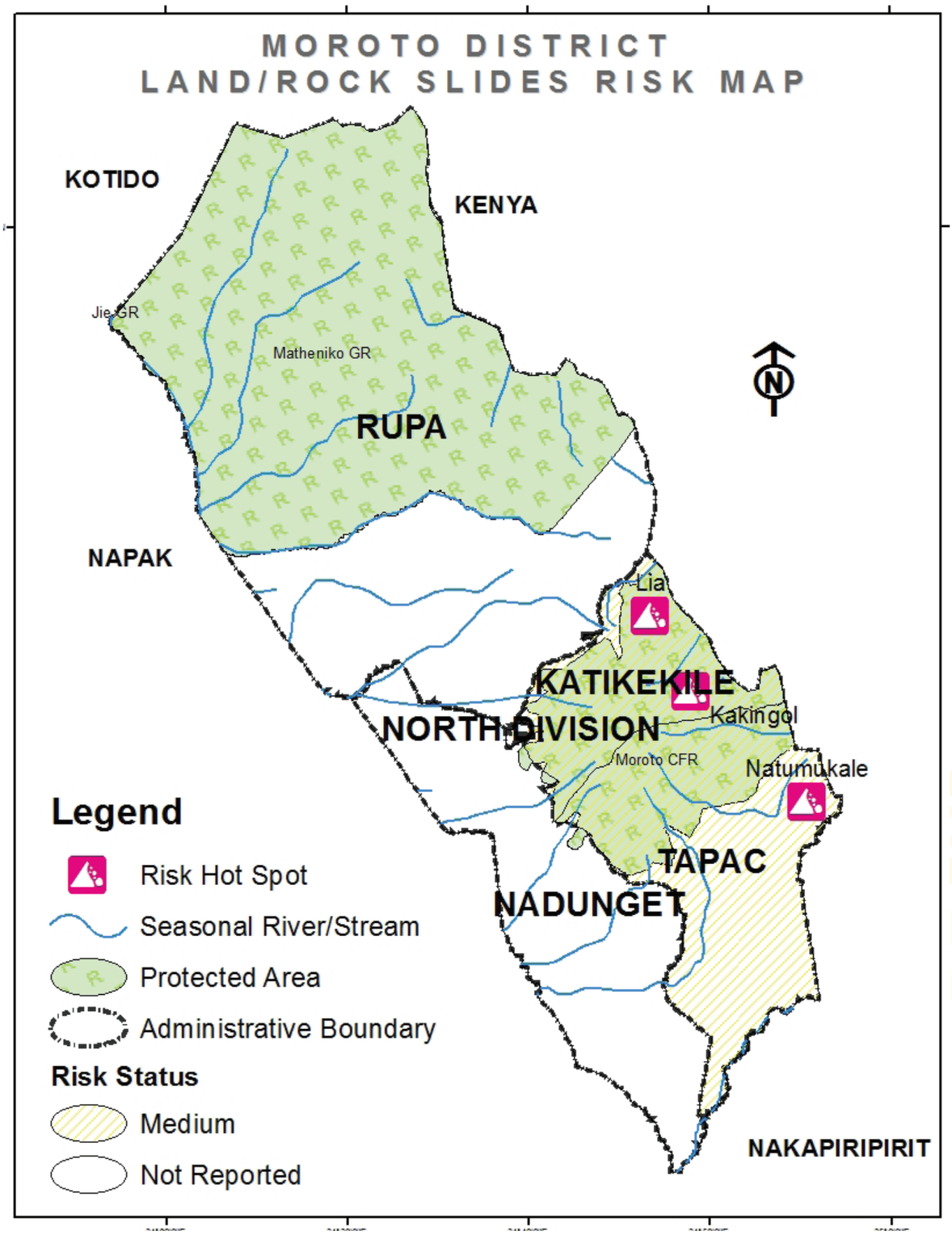

Figure 8 Landslide risk

Landslides are common in the mountainous areas of Tapac and Katikekile Sub County. The rock slides mainly occur during prolonged (hours) heavy rainfall; the rains weaken the soils which may fracture and liquefy, and flow rapidly to lower lying areas, affecting communities in their path. The impact of rock slides is loss of human and animal lives and crops as villages and gardens are buried. Landslide cases were reported in the Tepeth communities of Tapac and Katikekile. Other parts of the district have no reported cases of landslides.

Industrial Accident Risk

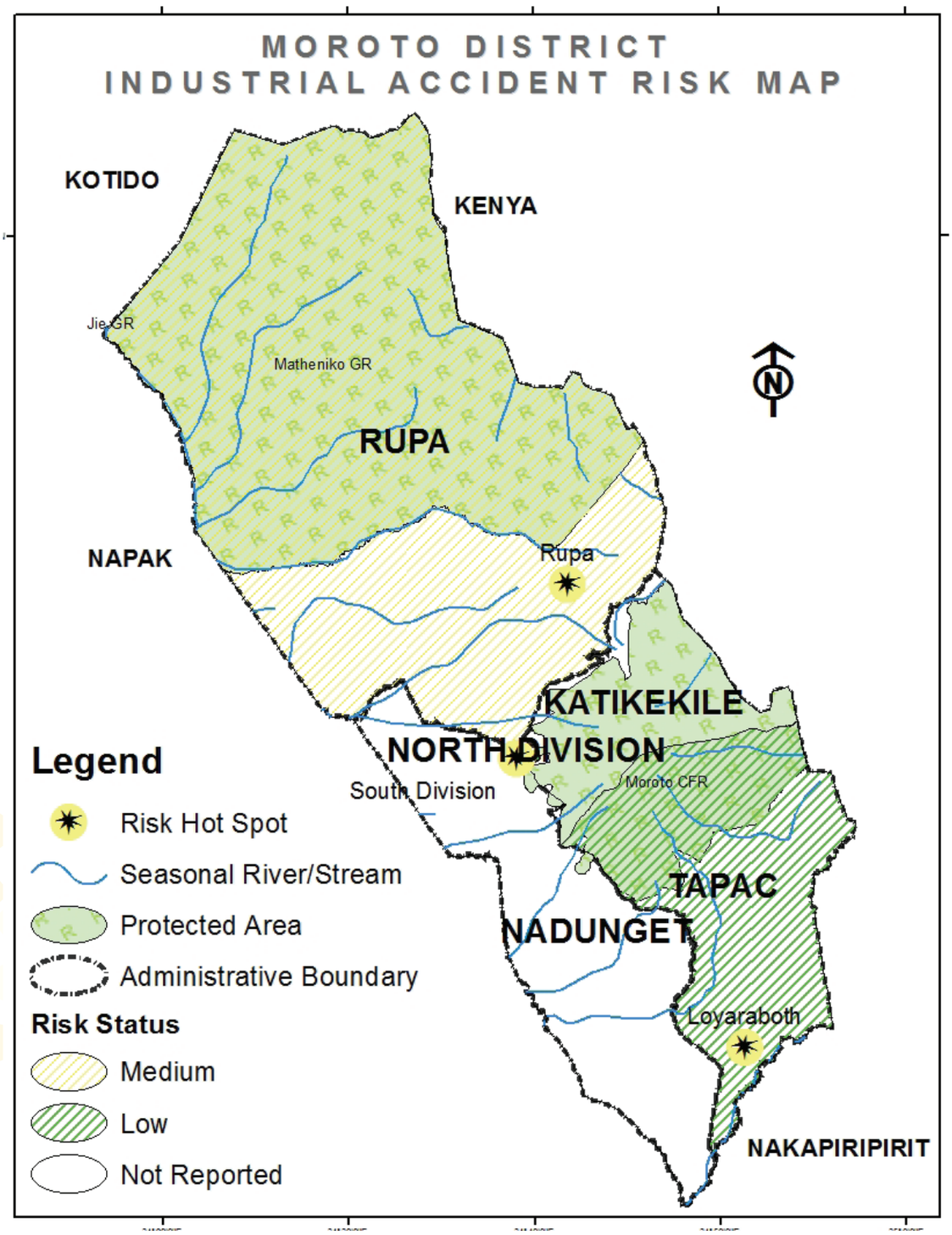

Figure 9 Industrial accident risk

Industrial accidents in Moroto district are primarily related to urban building fires and mining accidents. In South Division of Moroto municipality, fire burnt over 8 kiosks that are believed to have had illegal power connections, overcrowded and unplanned by the municipality. In Rupa, collapsed gold mines have killed many people. Gold mining has become regarded as a more lucrative alternative to farming in the unpredictable conditions of climate change so further fatalities can be expected in the sub-county. Other mining accidents have been reported in Katikekile Parish, especially in Kosiroi village.

Crop and Animal Disease Risk

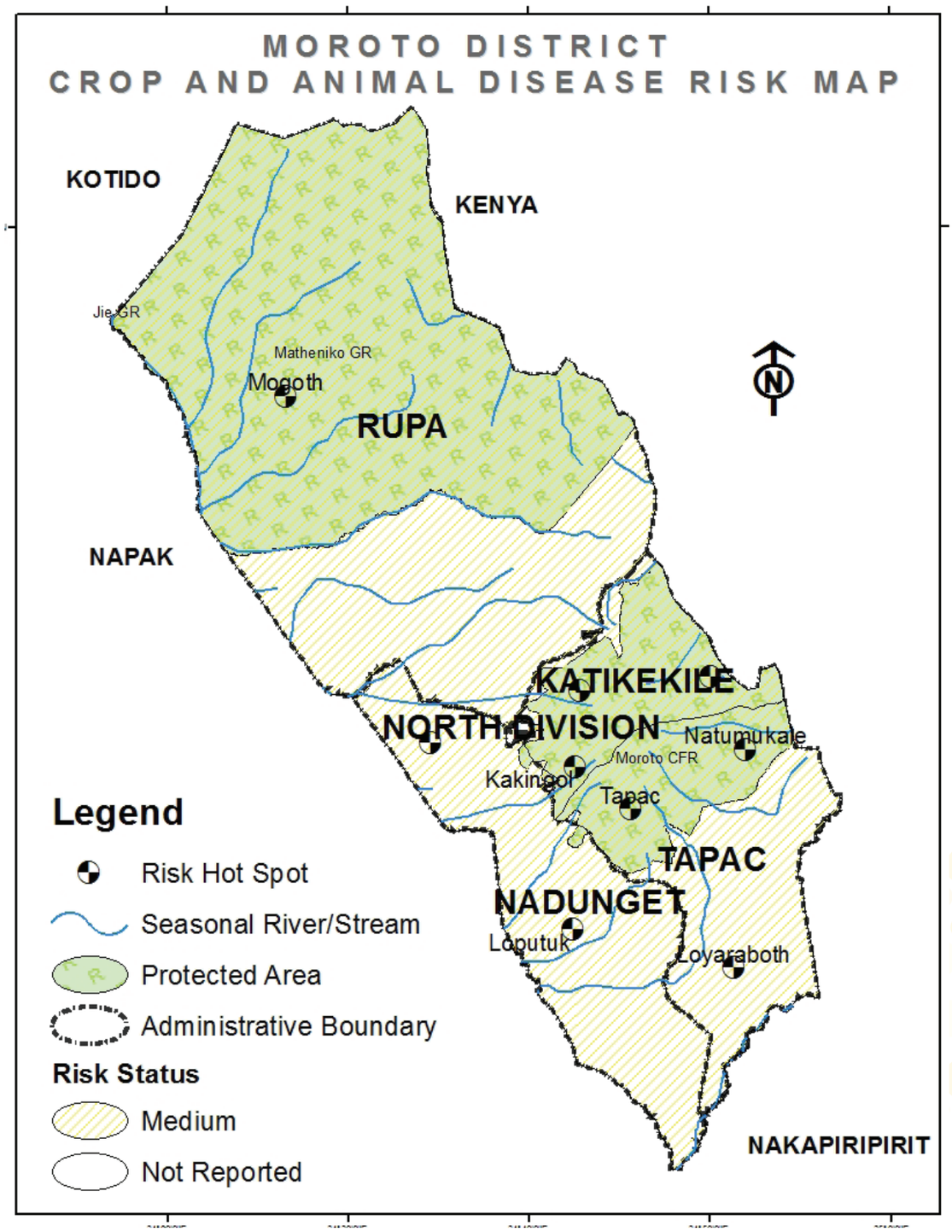

Figure 10 Crop and animal disease risk

These hazards are a serious threat given the vast population of livestock in the region and the nomadic pastoral lifestyle of the population. Animal diseases like CCPP, CBPP, PPR, Tick borne diseases and foot rot are reported to have killed a number of livestock in the Matheniko kraal, Rupa Sub-County in 2013. In Nadunget, anaplamosis claimed the lives of several cattle as well. Animal diseases are mainly due to the communal grazing methods, where several families keep their cattle in the same kraal.

Crop diseases are wide spread in the area, however due to the small number of agro-pastorals, the impact of crop diseases is not heavily felt.

Cattle Theft Risk

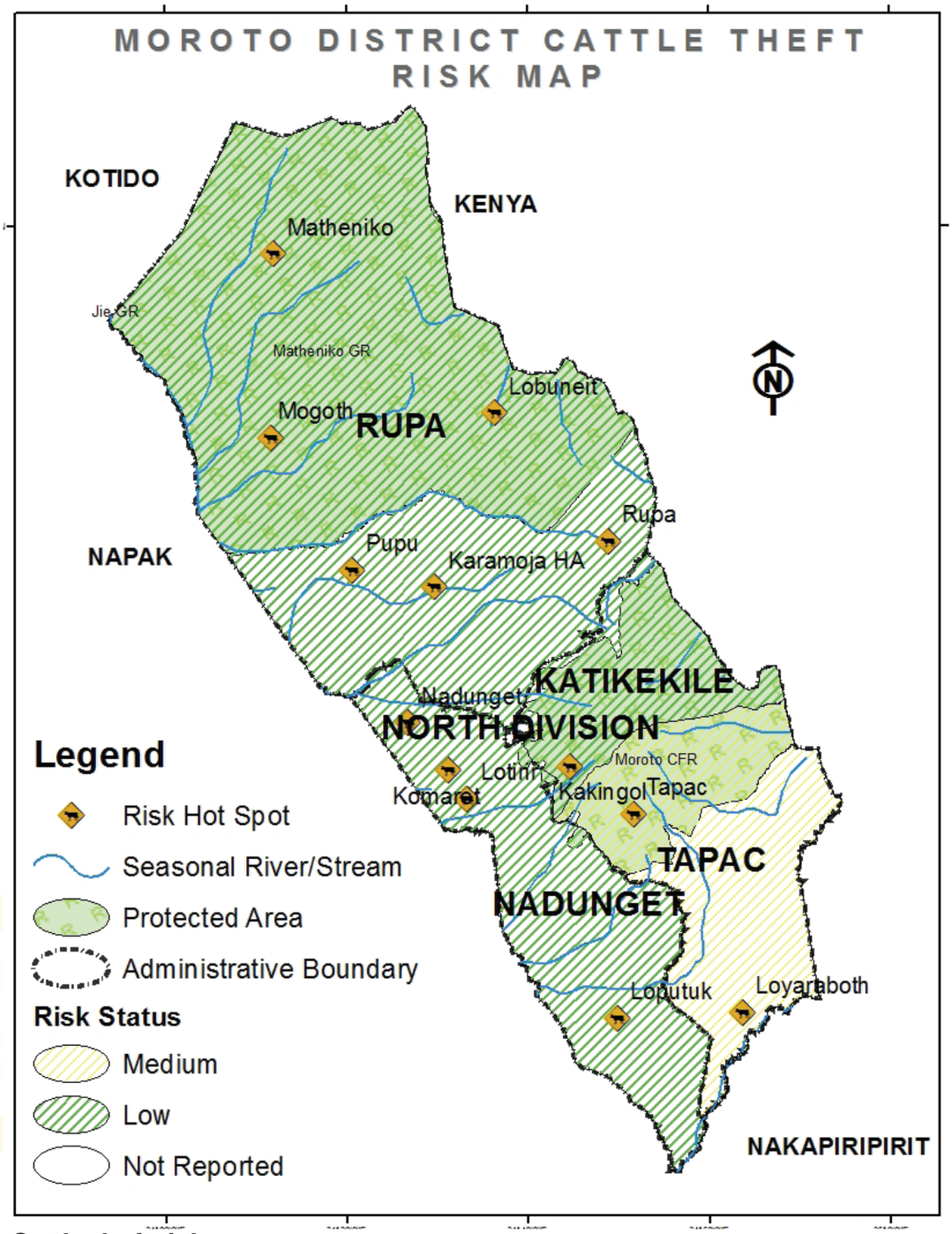

Figure 11 Cattle theft risk

Cattle theft and more especially rustling is on the decline as a result of disarmament which has improve security significantly. There are few cases reported of cattle thefts across borders between the Turkana of Kenya and Tepeth Communities. In Tapac and Katikekile Sub-Counties, cases are rare in occurrence due to the control by the Uganda People Defence Forces. Cattle thefts negatively affected the food security in the area. Within the district, the registered cases have reduced to mainly internal in nature where an individual from a neighbouring village steals from another. These cases often have been resolved in most cases. Although border cases have been reported, these are no longer common.

Hailstorm and Lightning Risk

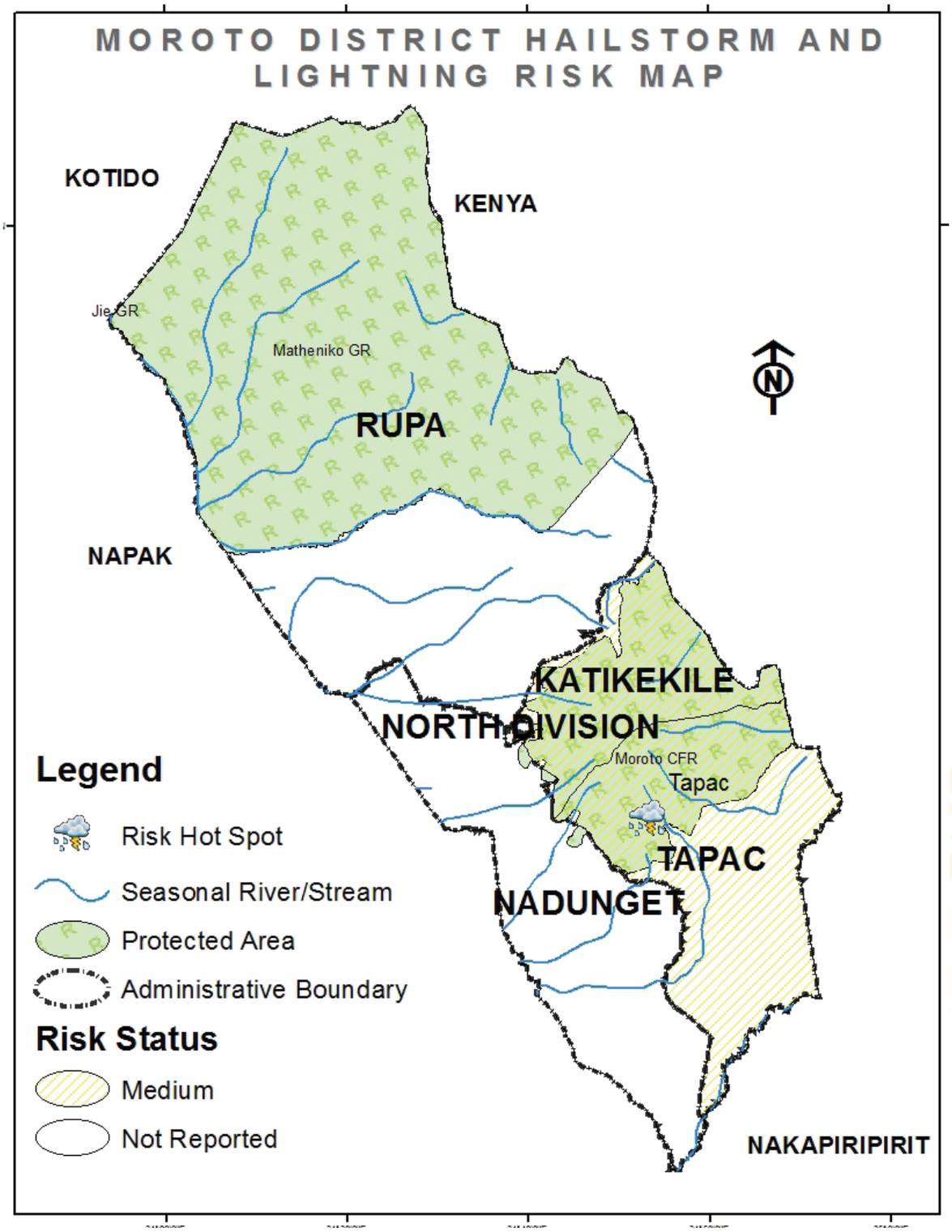

Figure 12 Hailstorm and lightning risk

Due to environment degradation and climatic changes, there are now frequent cases of erratic weather associated with severe storms, heavy rain, lightening and hail storms which cause destruction of crops, livestock and physical infrastructure. Many roofs of houses, schools, churches and homesteads have been blown off by strong winds. Cases of animals struck by lightning were reported in the parish of Tapac (Napakikimul and Lonyilik villages).

Land Conflict Risk

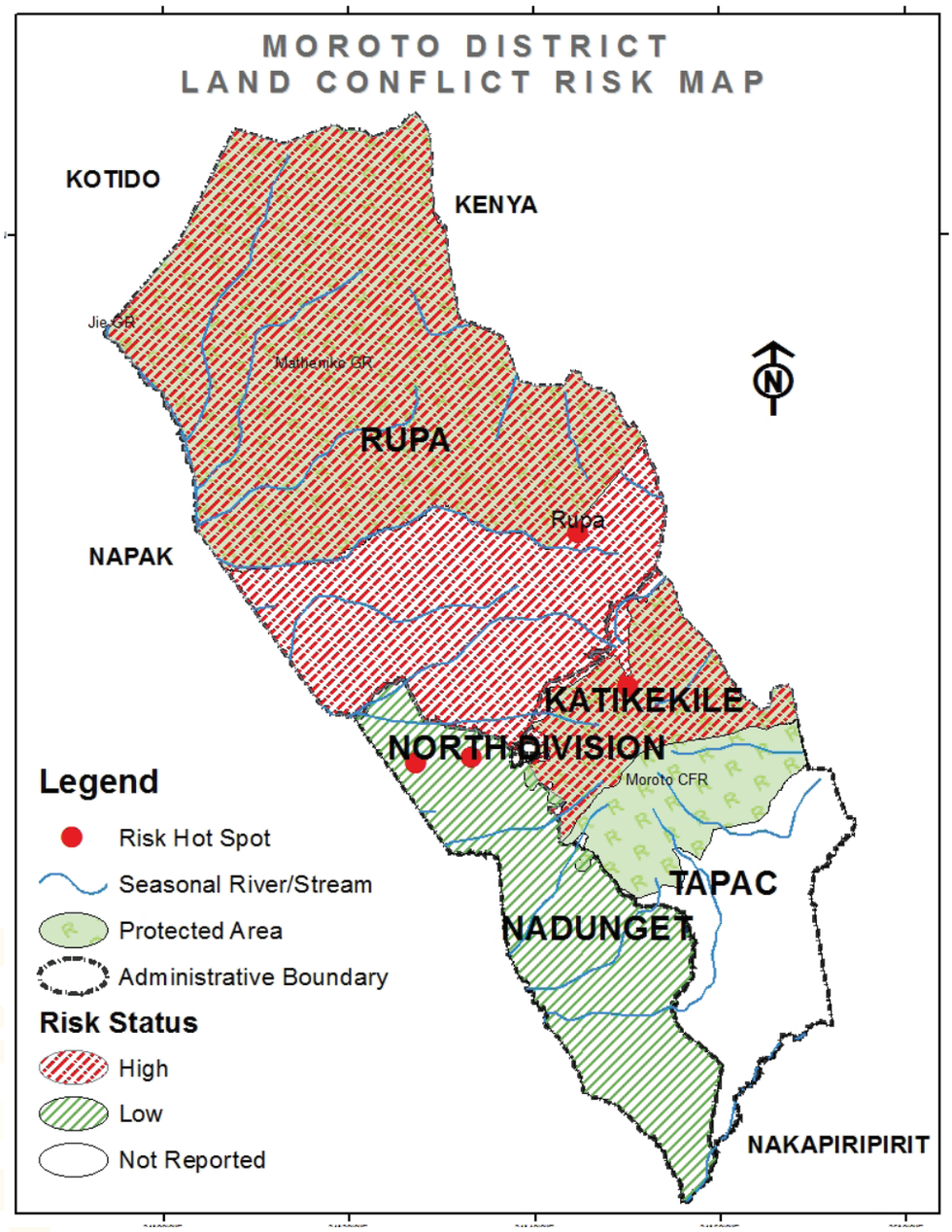

Figure 13 Land conflict risk

Due to population increase, land disputes and conflict are increasing throughout the district. Encroachment into institutional and government land has become common. Many Lower Local Governments in the district have been taken to courts of law because communities are reclaiming land that was given to government by their ancestors. Institutionally, schools and churches have land boundary cases with communities living adjacent to them. Land fragmentation is also increasing.

In Rupa Sub County the community is in dispute with the Uganda Wildlife Authority about fertile cultivable land in the former sub-county Lotisan which is now in the Matheniko Wildlife Reserve. In another case the community is pitted against holders of mineral concessions. Rupa Sub-County and Katikekile Sub-County are disputing an administrative boundary upon which distribution of royalties from mining companies (Jan Mangal, DAO and African Minerals) depends.

Vermin and Problem Animals Risk

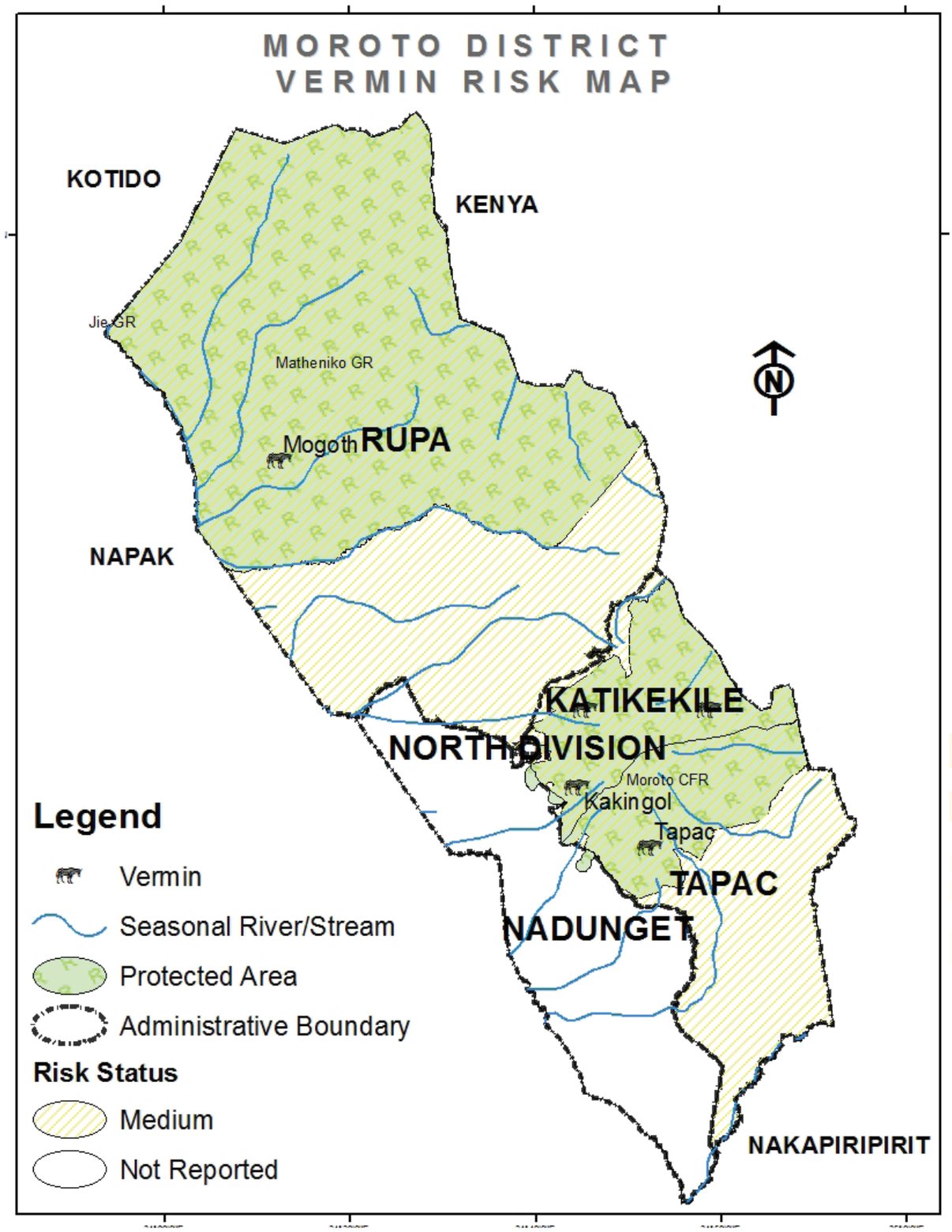

Figure 14 Vermin and problem animal's risk

During the harvest season in 2013, the community in Tapac Sub County reported the loss of the crops to wild animals. Warthogs were specifically reported to have inflicted significant damage to crops. There are also minor cases reported in Katikekile and Rupa since most of these sub-counties are within the protected areas.

VULNERABILITY

Risk and Vulnerability Assessment

Table 6 summarizes the communities' assessment of hazard severity and frequency in the sub-counties. Table 7 transforms those qualitative low/med/high judgements to numerical values which, when summed horizontally and sorted in descending order, rank the hazards by risk. The vertical sums indicate the relative aggregate vulnerability of the sub-counties.

Table 7 Risk and vulnerability assessment

Hazard	Rupa	Nadunget	Katikekile	Tapac	Moroto MC	Totals
Strong Wind	3	3	3	1	2	12
Environmental Degradation	3	3	3	2	1	12
Drought and Food Insecurity	3	3	2	2	1	11
Human Disease	2	2	2	2	2	10
Crop And Animal Disease	2	2	2	2	1	9
Floods	3	2	1	1	1	8
Land Conflict	3	1	3	1	0	8
Bushfires	0	0	3	3	1	7
Cattle Theft	1	1	1	2	1	6
Vermin	2	0	2	2	0	6
Pest Infestation	1	1	1	1	1	5
Industrial Accidents	2	0	0	1	1	4
Landslide	0	0	2	2	0	4
Hailstorms, Lightning	0	0	2	2	0	4
Totals	25	18	27	24	12	106

Vulnerability

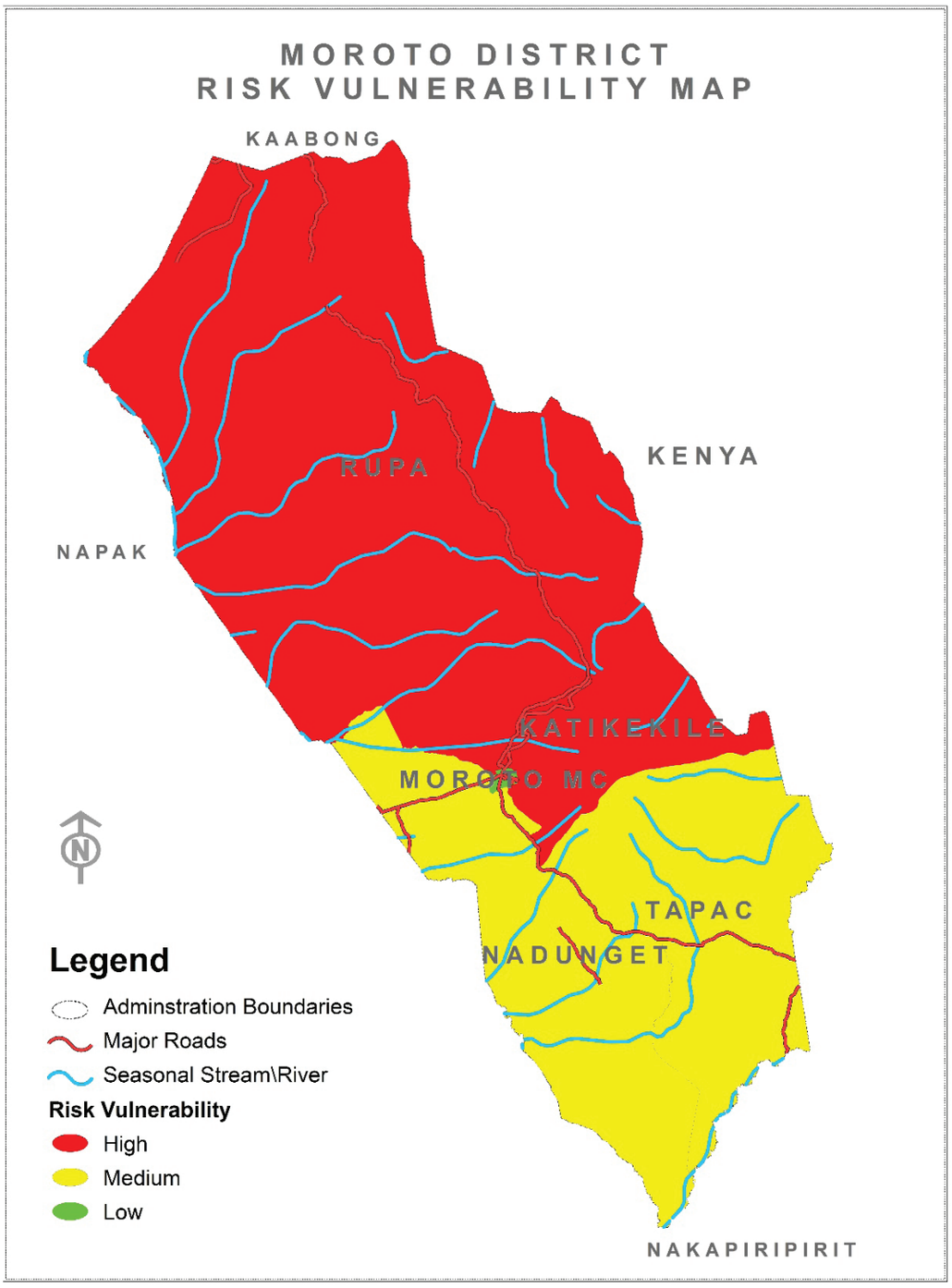

Fig. 15 Vulnerability Map

Moroto district risk vulnerability is categorized into; High, Medium and Low. All the sub counties except Moroto Municipality are ranked as high risk vulnerability areas within the district. The major hazards that affect these areas are floods, drought and food insecurity, strong winds, environmental degradation among others. The floods which have often blocked roads and destroyed crops and other property are due to the runoff water from the mountains and hills and the various rivers, that over flow during the rainy seasons. Although these are flash floods, they have impacted on the socio and economic activities with in these sub-counties.

Massive environmental degradation is attributed to commercialization of charcoal burning for fuel and collecting wood for fuel. The drought and food insecurity which is related to unpredictable climatic conditions, has led the communities to utilize the environment in unfriendly avenues to sustain households.

The strong winds are frequent in occurrence especially with the huge numbers of trees cut down which otherwise would have acted as wind breakers. Strong winds have affected crops and houses impacting mainly the women and children who spend most of their time in the gardens and houses. The wild\bush fires are attributed to farming practices, hunting. The fires usually spread very fast and have affected property since the houses are made of mud and wattle.

The low risk vulnerability area is Moroto Municipality. The hazards that have impacted on this area are, industrial accidents, strong winds among others. The industrial accidents within the town centers are partly attributed to poor\lack of physical planning hence the overcrowded nature of settlements has made them susceptible to electricity fires.

The urban centers usually have low risk vulnerability situations yet most urbanites are the main cause of the hazards and vulnerability risks in the upcoming or rural areas. For instance all charcoal burning is done in the rural areas but most is consumed in the urban areas.

CONCLUSIONS

The multi-hazard vulnerability profile produced in this mapping exercise combines physical data and perceptual information captured with participatory methods in Moroto District. It provides an understanding of how the district perceives each hazard based on likelihood of occurrence and its impact on the local communities.

The findings identify 14 hazards, strong wind, environmental degradation, drought, human disease, crop and animal disease, floods, land conflict, bushfires, cattle theft, vermin, pest infestation, industrial accidents, landslide, hailstorms, lightning, as predominant in the district, in order of decreasing risk.

Strong wind, environmental degradation, drought and human disease ranked closely as the most dangerous and high-risk hazards for people in Moroto District.

All of the sub-counties have significant vulnerability to disaster, accumulating risk from these hazards. Rupa, Katikekile and Tapac, Sub-Counties record high aggregate vulnerability levels. The least vulnerable, Moroto municipal Council, has medium risk of strong winds and human disease. This aggregated vulnerability to several hazards at once compounds the exposure to disaster risk and the complexity of managing it.

The mapping exercise demonstrates the value of integrating spatial information with community perception of hazards in the understanding of disasters in Moroto District. This disaster risk knowledge should therefore inform the disaster mitigation plans developed by the Moroto district local government that direct actions to minimize the impacts of hazards.

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/destroy 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. It sometimes involves use of fire arms and thus resulting into loss of lives.

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. They 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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