



THE REPUBLIC OF UGANDA

Bundibugyo District

Hazard, Risk and Vulnerability profile



2016

Acknowledgment

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Hon. Hilary O. Onek

Minister for Relief, Disaster Preparedness and Refugees

Contents

Acknowledgment	i
Contents	ii
List of Figures	ii
List of Tables.....	ii
Acronyms.....	iii
Executive Summary.....	iv

Introduction.....	1
Objectives.....	1
Methodology	1
Overview of the District.....	4
Location	4
Overview.....	4
Demographics	5
Livelihoods.....	6
Hazards	7
Hazards and Risks Assessments	10
Vulnerability	26
Conclusions.....	29
Definition of Terms.....	30

List of Figures

Figure 1: Landslide risk Map	10
Figure 2: Crop pests and diseases risk Map	12
Figure 3: Flood risk Map.....	14
Figure 4: Environmental degradation Map	16
Figure 5: Internal conflict risk Map.....	18
Figure 6: Human epidemic risk Map.....	20
Figure 7: Bush fire risk Map.....	21
Figure 8: Earthquake risk Map	22
Figure 9: Pest and animal disease risk Map.....	24
Figure 10: Vulnerability Map.....	27

List of Tables

Table 1: Projected 2012 Population of Bundibugyo District by Sub-county.....	5
Table 2: Major Tribes and Languages Spoken in Bundibugyo District	5
Table 3: Bundibugyo District Main Livelihoods, by Sub-county and Town Council.....	6
Table 4: Hazard Status	7
Table 5: Summary of Hazards by Sub-county	8
Table 6: Ranking of hazards	8
Table 7: Hazard risk assessment.....	9
Table 8: Risk and vulnerability assessment.....	26



ACRONYMS

CBPP	Contagious Bovine Pleuropneumonia
CFR	Central Forest Reserve
CICO	Chongqing International Construction Corporation
DDMC	District Disaster Management Committee
DRC	Democratic Republic of Congo
DRM	Disaster Risk Management
GIS	Geographic Information System
GPS	Global Positioning System
NGOS	Non-Government Organization
OPM	Office of the Prime Minister
TC	Town Council
UNDP	United Nations Development Programme

EXECUTIVE SUMMARY

This Bundibugyo 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.

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.

Bundibugyo District's geographic centre is located at 00° 43'N, 30° 04'E. The District is bordered by Hoima District to the northeast, Kibaale District to the East, Kabarole District to the South, and the Democratic Republic of the Congo to the West and North.

The profile identifies ten endemic hazards: severe storms, Landslides, floods, crop pest and disease, environmental degradation, internal conflicts, human epidemics, animal vector and disease, bush fires and earth quakes.

The Bundibugyo District Local Government Officials together with the communities ranked landslides, crop pests and diseases, animal vectors and diseases and severe storms to be the highest risks.

The most vulnerable communities in Bundibugyo District are Kasitu, with a weighted vulnerability of 5 (medium). Kasitu Sub-county is closely followed by Bubukwanga, Kirumya, Nyahuka Town Council, Bukonzo, and Ngamba Sub-counties with weighted vulnerabilities of 4, 4, 3, 3, 3 (low) respectively. The least vulnerable communities are those of Harugale, Sindila, Mirambi and Bubandi Sub-counties with a weighted vulnerability of 1 (low) each.

Early warning systems and other DRR interventions would be able to enhance the resilience of the people of Kabarole to the effects of climate change.

This profile is a legitimate 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 planning, District development planning process towards disaster proof plans.

INTRODUCTION

Bundibugyo District is vulnerable to a number of hazards that lead frequently to disasters. They include flooding, landslides, drought, animal attacks on crops, livestock and humans, crop pests and diseases, animal pests and diseases, environmental degradation, internal conflicts, hailstorms, wind storms, bush fires, human epidemic and earthquakes. While incidence of these hazards is reported, no consolidation and mapping of this information has been done to analyze the District's exposure and susceptibility to disaster risks.

The Bundibugyo 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 Bundibugyo 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 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 Bundibugyo 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 rutting
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

Bundibugyo District has 13 rural Sub-counties and 2 Urban Town Councils. It is bordered by Hoima District to the Northeast, Kibaale District to the east, Kabarole District to the South, and the Democratic Republic of the Congo to the West and North. The District headquarters at Bundibugyo are located approximately 78km West of Fort Portal and 154km by road North of Kasese Municipality, the largest urban centre in the Sub-region. Bundibugyo to Fort Portal is 83 km; Fort Portal to Kasese is 71 km. The geographic boundaries of the District are the Semuliki River to the West, the Ruwenzori Mountains to the East and Ntoroko to the North. The geographic location of the District is at 00 43N, 30 04E.

Overview

The District is relatively isolated from the rest of Uganda, being the only District that lies west of the Ruwenzori Mountains. Though it is still a part of the Nile Basin, it is ecologically and culturally part of Central Africa. Its people and customs are more similar to those of eastern DRC than the rest of Uganda, despite being politically in Uganda and East Africa. In 2010, the Northern part of Bundibugyo District was removed to form Ntoroko District. Bundibugyo District, together with neighboring Ntoroko District and Kasese District, are part of the Rwenzururu Kingdom.



Demographics

Table 1: Projected 2012 Population of Bundibugyo District by Sub-county

Sub-county	Male	Female	Total
Sindila	11,200	11,900	23,100
Ndugutu	12,900	13,200	26,100
Harugale	12,200	13,700	25,900
Bukonzo	5,900	7,800	13,700
Ngamba	6,000	6,800	12,800
Ntotoro	5,300	5,700	11,000
Kasitu	10,800	11,800	22,600
Bubandi	9,200	10,800	20,000
Nyahuka TC	4,800	5,400	10,200
Kisubba	8,400	8,900	17,300
Busaru	11,600	12,700	24,300
Mirambi	6,500	7,200	13,700
Bundibugyo TC	11,100	12,000	23,100
Bubukwanga	10,200	11,900	22,100
Kirumya	4,600	5,200	9,800
Total	111,652	124,911	276,600

Table 2: Major Tribes and Languages Spoken in Bundibugyo District

Sub-county	Tribe	Language
Sindila	Bakonzo, Bamba, Babwisi	Lukonzo, Kwamba, Lubwisi
Ndugutu	Bakonzo, Bamba, Babwisi	Lukonzo, Kwamba, Lubwisi
Harugale	Bakonzo, Bamba, Babwisi	Lukonzo, Kwamba, Lubwisi
Bukonzo	Bakonzo, Bamba, Babwisi	Lukonzo, Kwamba, Lubwisi
Ngamba	Bakonzo, Bamba, Babwisi	Lukonzo, Kwamba, Lubwisi
Ntotoro	Bakonzo, Bamba, Babwisi	Lukonzo, Kwamba, Lubwisi
Kasitu	Bakonzo, Bamba, Bavanuma, Batwa, Batuku	Lukonzo, Kwamba, Lubwisi, Lutoro, Luvanuma
Bubandi	Bakonzo, Bamba, Babwisi	Lukonzo, Kwamba, Lubwisi
Nyahuka TC	Bakonzo, Bamba, Babwisi	Lukonzo, Kwamba, Lubwisi
Kisubba	Bakonzo, Bamba, Babwisi	Lukonzo, Kwamba, Lubwisi
Busaru	Bakonzo, Bamba, Babwisi	Lukonzo, Kwamba, Lubwisi
Mirambi	Bakonzo, Bamba, Babwisi	Lukonzo, Kwamba, Lubwisi
Bundibugyo TC	Bakonzo, Bamba, Babwisi, Batoro	Lukonzo, Kwamba, Lubwisi, Rutooro
Bubukwanga	Bakonzo, Bamba, Babwisi	Lukonzo, Kwamba, Lubwisi
Kirumya	Bakonzo, Bamba, Babwisi	Lukonzo, Kwamba, Lubwisi

Livelihoods

Table 3: Bundibugyo District Main Livelihoods, by Sub-county and Town Council

Agro-ecological zone	Livelihood	Sub-county
Highland Zone	Bananas, Arabia coffee, beans, cassava, irish potatoes, seasonal horticultural crops, barley	Sindila, Ndugutu, Harugale, Bukonzo, Ngamba, Kasitu
	Goats and cattle, poultry, piggery	Sindila, Ndugutu, Harugale, Bukonzo, Ngamba, Kasitu, Ntotoro
	Apiary	Sindila, Ndugutu, Harugale, Bukonzo, Ngamba, Kasitu
	Tourism	Sindila, Ndugutu, Harugale, Bukonzo, Ngamba, Kasitu
	Petty trade	Sindila, Ndugutu, Harugale, Bukonzo, Ngamba, Kasitu, Ntotoro
	Agricultural markets	Sindila, Ndugutu, Harugale, Bukonzo, Ngamba, Kasitu, Ntotoro
	Brick laying	Sindila, Ndugutu, Harugale, Bukonzo, Ngamba, Kasitu, Ntotoro
	Fish farming	Sindila, Ndugutu, Harugale, Bukonzo, Ngamba, Kasitu, Ntotoro
	Charcoal burning and fuel wood	Sindila, Ndugutu, Harugale, Bukonzo, Ngamba, Kasitu, Ntotoro
	Lumbering	Sindila, Ndugutu, Harugale, Bukonzo, Ngamba, Kasitu, Ntotoro
Lowland Zone	Bananas, robusta coffee, soya beans, cassava, sweet potatoes, cocoa	Bubandi, Nyahuka TC, Kisubba, Busaru, Mirambi, Bundibugyo TC, Bubukwanga, Kirumya
	Goats, piggery, poultry, cattle,	Bubandi, Nyahuka TC, Kisubba, Busaru, Mirambi, Bundibugyo TC, Bubukwanga, Kirumya
	Petty trade	Bubandi, Nyahuka TC, Kisubba, Busaru, Mirambi, Bundibugyo TC, Bubukwanga, Kirumya
	Transport	Bubandi, Nyahuka TC, Kisubba, Busaru, Mirambi, Bundibugyo TC, Bubukwanga, Kirumya
	Tourism	Kisubba, Bubukwanga
	Aquaculture	Bubandi, Nyahuka TC, Kisubba, Busaru, Mirambi, Bundibugyo TC, Bubukwanga, Kirumya
	Brick making	Bubandi, Nyahuka TC, Kisubba, Busaru, Mirambi, Bundibugyo TC, Bubukwanga, Kirumya
	Stone quarrying and sand mining	Bubandi, Nyahuka TC, Kisubba, Busaru, Mirambi, Bundibugyo TC, Bubukwanga, Kirumya
	Charcoal burning, fuel wood	Kisubba, Bubukwanga, Kirumya
Lumbering	Bubandi, Nyahuka TC,	

Hazards

Table 4: Hazard status

Hazard	Status	Sub-county
Landslides	Instances of mudslides in the low lying areas reported	Kirumya, Ntotoro, Bubukwanga, Bundibugyo Town Council, Nyahuka Town Council, Busara, Ngamba, Kasitu, Bukonzo, Sindila, Ndugutu, Harugale
Crop pests and diseases	Instances of banana wilt, African cassava mosaic, cassava brown streak, cocoa verticium wilt, coffee wilt reported	Bubukwanga, Bundibugyo TC, Nyahuka TC, Bukonzo, Kasitu, Kirumya, Kisubba, Ndugutu, Busaro and Ngamba Sub Counties
Animal Vector and diseases	Instances of swine fever, foot and mouth, CBPP, rabies and east coast fever are reported	Kasitu Sub-county
Heavy storms	Instances of hail storm and high winds reported	District wide
Flooding	Instances reported	All Sub Counties and Town Councils
Environmental degradation	River bank degradation as a result of sand and stone mining along the rivers; Central Forest Reserves cut off and settled in by locals have been reported	Nyahuka, Ndugutu, Bubukwanga, Harugale, Bukonzo, Busaro, Kasitu and Kirumya
Internal conflicts	Instances of tribal conflicts reported between Bakonjo and Bamba	Bubukwanga, Kisuba, Nyahuka TC, Busaro, Ntotoro
Human epidemic	Incidence of Ebola reported in 2007	Ngamba, Bundibugyo Town Council
Bush fires	Incidence of wild fire reported	Kasitu
Earthquake	Incidence of 1966 reported	Bundibugyo Town Council

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	Severe storms	Landslides	Floods	Crop pest and disease	Environmental degradation	Internal conflicts	Human epidemics	Animal Vector and disease	Bush fires	Earth quakes	Total
Kasitu	•	•							•		7
Bubukwanga	•	•			•	•					6
Bundibugyo TC	•	•					•			•	6
Nyahuka TC	•	•		•		•					6
Ntotoro	•	•				•	•				5
Bukonzo	•	•		•							5
Ndugutu	•	•			•						5
Busaro	•					•					5
Kirumya	•		•		•						4
Kisubba	•			•							4
Harugale	•	•									4
Ngamba	•	•									4
Sindila	•	•	•								3
Merambi	•										2
Bubandi	•										2
Total	15	10	15	10	8	5	2	1	1	1	68

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	Landslides	2	5	3	10	1
2	Crop pest and disease	2	5	3	10	1
3	Environmental degradation	3	4	2	9	3
4	Floods	1	5	2	8	4
5	Internal conflicts	1	3	1	5	5
6	Human epidemics	1	2	1	4	6
7	Bush fires	2	1	1	4	6
8	Animal Vector and disease	1	1	1	3	8
9	Earth quakes	1	1	1	3	8



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	Landslides	Crop pest and disease	Environmental degradation	Internal conflicts	Human epidemics	Animal Vector and disease	Bush fires	Earth quakes
Kasitu	H	L	M	H	M	N	M	M	N
Bubukwanga	M	M	M	H	H	N	N	N	N
Bundibugyo TC	L	M	M	N	L	L	N	N	L
Nyahuka TC	L	L	M	H	L	N	N	N	N
Ntotoro	M	L	N	N	M	N	N	N	N
Bukonzo	L	L	M	M	H	N	N	N	N
Ndugutu	L	L	M	L	L	N	N	N	N
Busaru	N	N	M	H	L	N	N	N	N
Kirumya	N	H	M	H	H	N	N	N	N
Kisubba	L	N	M	N	L	N	N	N	N
Harugale	N	L	N	M	N	N	N	N	N
Ngamba	N	H	M	N	N	H	N	N	N
Sindila	L	L	N	N	N	N	N	N	N
Mirambi	L	N	N	N	N	N	N	N	N
Bubandi	M	N	N	N	N	N	N	N	N

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

Risks

Landslide Risk

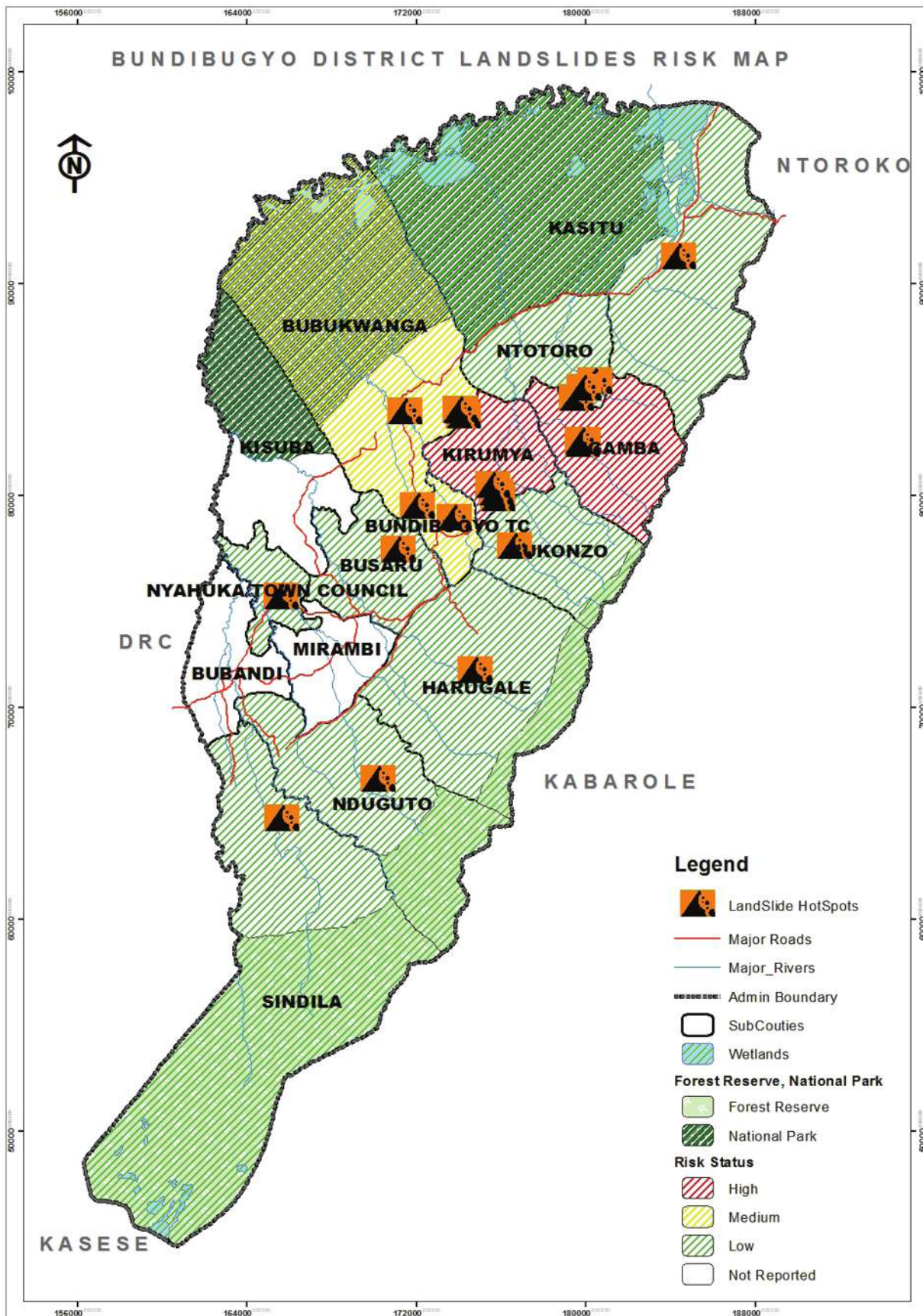


Figure 1: Landslide risk map



Figure 1 above shows the status of landslides as a hazard in Bundibugyo District. Landslides in the low lying areas are reported often for instance in May, 2013 overran approximately 200 hectares of farmland. They carried away or buried gardens of cocoa, bananas and coffee, affecting the local population to varying extents: Kirumya and Ngamba Sub-counties face high risk of landslides as shown on the map by the color red; Bubukwanga Sub-county has moderate risk to landslides as depicted by yellow on the map above; Kisuba, Mirambi and Bubandi Sub-counties did not report any incidences of landslides and all the other sub counties face low vulnerability thus the color green on the map.

The following locations are hotspots for the hazard in the respective sub counties:

- Kirumya (Bundikeki Parish at Nyangasa Village has extensive damage, Bundimurombi)
- Ntotoro (Bugando)
- Bubukwanga (Bubukwangaparish (BuhunduVillage) Bundigere Parish (Bundimbali Village) and Mataisa Parish (Bunyaruta Village, most hit)
- Bundibugyo Town Council Bimara Parish, Nyambiri and Kibale cells; Kanyansimbi Parish, Mutukula Cell; Bundibugyo Central Parish, Kisenyi cell.
- Nyahuka Town Council Kasiri Parish
- Busaru Sub-county, Bugombwa Parish, Mukudungu and Busengerwa Villages; Bundinyama Parish, Hakitara and Bundimwendya
- Ngamba Sub-county, Kikyo Parish, Burabagira Villages and Ngamba Parishes, Kakuka and Kityabya Villages
- Kasitu Sub-county, Kasitu Parish, Ntandi Parish and parts of Kabango
- Bukonzo Sub-county, Bundimulangya Parish, Kirumya Muslim and Sure Deal Villages, Buhundu Parish, Twanzane Village
- Sindila Sub-county, Kakuka Parish, Kakuka I, Malindi, Bihya, Buboni Villages; Bunyamwera Parish, Musili, Kabwe, Kaghughu Villages.
- Ndugutu Sub-County, Butama Parish, Kasingiri, Bugwiro, Nyakabugha and Butama Villages; Kasanzi Parish, Irombyo, Busigha, Kasanzi II Villages; Bundimbuga Parish, Buengya II Village and
- Harugale Sub-county, Bumate Parish, Kidungu Village; Bupomboli Parish, KibaleKabingo Villages; Kasulenge Parish, Kitsolima Bitsikya Villages; Ngite Parish, Kanyangoma Kabahira Villages.

Crop Pests and Diseases Risk

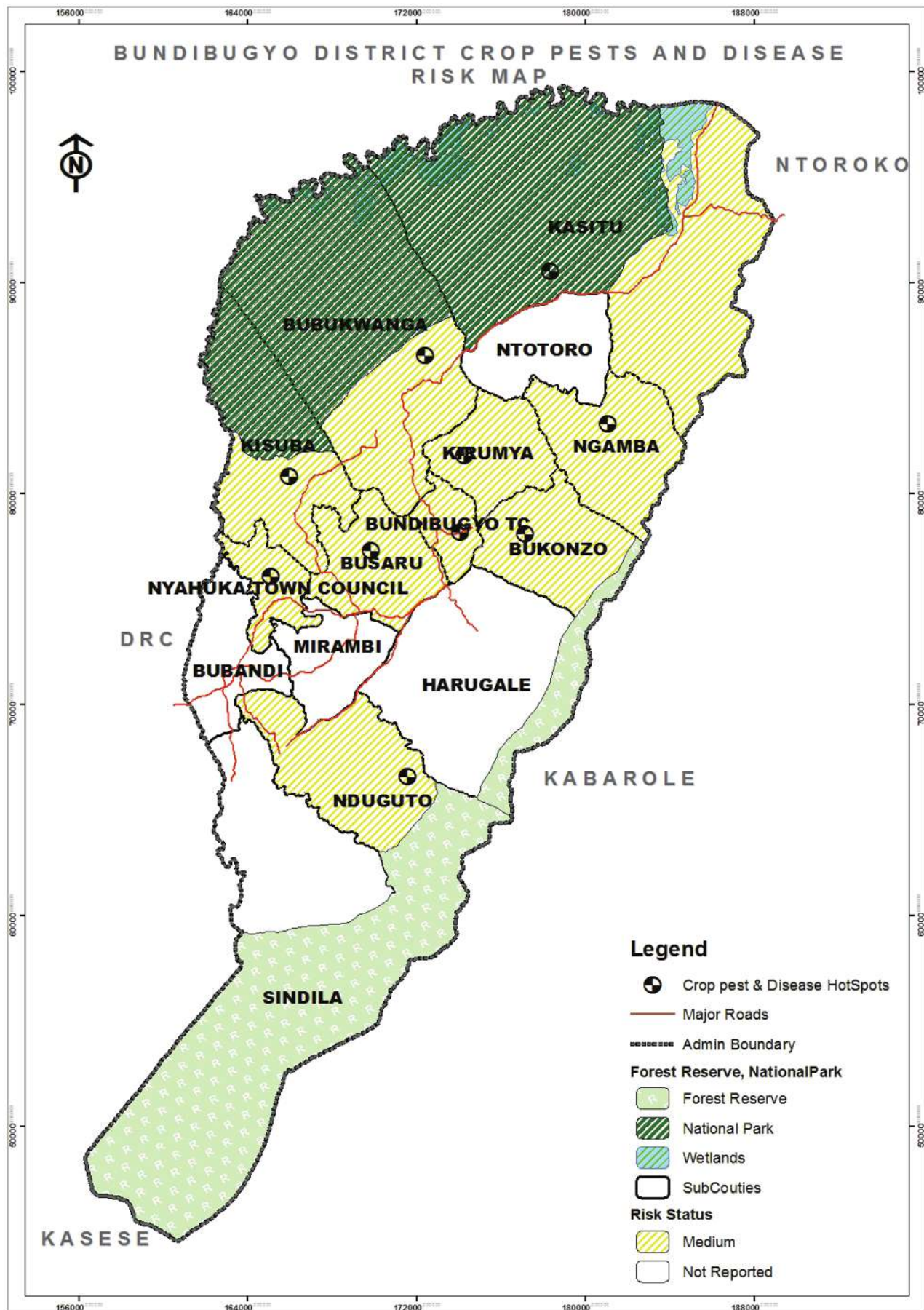


Figure 2: Crop Pests and Diseases Risk Map



Figure 2 shows the status of crop pests and diseases in the District. In Bundibugyo District, crop pest and diseases proliferate in the prone Sub-counties of Busaro, Bubukwanga, Bukonzo, Kirumya, Ngamba, Kasitu, Kisubba, Nyahuka, Bubandi, Mirambi, and Bundibugyo Town Council. These sub counties report moderate risk of crop pests and diseases represented by the yellow color on the map while Sindila, Harugale, Bubandi, Mirambi and Ntotoro did not report any incidences thus no risk of crop pests and diseases.

The following Parishes, which are hotspots for the hazard report crop pests and diseases: Bunyangule, Butama, Bundimbuga, Kasanzi, Ngite, Kasulenge, Bupomboli, Bumate, BuKangama, Buhundu, Bunguha, Burambagira, NgambaKikyo, Malomba, Kasitu, and Burondo Incidence of banana bacterial wilt, African cassava mosaic disease, cassava brown streak, cocoa verticillium wilt, coffee wilt disease, white flies, thrips, grass hoppers, army worms and birds are recorded. The cassava brown streak disease is widespread in the District.

Cocoa Verticillium wilt is prevalent mainly in low lying areas of the Sub-counties of Busaro, Kisubba, Nyahuka Town Council, Kirumya, Bubukwanga, Bubandi, Mirambi, and Bundibugyo Town Council.

Flood Risk

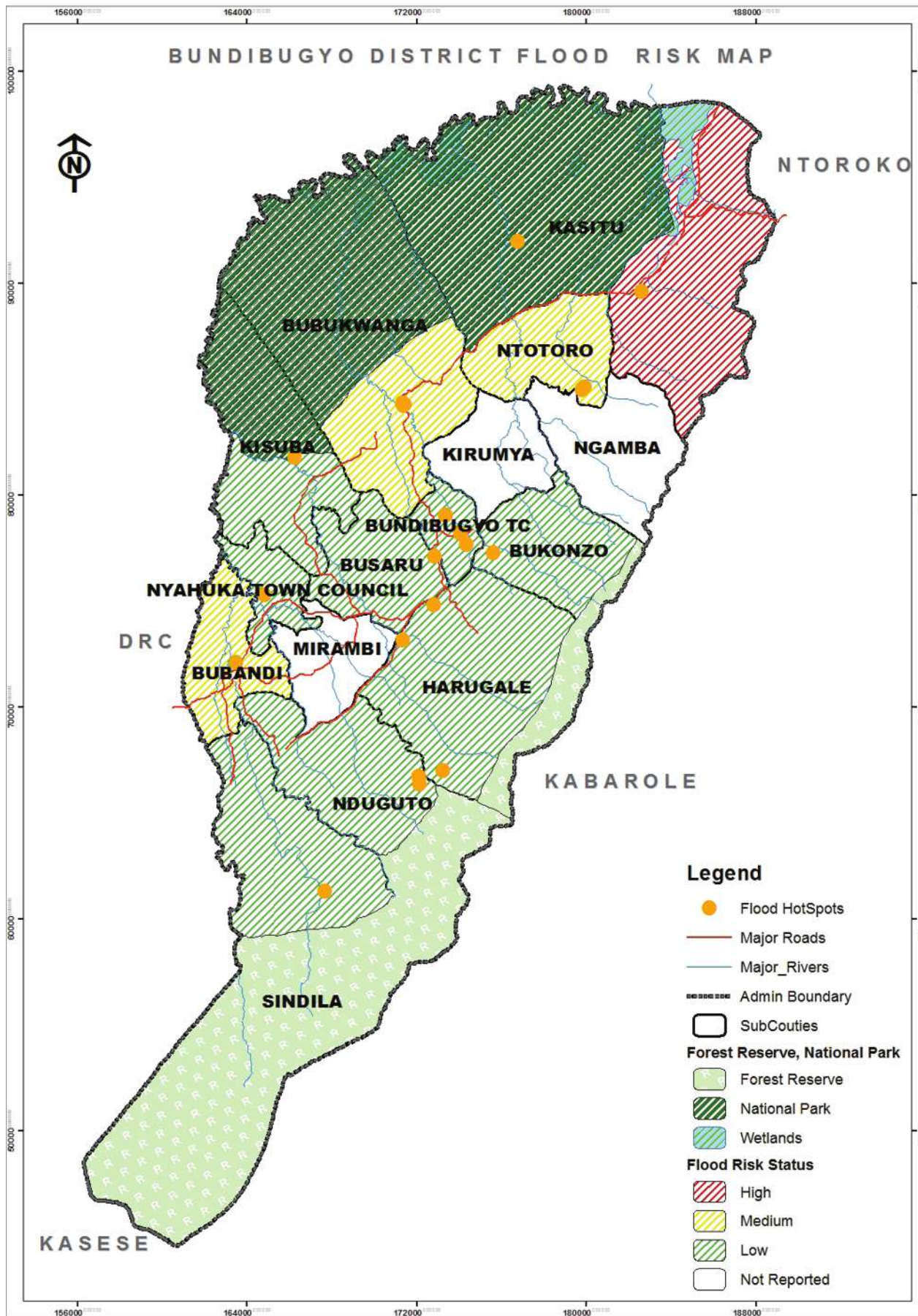


Figure 3: Flood Risk Map



Figure 3 displays the risk status of floods in Bundibugyo District. As shown on the map, the hazard risk is at varied magnitudes whereof Kasitu Sub-county is faced with the highest risk thus the color red; Ntotoro, Bubukwanga and Bubandi face moderate risk of floods; and the rest of the Sub-counties and Town Councils face low risk (coloured green on the map) except Mirambi, Kirumya and Ngamba which do not face any risk at all.

In each annual wet season floods occur on these rivers, constituting almost the entire District:

R. Semiliki, Kisubba, Bubukwanga, Ntotoro and Kasitu Sub-counties

R. Ntotoro, Ngamba, Kasitu and Ntotoro Sub-counties

R. Nkisia, Kasitu Sub-county

R. Kirumia, Bukonzo, Kirumia and Ntotoro Sub-counties

R. Lamya, Sindila, Bubandi, Nyahuka, and Kisubba Sub-counties

R. Mpulia, Kasitu Sub-county

R. Tokwe, Harugale, Bundibugyo Town Council and Bubukwanga Sub-counties

R. Nyalulu, Busaru, Harugale, Bubukwanga Sub-counties

R. Lugo, Harugale, Busaru, Kisuba and Bubukwanga Sub-counties

R. Nyahuka, Ndugutu, Merambi Sub-counties, and Nyahuka Town Council

R. Ndugutu, Ndugutu, Bubandi Sub-counties

R. Sindila, Sindila and Bubandi Sub-counties

R. Ngelemeke Kasitu Sub-county

R. Rwabatwa Ndugutu, Bubandi Sub-counties and Nyahuka Town Council

R. Kirumya Kirumya Sub-county.

Flash flooding may occur after a heavy rain in the mountains. Extensive damage is reported with loss of farm land and crops, livestock, bridges, gravity flow schemes, water sources and sometimes loss of human life. In 2001, Kasitu flooding killed 21 people in one day.

The Semuliki River frequently overruns its banks in Burondo Parish, Kasitu Sub-county, flooding extensive grazing land. Flowing between Uganda and DRC, its shifting course has international boundary implications.

Environmental Degradation Risk

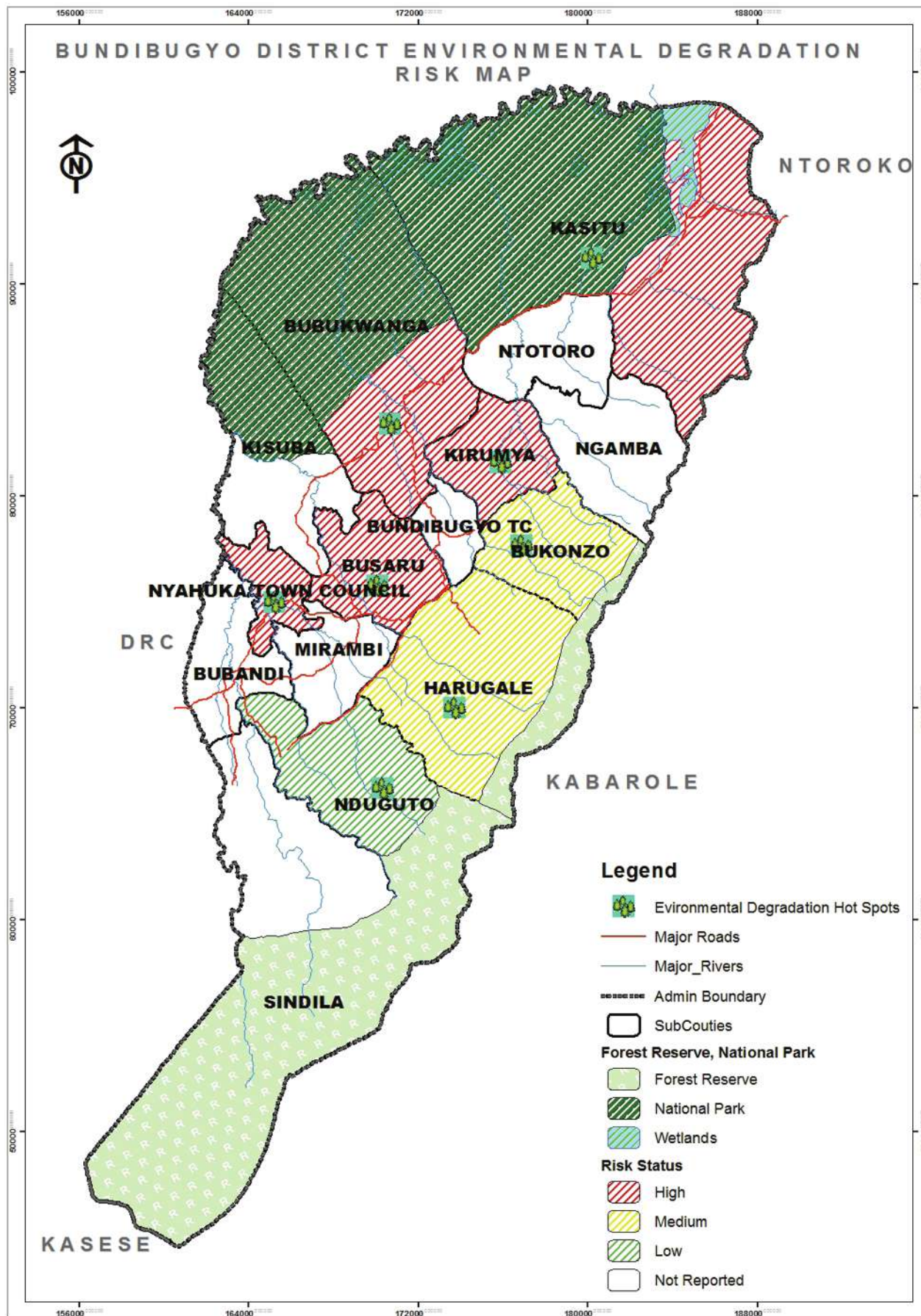


Figure 4: Environmental Degradation Risk Map

Figure 4 above depicts the risk status of environmental degradation in the District. In Bundibugyo District, environmental degradation is a grave risk because of the various aspects of life, livelihoods, property and environment it disrupts and destroys. The Sub-counties of Kasitu, Bubukwanga, Kirumya, Busaru, and Nyahuka Town Council are prone to high risk of environmental degradation and shaded in the color red; Bukonzo and Harugale sub counties are prone to moderate risk of environmental degradation; Ndugutu Sub-county is prone to low risk of environmental Degradation; and all the other sub counties and town councils are not prone to the risk of environmental degradation.

The environment is being degraded in various ways:

River bank degradation results from sand and stone mining on Nyahuka River in Nyahuka-Town Council. The activity weakens the river banks making it more vulnerable to erosion and river bank overflow, and causes silting and other side effects. It occurs at many points along the river Nyahuka, Rivers Bimara and Tokwe in Bundibugyo Town Council, Rivers Ndugutu and Lamya in Bubandi Sub-county and R. Nkisyia in Kasitu Sub-county

Invasions of Central Forest Reserves by settlers have been reported, reducing forest cover and its carbon capture capacity, in Kabango Muntandi CFR in Kasitu Sub-county, Bundikek CFR in Kirumya Sub-county, and Mataa and Nyakakindo in Busaru Sub-county. The largest CFR in the District has been entirely deforested for cultivation.

On the River Bimara and River Humya in Bubukwanga Sub-county, stone, sand mining and oil palm processing discharge sediment and waste into river, challenging aquatic life and the surrounding ecosystem.

The Harugale borrow pits and others were opened by CICO for gravelling roads in Bundibugyo, accelerating soil erosion on the slopes and raising the risk of landslides.

Internal Conflicts Risk

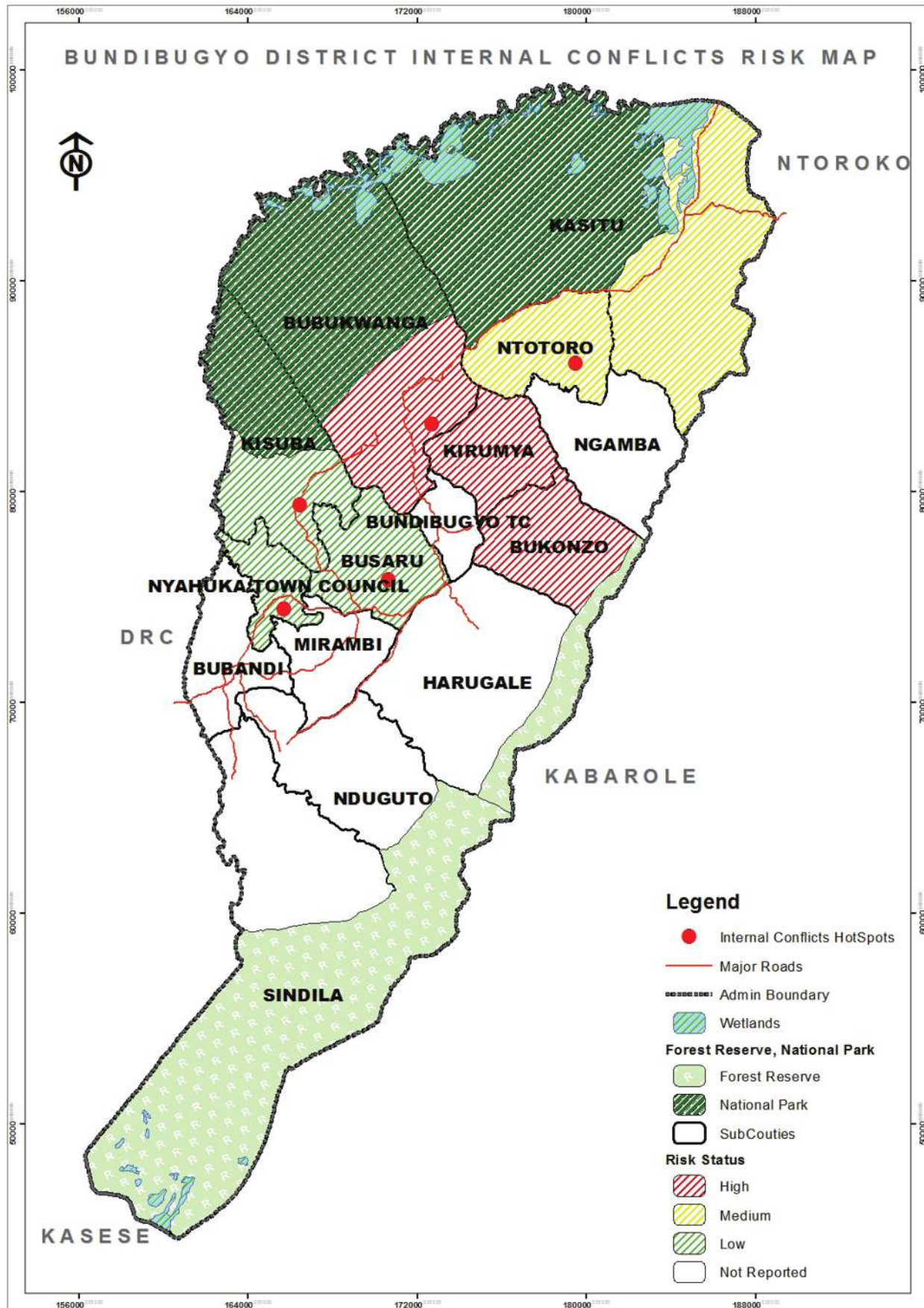


Figure 5: Internal Conflict Risk Map



Figure 5 shows the status of internal conflict risk in Bundibugyo District. Conflicts with a variety of origins are ongoing in Sub-counties of Bundibugyo District, which include Bubukwanga (Mataisa Parish – Bunyaruta Village and Bundinyama Parish Bundiwerume Village), Ntotoro Parish, Kitungezi Village. For example, the Bamba and Bakonzo are in dispute over the visit of the King of Bakonzo to Bundibugyo. In June 2012 reports of tribal conflicts over land between Bakonzo and Bamba were received, mainly in the low lying Sub Counties.

Other Sub-counties in conflict include Ntotoro, Kitungezi Parish; Nyahuka Town Council, Kalera Cell; Kisubba Sub-county, Busoru Parish, Butogo Trading Center; Busaru Sub-county, Kirindi Parish, Kirindi Village where escalation to disastrous levels may occur if situations are not well managed.

Overall, referring to the map, Bubukwanga, Bukonzo and Kirumya Sub-counties are prone to high risks of internal conflicts as shown by the red color on the map; Kasitu and Ntotoro sub counties are prone to moderate risk of internal conflicts as shown by the color yellow on the map, Bundibugyo T/C, Nyahuka T/C, Busaru Sub-county and Kisuba Sub-county are prone to low risk of internal conflicts as represented by the color green on the map. All the other Sub-counties are not prone to risks of internal conflicts.

Human Epidemic Risk

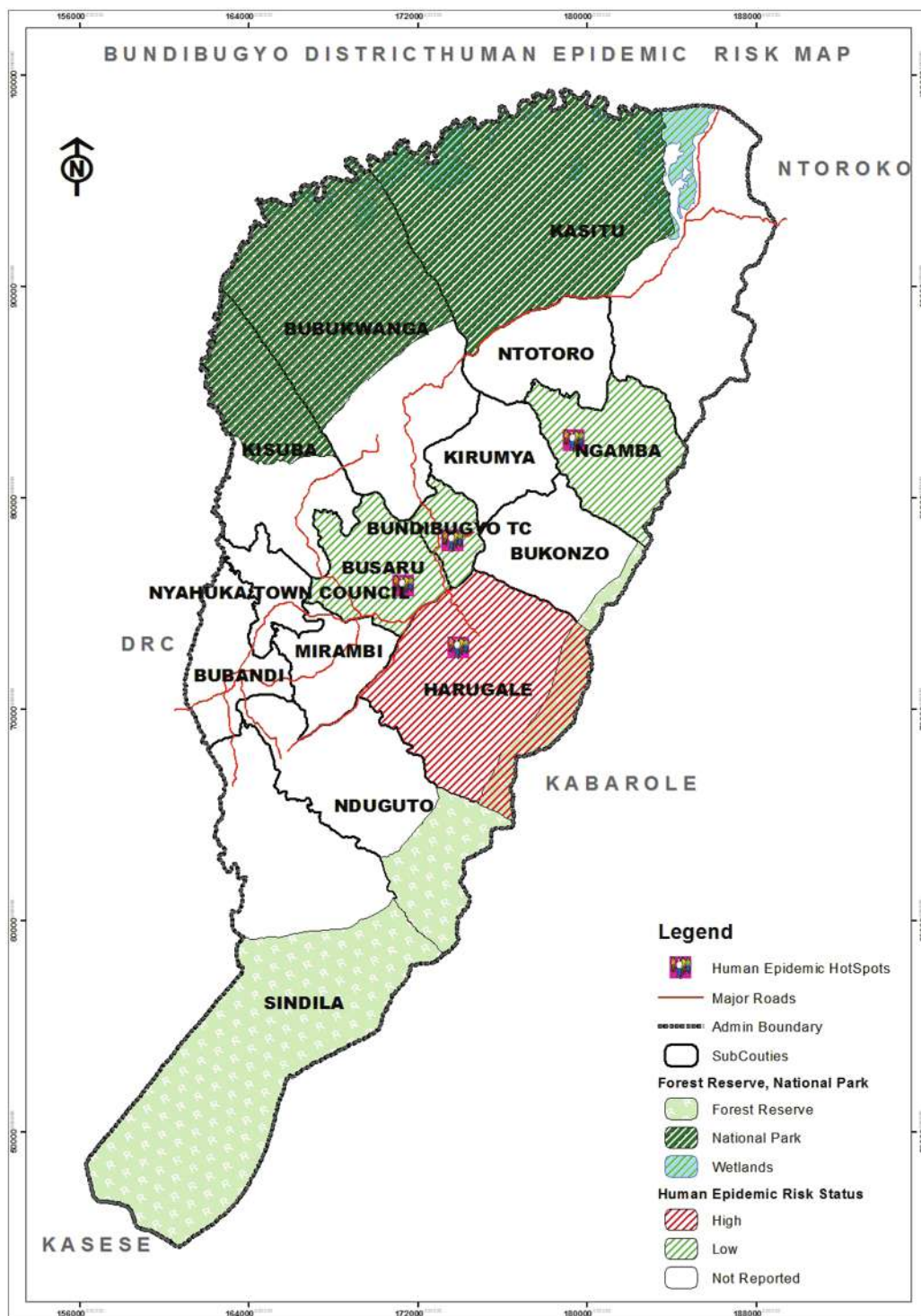


Figure 6: Human Epidemic Risk Map

The status of human epidemics in the District are shown in figure 6. Bundibugyo District has registered several human epidemics which claimed many lives mainly in Bundibugyo Town Council and Ngamba Sub-county. In 2007 an ebola outbreak killed 34 people. It started in Ngamba Sub-county and spread to Bundibugyo Town Council. Whereas Harugale, Busaru, Ngamba and Bundibugyo Town Council are epidemic-prone, Ngamba is prone to high risk as depicted by color red on the map, while Bundibugyo Town Council is prone to low risk. The other sub counties of Harugale and Busaru are potentially prone to low risk of human epidemics.

Bush fire Risk

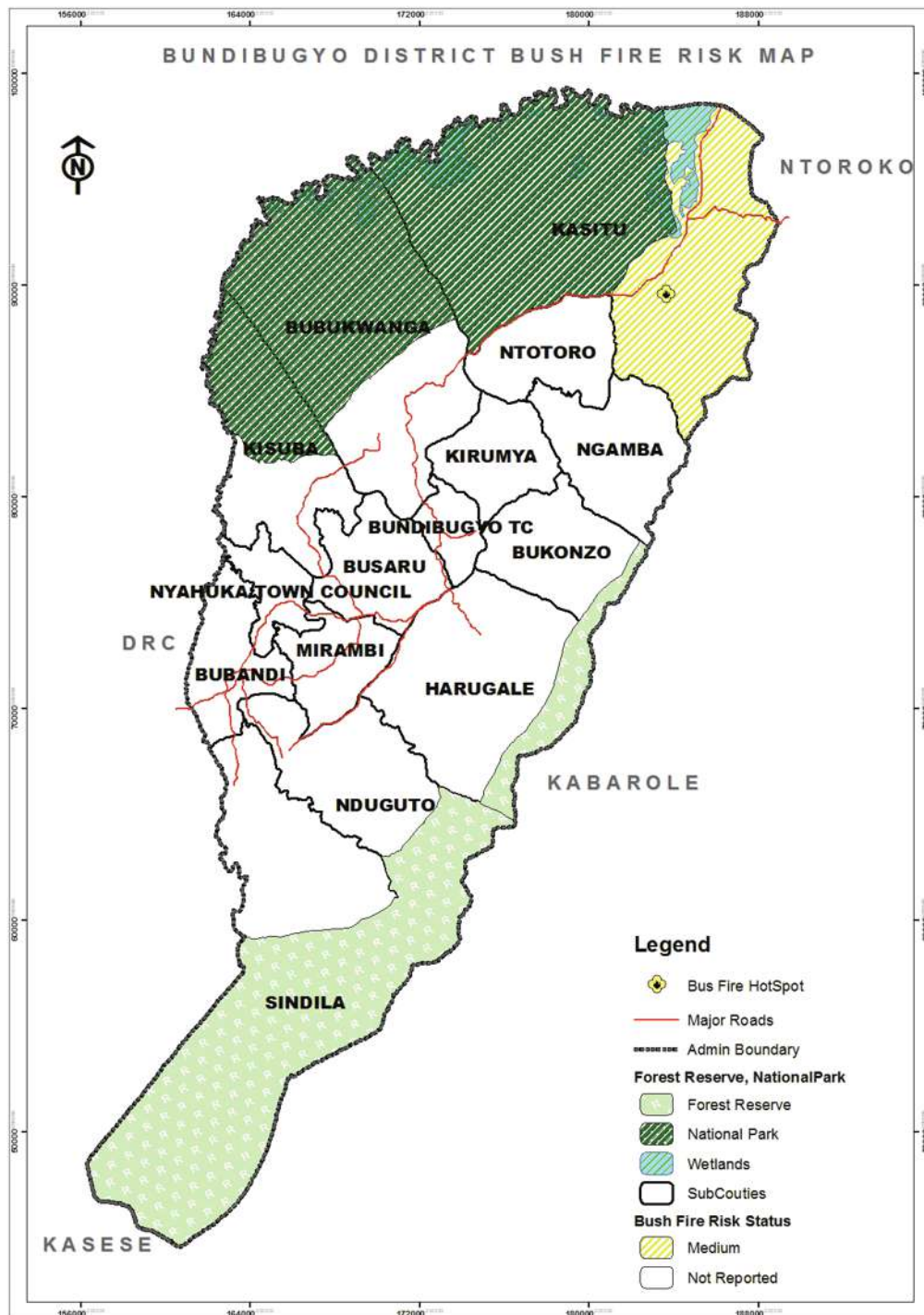


Figure 7: Bush Fire Risk Map

Figure 7 displays the risk status of wild fires in Bundibugyo District. Instances of wild fire have been reported in the highland Sub-county of Kasitu, mainly in Karambi and Burondo Parishes and in parts of the North Rwenzori Forest Reserve. These bush fires coincide with prolonged dry spell and people who burn their gardens for cultivation and then fail to control them. The fires damage natural pastures, affecting pastoralists, and also burn other people’s gardens causing losses in the natural environment, property, livelihood and other aspects of life. The Sub-county is prone to moderate risk of bush fires as represented by the color yellow on the map.

Earthquake Risk

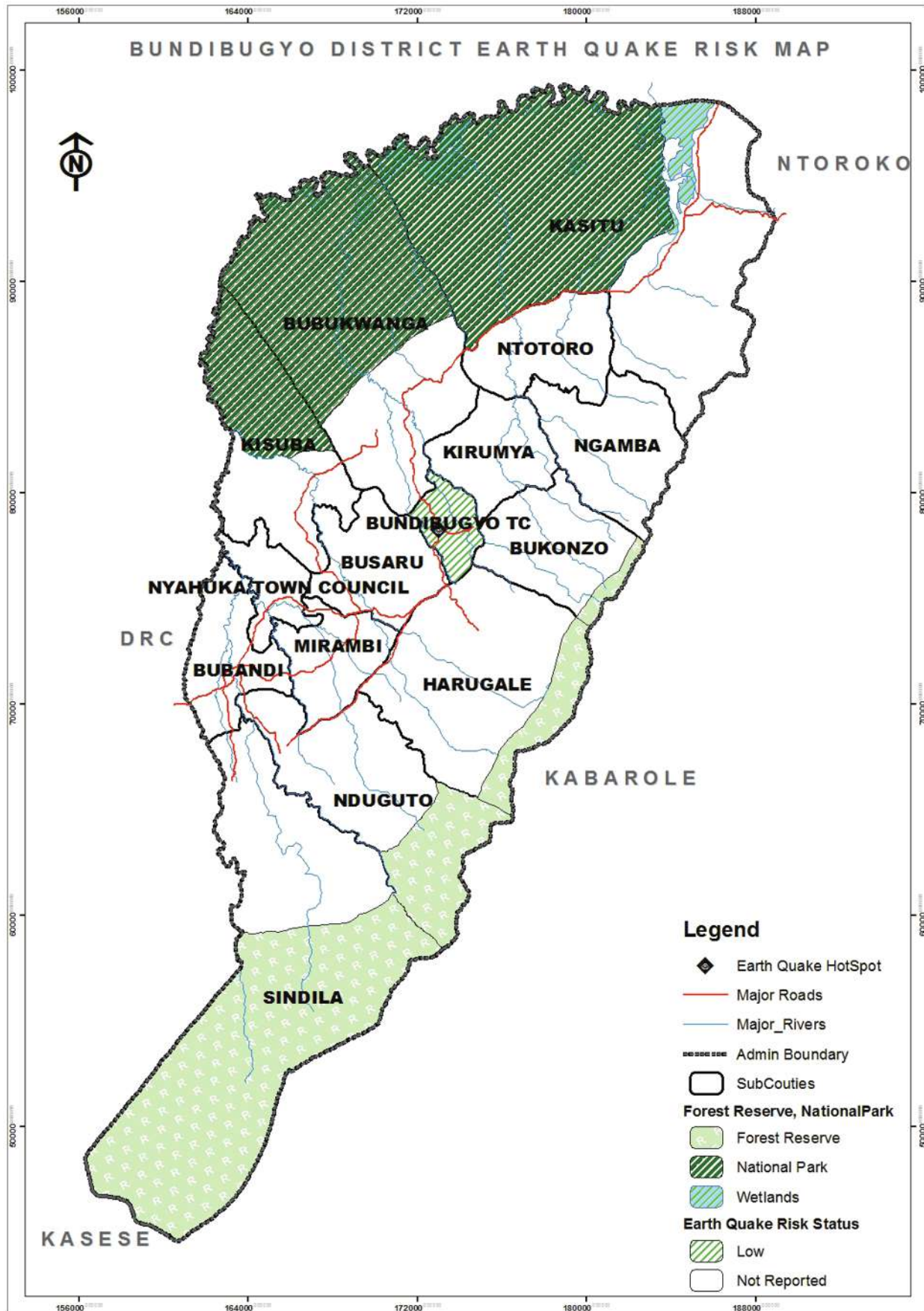


Figure 8: Earthquake Risk Map



Earthquake risk status in Bundibugyo District is shown in figure 8. Instances of earth quake were reported in 1966 and 1994 in Bundibugyo Town Council and damage was reported at the then Saza (County) headquarters, which was so severely cracked that the building was condemned. The same earthquake also affected the District Hospital of Bundibugyo where staff quarters buildings were reported to have collapsed. Frequent though weak tremors suggest that Bundibugyo Town Council is prone to low risk of earthquake due to its population density and unplanned development compared to other Sub-counties and Town Councils in the District.

Animal Vector and Diseases Risk

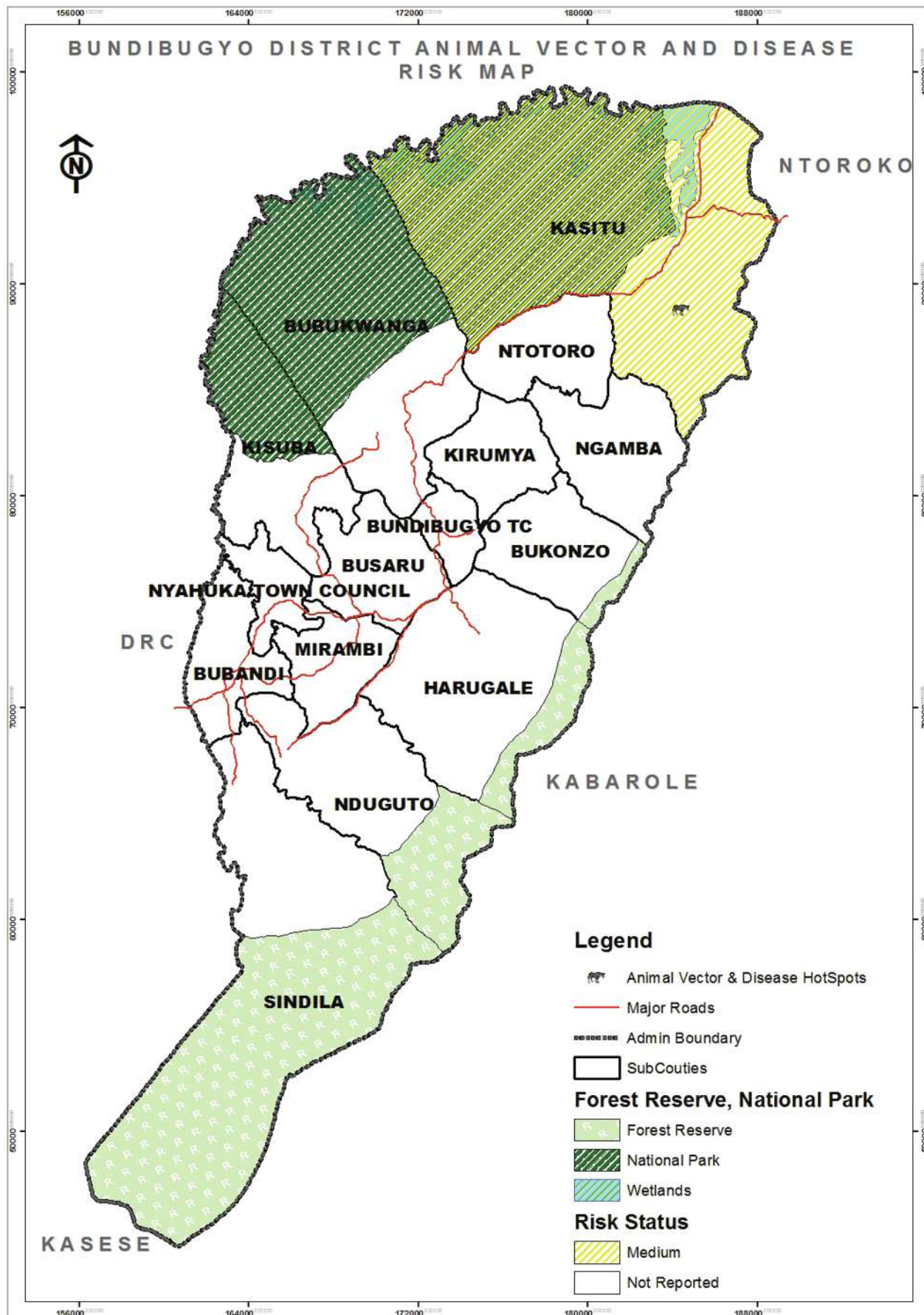


Figure 9: Animal Vector and Disease Risk Map

Figure 9 portrays the status of animal vector and disease risk in Bundibugyo District. Instances of ticks, swine fever, foot and mouth diseases, CBPP, brucellosis, lumpy skin diseases, rabies and east coast fever are reported to be common in Kasitu Sub-county, Burondo Parish. Animals, mainly cows, graze in big numbers on communal land facilitating the spread of animal diseases and pests, and make Kasitu Sub-county prone to moderate risk of this hazard. Additionally the Sub-county is adjacent to the Semiliki Game Reserve where the domestic herds interact with the wild and become exposed to lumpy skin disease, common among wild animals.

Vulnerability

Table 7 summarizes the communities' assessment of hazard severity and frequency in the Sub-counties. Table 8 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 of the communities at Sub-county level.

Table 8: Risk and vulnerability assessment

Sub-county	Floods	Landslides	Crop pest and disease	Environmental degradation	Internal conflicts	Human epidemics	Animal Vector and disease	Bush fires	Earth quakes	Cumulative vulnerability (Absolute)	Weighted vulnerability (Cumulative/3)
Kasitu	3	1	2	3	2	0	2	2	0	15	5
Bubukwanga	2	2	2	3	3	0	0	0	1	13	4
Bundibugyo TC	1	2	2	0	1	1	0	0	0	7	2
Nyahuka TC	1	1	2	3	1	0	0	0	0	8	3
Ntotoro	2	1	0	0	2	0	0	0	0	5	2
Bukonzo	1	1	2	2	3	0	0	0	0	9	3
Ndugutu	1	1	2	1	1	0	0	0	0	6	2
Busaru	0	0	2	3	1	0	0	0	0	6	2
Kirumya	0	3	2	3	3	0	0	0	0	11	4
Kisubba	1	0	2	0	1	0	0	0	0	4	1
Harugale	0	1	0	2	0	0	0	0	0	3	1
Ngamba	0	3	2	0	0	3	0	0	0	8	3
Sindila	1	1	0	0	0	0	0	0	0	2	1
Mirambi	1	0	0	0	0	0	0	0	0	1	1
Bubandi	2	0	0	0	0	0	0	0	0	2	1
Total	16	17	20	20	18	4	2	2	1	100	

Key: 3 = High, 2 = Medium, 1 = Low, 0 = Not reported



Risk Vulnerability

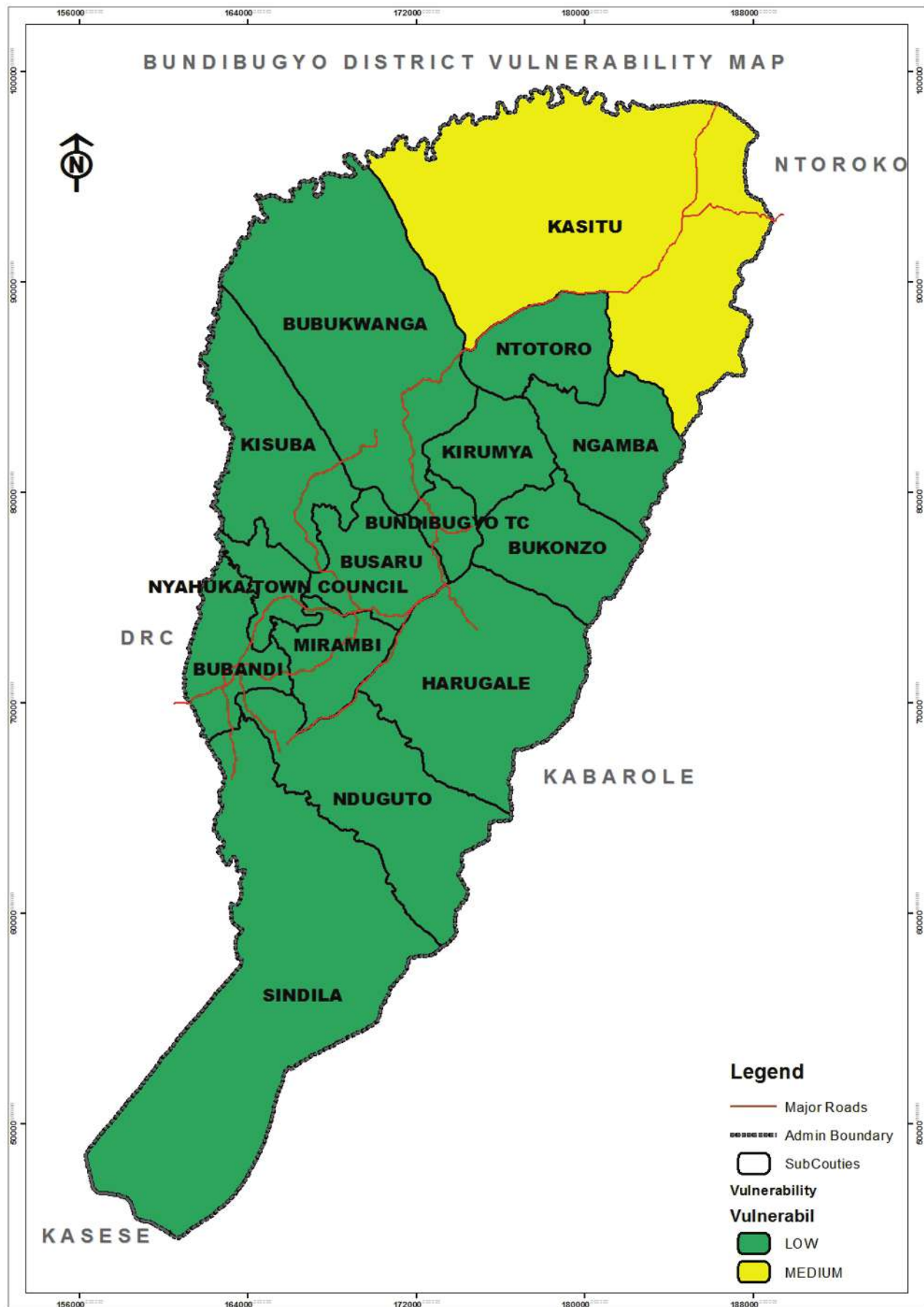


Figure 10: Risk Vulnerability Map

The vulnerability map in Figure 10 shows the areas of low, medium and high vulnerability according to the risk and vulnerability analysis 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 4 or less are coded “low”, considered to be low vulnerability areas and are assigned green, those from 5 to 7 are coded “medium”, considered to be medium vulnerability areas and are assigned yellow while those whose weighted vulnerabilities are 8 or more are coded “high”, considered to be high vulnerability areas and are represented by red.

Bundibugyo District is exposed to 9 hazards namely crop pests and diseases, environmental degradation, internal conflicts, landslides, floods, human epidemics, animal vector and diseases, bush fires and earthquakes arranged in their order of risk from highest to lowest. These are exacerbated by increasing human activities on the mountain slopes of Rwenzori, farming in the low-lying areas and flood plains, houses with weak foundations and poor building designs, and poor soils with less protective vegetation on slopes among many other unsustainable practices.

The District did not have any Sub-county that is highly vulnerable (red). Kasitu, the most vulnerable Sub-county in the District is at the medium (yellow) scale of vulnerability but suspected to achieve the “red” status in the near future due to its unprecedented environmental degradation and exposure to floods. The rest of Sub-counties are at the lower level (green) of the vulnerability scale. Harugale, Sindila, Mirambi and Bubandi Sub-counties portrayed very low vulnerability levels to the stated hazards tying at a weighted vulnerability of 1.

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

Conclusion

This multi hazard, risk and vulnerability profile for Bundibugyo District was produced after conducting a rigorous people centered, multi-sectoral, and multi stakeholder field data collection/mapping, analysis, and map production exercise. 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 Bundibugyo perceive each of the hazards based on the past trends and the predicted likelihood of their occurrences and impact on the communities.

The Bundibugyo District Local Government Officials together with the communities ranked crop pests and diseases, environmental degradation, internal conflicts and landslides to be the highest/major risks in the District with total risks of 20, 20, 18 and 17 respectively.

The most vulnerable communities in Bundibugyo District are Kasitu, with a weighted vulnerability of 5 (medium). Kasitu Sub-county is closely followed by Bubukwanga, Kirumya, Nyahuka TC, Bukonzo, and Ngamba Sub-counties with weighted vulnerabilities of 4, 4, 3, 3, 3 (low) respectively. The least vulnerable communities are those of Harugale, Sindila, Mirambi and Bubandi Sub-counties with a weighted vulnerability of 1 (low) each.

Early warning systems and other DRR interventions would be able to enhance the resilience of the people of Bundibugyo to the effects of climate change.

This profile is a legitimate 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 planning and District development planning process towards disaster proof plans.

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 loose 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, marburg, plague, avian influenza, ebola and sleeping sickness among others.

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

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

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

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

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

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

Environmental Degradation. This results from poor land use and other unsustainable ecosystem exploitation that lead to deterioration of the environment. Overgrazing, cultivation on sloping land, unguided and uncontrolled use of fertilizers and pesticides, bush burning,

overfishing, deforestation, mining, poor wastewater treatment, inappropriate waste disposal and wetlands reclamation are examples of causes of environmental degradation.

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

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

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

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

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